

NFPA 654  
Standard for the  
Prevention of Fire and  
Dust Explosions in the  
Chemical, Dye,  
Pharmaceutical,  
and Plastics  
Industries  
1994 Edition



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

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## **NFPA 654**

### **Standard for the**

# **Prevention of Fire and Dust Explosions in the Chemical, Dye, Pharmaceutical, and Plastics Industries**

## **1994 Edition**

This edition of NFPA 654, *Standard for the Prevention of Fire and Dust Explosions in the Chemical, Dye, Pharmaceutical, and Plastics Industries*, was prepared by the Technical Committee on Fundamentals of Dust Explosion Prevention and Control 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.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

## **Origin and Development of NFPA 654**

NFPA 654 was initiated by the Committee on Dust Explosion Hazards in 1943 and originally applied only to the prevention of dust explosions in the plastics industry. As such, it was tentatively adopted in 1944 and officially adopted in 1945. Amendments were adopted in 1946, 1959, 1963, and 1970. The 1970 edition was reconfirmed in 1975.

In 1976, responsibility for NFPA 654 was transferred to the Technical Committee on Fundamentals of Dust Explosion Prevention and Control. The Committee, in completely revising the document, also expanded its scope to include chemical, dye, and pharmaceutical dusts, since the fire and explosion hazards of these dusts are generally the same as for plastic dusts.

The 1982 edition of this standard consisted of a complete rewrite of the 1975 edition. Due to limited technological changes in this area since 1982, the Committee voted to reconfirm the text as it appears in the 1982 version. Editorial corrections and changes to allow the document to adhere more closely to the *NFPA Manual of Style* were incorporated into the 1988 edition.

For the 1994 edition of NFPA 654, the standard was partially revised to improve its usability, adoptability, and enforceability; to update out-dated terminology; and to add the NFPA language for equivalency and retroactivity. In addition, the Technical Committee on Fundamentals of Dust Explosion Prevention and Control added new technologies for explosion prevention to be consistent with the 1992 edition of NFPA 69, *Standard on Explosion Prevention Systems*. The Committee also clarified the requirements relating to controlling hazardous accumulations of process dust.

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*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 that are generally applicable to all dusts concerning the fundamentals of dust explosion prevention. This Technical Committee also shall be responsible for documents on the prevention, control, and extinguishment of fires and explosions in dust collection equipment and in pneumatic conveying equipment.

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**NFPA 654****Standard for the****Prevention of Fire and Dust Explosions in the Chemical, Dye, Pharmaceutical and Plastics Industries****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 8 and Appendix B.

**Chapter 1 General****1-1 Scope.**

**1-1.1** This standard shall apply to all phases of the manufacture and processing of industrial dusts including, but not limited to, chemicals, dyes, pharmaceuticals and plastics where a fire or explosion hazard might exist due to the presence of combustible dusts.

**1-1.2** This standard shall not apply to materials covered by the following:

NFPA 61A, *Standard for the Prevention of Fire and Dust Explosions in Facilities Manufacturing and Handling Starch*

NFPA 61B, *Standard for the Prevention of Fires and Explosions in Grain Elevators and Facilities Handling Bulk Raw Agricultural Commodities*

NFPA 61C, *Standard for the Prevention of Fire and Dust Explosions in Feed Mills*

NFPA 61D, *Standard for the Prevention of Fire and Dust Explosions in the Milling of Agricultural Commodities for Human Consumption*

NFPA 65, *Standard for the Processing and Finishing of Aluminum*

NFPA 480, *Standard for the Storage, Handling and Processing of Magnesium Solids and Powders*

NFPA 481, *Standard for the Production, Processing, Handling, and Storage of Titanium*

NFPA 482, *Standard for the Production, Processing, Handling, and Storage of Zirconium*

NFPA 490, *Code for the Storage of Ammonium Nitrate*

NFPA 651, *Standard for the Manufacture of Aluminum Powder*

NFPA 655, *Standard for Prevention of Sulfur Fires and Explosions*

NFPA 664, *Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities*

NFPA 8503, *Standard for Pulverized Fuel Systems*.

**1-1.3** NFPA 91, *Standard for Exhaust Systems for Air Conveying of Materials*, shall not apply to material transfer systems or dust control systems covered by this standard.

**1-2 Purpose.** The purpose of this standard is to prescribe requirements for safety to life and property from fire and explosion and to minimize the resulting damage should a fire or explosion occur.

**1-3 Equivalency.** Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard, provided technical documentation is submitted to the authority having jurisdiction to demonstrate equivalency and the system, method, or device is approved for the intended purpose.

**1-4 Retroactivity.** This standard applies to facilities on which construction is begun subsequent to the date of publication of the standard. When major replacement or renovation of existing facilities is planned, provisions of this standard shall apply.

**1-5 Definitions.** For the purpose of this standard, the following terms shall have the meanings given below.

**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.

**Chemical.** A substance composed of an element or combination of elements.

**Combustible Dust.\*** Any finely divided solid material 420 microns or smaller in diameter (material passing a U.S. No. 40 Standard Sieve) that presents a fire or explosion hazard when dispersed and ignited in air.

**Detachment.** In the open air or in a separate building.

**Duct.** Pipes, channels, or other enclosures used for the purpose of conveying air, dust, or gas. A duct shall not include short sections of flexible hose.

**Dye.** A solid or powdered coloring matter.

**Explosion.** The bursting of a building or container as a result of development of internal pressure beyond its confinement capacity.

**Hybrid Mixture.\*** A mixture of a combustible gas with either a combustible dust or a combustible mist.

**Labeled.** Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation that maintains periodic inspection of production of labeled equipment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

**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.

**Pharmaceutical.** A natural or manufactured medicinal drug composed of various ingredients.

**Plastic.** A generic term referring to synthetic or natural resins, with or without additives, that can be molded by heat and pressure, or both. The term also refers to the finished products.

**Separation.** The interposing of distance between the combustible dust process and other operations that are in the same room.

**Segregation.** The interposing of a physical barrier between the combustible dust process and other operations.

**Shall.** Indicates a mandatory requirement.

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

## Chapter 2 Plant Arrangement and Building Construction

### 2-1 Segregation, Separation, or Detachment of Dust Handling and Processing Areas.

**2-1.1** Areas in which combustible dusts are processed or handled shall be segregated, separated, or detached in such a manner as to minimize damage to other portions of the plant should an explosion or fire occur. (See 3-3.2.4.)

**2-1.2** If physical barriers are erected to segregate dust explosion hazards, they shall be designed for sufficient explosion resistance to preclude failure of these barriers before the explosion pressure can be safely vented to the outside.

**2-1.3** Compartmentation shall be permitted to be used to limit the area considered hazardous, provided a dust collection system is installed to minimize accumulations of dust. Process equipment, including the dust collection system, shall be protected as required by Chapters 3 and 4.

### 2-2 Building Construction.

**2-2.1** All buildings shall be of Type I or II construction, as defined in NFPA 220, *Standard on Types of Building Construction*. Where local, state, and national building codes require, modifications shall be permitted for conformance to these codes.

**2-2.2\*** Interior surfaces shall be as smooth as possible to facilitate cleaning and minimize combustible dust accumulation.

**2-2.3** Concealed spaces shall be sealed to prevent dust accumulation.

**2-2.4** Interior walls erected as fire partitions shall be designed for a minimum fire endurance of 1 hour.

**2-2.5** Openings in fire walls shall be protected by automatic closing fire doors having a fire protection rating of 3 hours. Fire doors shall be installed according to NFPA 80, *Standard for Fire Doors and Fire Windows*, and shall normally be in the closed position.

**2-2.6** Means of egress shall comply with NFPA 101®, *Life Safety Code*®.

**2-2.7** All penetrations of floors, walls, or partitions shall be dusttight and, where structural assemblies have a fire endurance rating, the seal shall maintain that rating.

**2-2.8** Interior stairs, elevators, and manlifts shall be enclosed in dusttight shafts having a 1-hour fire resistance rating. Doors of the automatic-closing or self-closing type, having a fire protection rating of 1 hour, shall be provided at each landing.

*Exception: Stairs, elevators, and manlifts serving only open-deck floors, mezzanines, and platforms need not be enclosed.*

**2-2.9\*** Floors and load bearing walls exposed to dust explosion hazards shall be designed to preclude failure during an explosion.

### 2-3 Explosion Venting.

**2-3.1\*** If a room or building contains a dust explosion hazard external to protected equipment, such areas shall be provided with explosion venting to a safe outside location.

**2-3.2\*** Vent closures shall be directed toward a personnel restricted area, or the vent closure shall be restrained to minimize the missile hazard to personnel and equipment. In addition to the missile hazard, the fireball emitted from the vent opening shall not impinge upon personnel pathways.

**2-3.3** Explosion vents shall be designed such that, once opened, they will remain open to prevent failure from the vacuum following the pressure wave.

## Chapter 3 Process Equipment

### 3-1\* General.

**3-1.1 Equipment Explosion Protection.** In designing explosion protection for equipment, one of the following methods of protection shall be incorporated:

(a) Equipment can be designed to contain the anticipated explosion pressure in accordance with NFPA 69, *Standard on Explosion Prevention Systems*.

(b)\* Explosion venting can be provided.

(c) An explosion suppression system shall be permitted to be provided and, where used, shall be designed in accordance with NFPA 69, *Standard on Explosion Prevention Systems*.

(d)\* Inerting shall be permitted to be used to reduce oxygen content below the specific level for the material being handled. See NFPA 69, *Standard on Explosion Prevention Systems*.

(e) The dust shall be permitted to be rendered noncombustible through dilution with a noncombustible dust. If this method is used, test data for specific dust and diluent combinations shall be provided and shall be acceptable to the authority having jurisdiction.

**3-1.2 Equipment Isolation.** Isolation devices shall be provided to prevent explosion propagation between major pieces of equipment connected by ductwork, or the design shall take into consideration the increased venting requirements from pressure piling and flame jet ignition. Isolation devices include, but are not limited to:

- (a)\* Chokes,
- (b)\* Rotary valves,
- (c) Fast-acting dampers and valves,
- (d) Flame front diverters,
- (e) Deflagration isolation systems.

(See NFPA 69, *Standard on Explosion Prevention Systems*, for design requirements.)

### 3-2 Bulk Storage.

**3-2.1** For the purpose of this section, bulk storage shall include such items as bins, tanks, hoppers, and silos.

**3-2.2** Bulk storage containers, whether located inside or outside of buildings, shall be constructed of noncombustible material.

**3-2.3** There shall be no intertank or interbin venting.

**3-2.4\*** Interior surfaces shall be as smooth as possible to facilitate cleaning and minimize combustible dust accumulation.

**3-2.5** Access doors or openings shall be provided to permit inspection, cleaning, and maintenance. Access doors or openings shall be designed to prevent dust leaks. Access doors shall not be considered as an explosion relief area unless specifically designed for that function and vented to outside the building.

**3-2.6** Bulk storage containers shall be provided with explosion protection as described in 3-1.1.

### 3-3 Material Transfer System.

#### 3-3.1 Duct Systems.

**3-3.1.1\*** Ducts handling combustible dust shall be constructed of noncombustible material, shall be of adequate strength and rigidity to meet the conditions of service and installation requirements, and shall be properly protected where subject to mechanical injury. All ducts, whether inside or outside of buildings, shall be thoroughly braced where required and substantially supported by metal hangers or brackets and shall be designed to afford strength and rigidity against disruption. All lap joints shall be made in the direction of the air flow.

*Exception\*:* Flexible hose to allow material pick-up, flexible connections for vibration isolation, and bellows for the free movement of weigh bins shall be permitted if they are conductive or the equipment is bonded and grounded.

**3-3.1.2** All ducts shall be made reasonably dusttight throughout and shall have no openings other than those required for the proper operation and maintenance of the system, i.e., clean-out panels, service access panels for explosion vents, etc.

**3-3.1.3** Changes in sizes of ducts shall be by means of a taper transformation piece, the included angle of the taper being not more than 30 degrees.

**3-3.1.4** The passing of ducts through a physical barrier for segregation shall be avoided.

#### 3-3.2 Bucket Elevators.

**3-3.2.1** Belt-driven bucket elevators shall be provided with explosion protection as specified in 3-1.1. Bucket elevators, wherever possible, shall be located outside buildings. Where explosion venting is provided, the bucket elevator shall be located as close as possible to exterior walls where explosion relief can be vented to the outside. If the distance between the head and boot exceeds 20 ft (6.1 m), explosion relief shall be provided at not more than 20-ft (6.1-m) intervals on the legs.

**3-3.2.2** Elevator leg casings, head and boot sections, and connecting ducts shall be dusttight and shall be constructed of noncombustible materials.

**3-3.2.3** Where provided, inlet and discharge hoppers shall be designed so that they are accessible for cleaning and inspection.

**3-3.2.4\*** Belt-driven bucket elevators shall be equipped with a mechanical or electromechanical device that cuts off the power to the drive motor and sounds an alarm in the event of leg belt slowdown exceeding 20 percent. Feed to the elevator leg shall be stopped or diverted.

**3-3.2.5** No bearings shall be located or exposed within the bucket elevator casing.

#### 3-3.3 Conveyors.

**3-3.3.1** All conveyors (e.g., screw, drag, pneumatic, etc.) shall be of metal construction and shall be designed to prevent escape of combustible dusts. Coverings on clean-out, inspection, and other openings shall be securely fastened.

**3-3.3.2\*** Pneumatic systems shall be designed in accordance with NFPA 650, *Standard for Pneumatic Conveying Systems for Handling Combustible Materials*.

**3-3.3.3** Conveyors shall be protected from explosion as specified in 3-1.1.

**3-3.3.4** Belt-driven conveyors shall be equipped with an automechanical or an electromechanical device that cuts off the power to the drive motor and sounds an alarm in the event of a belt slowdown exceeding 20 percent. Feed to the conveyor shall be stopped or diverted.

#### **3-3.4 Fans or Blowers.**

**3-3.4.1** Blowers or exhaust fans shall be installed on proper foundations and shall be secured in a substantial manner.

**3-3.4.2** For fans, ample clearance shall be provided between the blades and the casing, and fans shall be designed to operate below the minimum explosible concentration of the normally expected dust and hybrid loading.

**3-3.4.3\*** For fans on the discharge side of the dust collectors, the dust concentration in the system shall be designed to be below the minimum explosible concentration of the normally expected dust and hybrid loading.

**3-3.4.4** The fan bearings shall not extend into the casings. Belt drives shall not be located inside the fan or blower housing. A clearance shall be provided between the shaft and casings.

**3-3.4.5** A minimum conveying velocity shall be maintained throughout the conveying system to prevent the accumulation of dust at any point and to pick up any dust or powder that drops out during an unscheduled system stoppage.

#### **3-4 Size Reduction.**

**3-4.1** Size reduction equipment shall include such items as mills, grinders, and pulverizers.

**3-4.2** Before material is processed by size reduction equipment, foreign matter shall be removed as required by 5-1.1 or by the use of grates or other separation devices.

**3-4.3** Size reduction equipment shall be isolated as required by 3-1.2.

**3-4.4** Explosion protection shall be provided as specified in 3-1.1.

**3-5\* Particle Size Separation.** Screens, sieves, and similar devices shall be in dusttight enclosures. Connection ducts shall be made of metal.

*Exception: Where movement of the equipment is necessary, short flexible connections shall be permitted to be used. Such connectors shall be electrically conductive and bonded. (See Section 5-3.)*

#### **3-6 Mixers and Blenders.**

**3-6.1\*** Mixers and blenders shall be dusttight. Foreign matter shall be removed as required by 5-1.1 or by the use of grates or other separation devices.

**3-6.2** Explosion protection shall be provided as specified in 3-1.1.

**3-6.3** Mixers and blenders shall be made of metal or other noncombustible material.

#### **3-7 Dryers.**

**3-7.1\*** A dryer, within the scope of this standard, shall be any piece of processing equipment used to reduce the moisture or volatile content of the material being handled.

**3-7.2\*** Heating systems shall be in accordance with 5-5.1.

**3-7.3** Drying media that contacts material being processed shall not be recycled to rooms or buildings. Drying media shall be permitted to be passed through a filter, dust separator, or equivalent means of dust removal and recycled to the drying process.

**3-7.4** Dryers shall be isolated as required by 3-1.2.

**3-7.5** Combustion controls on all heating mediums shall be provided in accordance with the following NFPA standards, as applicable:

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

NFPA 85C, *Standard for Prevention of Furnace Explosions/Implosions in Multiple Burner Boiler-Furnaces*

NFPA 86, *Standard for Ovens and Furnaces*

NFPA 8501, *Standard for Single Burner Boiler Operation*.

**3-7.6** Dryers shall be constructed of noncombustible materials.

**3-7.7** Interior surfaces of dryers shall be designed so that accumulations of material are minimized and cleaning is facilitated.

**3-7.8** Outward opening access doors or openings shall be provided in all parts of the dryer and connecting conveyors to permit inspection, cleaning, maintenance, and the effective use of portable extinguishers or hose streams.

**3-7.9** Explosion protection shall be provided as specified in 3-1.1.

#### **3-7.10 Dryer Operation.**

**3-7.10.1** Operating controls shall be designed, constructed, installed, and monitored so that required conditions of safety for operation of the air heater, the dryer, and the ventilation equipment are maintained.

**3-7.10.2** The drying chamber shall have an operating control arranged to maintain the temperature within the prescribed limits.

**3-7.10.3** Extraneous material that would contribute to a fire hazard shall be removed from the commodity before it enters the dryer.

**3-7.10.4** Operating personnel shall be fully instructed on the safe operation of the dryer, according to the manufacturer's operating instructions. Instruction shall include procedures to be followed in case of fire.

## **Chapter 4 Dust Control**

#### **4-1 Dust Collection.**

**4-1.1** Continuous suction shall be provided for processes where combustible dust is liberated in normal operation. The dust shall be conveyed to dust separators or collectors.

**4-1.2 Location and Provisions for Dust Collection Systems.****4-1.2.1\*** Dust collectors shall be located outside of buildings.

*Exception No. 1\*:* Dust collectors shall be permitted to be located inside of buildings if they are located adjacent to an exterior wall, are vented to the outside through straight ducts not exceeding 10 ft (3 m) in length, and have explosion vents.

*Exception No. 2:* Dust collectors protected with an explosion suppression system meeting the requirements of NFPA 69, *Standard on Explosion Prevention Systems*, shall be permitted to be located inside buildings.

**4-1.2.2** Dust collection equipment shall be provided with explosion protection, as specified in 3-1.1.

**4-1.3** Manifolding of dust collection ducts shall not be permitted unless arranged in accordance with 4-1.3.1 and 4-1.3.2.

**4-1.3.1** Dust collection ducts from a single piece of equipment or from multiple pieces of equipment interconnected on the same process stream shall be permitted to be manifolded.

**4-1.3.2** Dust collection ducts from isolated pieces of equipment shall be permitted to be manifolded if each of the ducts is equipped with an isolation device prior to manifolding.

**4-1.4** Dust collectors shall be constructed of noncombustible materials. Cloth-type collectors shall be provided with dusttight metal enclosures or their equivalent.

**4-1.5** Recycling of air from collectors to buildings shall be permitted if the system is designed to prevent both return of dust and transmission of energy from a fire or explosion to the building.

*Exception:* Recycling of air to the building shall not be permitted under any circumstances when combustible gases or vapors, hybrid mixtures, or inert gases are involved.

**4-2 Housekeeping.** The requirements of 4-2.1 through 4-2.4 shall be applied retroactively.

**4-2.1\*** Equipment shall be designed, maintained, and operated in a manner that minimizes the escape of dust. Regular cleaning frequencies shall be established for floors and horizontal surfaces, such as ducts, pipes, hoods, ledges, and beams to minimize dust accumulations within operating areas of the facility.

**4-2.2\*** Surfaces shall be cleaned in a manner that minimizes the generation of dust clouds. Vigorous sweeping, blowing down with steam or compressed air produces dust clouds and shall be permitted only if the requirements of 4-2.3 are met.

**4-2.3** Blowdown with steam or compressed air can be performed if the following items are complied with:

- (a) Area and equipment shall be vacuumed prior to blowdown.
- (b) Electrical power and other sources of ignition shall be shut down or removed from the area.
- (c) Only low-pressure steam or compressed air shall be used.

**4-2.4** When used, vacuum cleaners shall be listed for use in Class II hazardous locations or shall be a fixed-pipe suction system with remotely located exhaustor and collector.

*Exception:* Where flammable vapors or combustible gases are present, vacuum cleaners shall be listed for Class I hazardous locations.

**Chapter 5 Control of Ignition Sources****5-1 Friction.**

**5-1.1\* Tramp Metal.** Magnetic separators of the permanent magnet or self-cleaning electromagnetic type or pneumatic separators shall be installed to remove metal or foreign matter capable of igniting combustible material being processed. [See Figures A-3-1.2(a) and (b).]

**5-1.2\*** Belt drives shall be designed to stall without slipping, or a safety device shall be provided to shut down the equipment if slippage occurs.

**5-1.3 Bearings.**

**5-1.3.1** Roller or ball antifriction bearings shall be used on all processing and transfer equipment. Lubrication shall be performed in accordance with the manufacturer's recommendations.

**5-1.3.2** Wherever possible, bearings shall be located outside the combustible dust stream where they are less exposed to dust and more accessible for inspection and service.

**5-1.4 Equipment.**

**5-1.4.1** Equipment shall be installed and maintained so that constant true alignment is maintained and adequate clearance is provided to minimize friction.

**5-1.4.2** Equipment such as screw conveyors or drag conveyors shall be arranged to shut down if the discharge opening becomes plugged.

**5-2 Electrical Equipment.** All electrical equipment and installations shall comply with the requirements of NFPA 70, *National Electrical Code*®, or NFPA 496, *Standard for Purged and Pressurized Enclosures for Electrical Equipment*, as applicable.

**5-3\* Static Electricity.** All machines and equipment, including duct work, storage bins, and permanently installed and portable vacuum cleaning systems, shall be bonded and grounded. Where belt drives are used, the belts shall be of electrically conductive material. Ionization methods shall be used to dissipate static electricity in nonconducting equipment. The utilization of flexible intermodel bulk containers shall not be permitted where flammable gases or combustible vapors are present.

**5-4 Open Flames and Sparks.** The requirements of 5-4.1 through 5-4.3 shall be applied retroactively.

**5-4.1** Cutting and welding shall comply with the applicable requirements of NFPA 51B, *Standard for Fire Prevention in Use of Cutting and Welding Processes*.

**5-4.2** A hot work permit system shall be used for any process resulting in sparks or using open flames in areas

where combustible dust is present. Precautions shall be similar to those required in 5-4.1 for cutting and welding operations.

**5-4.3** Smoking shall be permitted only in designated areas.

## **5-5 Heating Systems.**

### **5-5.1 Process Heating Systems.**

**5-5.1.1** Process heating systems using air, steam, or heat transfer fluids shall be provided with pressure relief valves where necessary. Relief valves on systems employing combustible heat transfer media shall be vented to a safe outside location.

**5-5.1.2** Heaters for heat transfer media shall be located in a separate, dust-free room or building, or outdoors.

**5-5.1.3** Air for combustion shall be taken from a clean outside source.

**5-5.1.4** Heat exchangers shall be located and arranged in a manner that does not allow combustible dust to accumulate on coils, fins, or other heated surfaces.

**5-5.1.5** Where a system employs combustible heat transfer media, automatic sprinkler protection shall be provided in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

### **5-5.2 Comfort Heating.**

**5-5.2.1** In areas containing combustible dust, comfort heating, if provided, shall be provided by indirect means or a means suitable for the location.

**5-5.2.2** If used, hot water or low-pressure steam (15 psig or less) shall be supplied by a boiler installed in accordance with 5-5.1.2.

**5-5.2.3** Hot air heaters shall be installed in accordance with 5-5.1.2. Air containing combustible dust shall not be circulated back to the heater, nor shall it be recirculated to nonhazardous areas of the building.

**5-5.2.4** Steam and hot water supply pipes and hot air supply ducts in areas containing combustible dust shall be fitted with properly maintained insulation having a continuous nonporous covering and having a thickness sufficient to keep the temperature of the outer surface below 80 percent of the minimum ignition temperature of the dust layer.

**5-6 Hot Surfaces.** The temperature of all exposed surfaces (engines, pipes, ducts, process equipment) within an area containing a combustible dust shall be maintained below 80 percent of the minimum ignition temperature of the dust layer.

**5-7 Industrial Trucks.** In areas containing a combustible dust hazard, only industrial trucks of a type suitable for the electrical classification of the area shall be used. See NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Maintenance, and Operation*, and Articles 500 and 502 of NFPA 70, *National Electrical Code*.

## **5-8 Powder-Actuated Tools.**

**5-8.1** Powder-actuated tools shall not be used in areas where combustible dust is present.

**5-8.2** When the use of powder actuated tools becomes necessary, all dust-producing machinery in the area shall be shut down; all equipment, floors, and walls shall be cleaned carefully; and all dust accumulations shall be removed.

**5-8.3** A thorough check shall be made after the work is completed to be sure that no cartridges or charges are left on the premises where they can enter equipment or be accidentally discharged after operation of the dust-producing or handling machinery is resumed.

## **Chapter 6\* Fire Protection**

**6-1 Fire Extinguishers.** Portable fire extinguishers shall be provided throughout all buildings according to the requirements of NFPA 10, *Standard for Portable Fire Extinguishers*.

### **6-2 Hose, Standpipes, and Hydrants.**

**6-2.1** Standpipes and hose, where provided, shall comply with NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*.

**6-2.2** Electrical-type (or equivalent) spray nozzles shall be provided in areas containing dust in order to limit the potential for generating unnecessary airborne dust during fire-fighting operations.

**6-2.3** Private outside protection, including outside hydrants and hoses, where provided, shall comply with NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*.

**6-3\* Automatic Sprinklers.** Automatic sprinklers, where provided, shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

**6-4 Special Fire Protection Systems.** Automatic extinguishing systems or special hazard extinguishing systems, where provided, shall be designed, installed, and maintained in accordance with the following standards as applicable. The extinguishing systems shall be designed and used to minimize the generation of dust clouds during their discharge.

(a) NFPA 11, *Standard for Low-Expansion Foam*

(b) NFPA 11A, *Standard for Medium- and High-Expansion Foam Systems*

(c) NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*

(d) NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*

(e) NFPA 12B, *Standard on Halon 1211 Fire Extinguishing Systems*

(f) NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*

(g) NFPA 16, *Standard on the Installation of Deluge Foam-Water Sprinkler and Foam-Water Spray Systems*

(h) NFPA 17, *Standard for Dry Chemical Extinguishing Systems*

(i) NFPA 72, *National Fire Alarm Code*

**6-5 Alarm Service.** Alarm service, if provided, shall comply with NFPA 72, *National Fire Alarm Code*.

## Chapter 7 Training, Inspection, and Maintenance

### 7-1 Employee Training.

**7-1.1** There shall be policies and requirements that provide for initial and continuing training for all employees. These shall include the development of operating procedures that are reviewed at least once per year and after every process change.

**7-1.2** All employees shall be instructed at scheduled intervals regarding the potential hazards of their working environment and their behavior and procedures in case of equipment or process failures that can result in fire or explosion.

### 7-2 Periodic Inspection.

**7-2.1** A systematic inspection for safe operations shall be made at regular intervals, and reports shall be submitted to plant management for review.

The inspection shall include:

- (a) Fire and explosion protection and prevention equipment;
- (b) Dust control equipment;
- (c) Housekeeping;
- (d) Potential ignition sources;
- (e)\* Electrical, process, and mechanical equipment, including interlocks; and
- (f) Standard operating procedures and work practices.

**7-2.2** Competent persons shall conduct inspections and the record of their findings and recommendations shall be recorded permanently in the principal plant office.

**7-2.3\*** An emergency plan shall be maintained up-to-date and shall be coordinated with existing local community emergency planning.

### 7-3 Maintenance.

**7-3.1** A planned maintenance system shall be established to regularly lubricate, inspect, and test electrical and mechanical equipment in accordance with the manufacturer's recommendations.

**7-3.2** A recordkeeping system of repairs and planned maintenance shall be established.

## Chapter 8 Referenced Publications

**8-1** The following documents or portions thereof are referenced within this standard and shall be considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

**8-1.1 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 11, *Standard for Low-Expansion Foam*, 1994 edition.

NFPA 11A, *Standard for Medium- and High-Expansion Foam Systems*, 1994 edition.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, 1993 edition.

NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*, 1992 edition.

NFPA 12B, *Standard on Halon 1211 Fire Extinguishing Systems*, 1990 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 1994 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, 1993 edition.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, 1990 edition.

NFPA 16, *Standard on the Installation of Deluge Foam-Water Sprinkler and Foam-Water Spray Systems*, 1991 edition.

NFPA 17, *Standard for Dry Chemical Extinguishing Systems*, 1994 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, 1992 edition.

NFPA 31, *Standard for the Installation of Oil-Burning Equipment*, 1992 edition.

NFPA 51B, *Standard for Fire Prevention in Use of Cutting and Welding Processes*, 1994 edition.

NFPA 61A, *Standard for the Prevention of Fire and Dust Explosions in Facilities Manufacturing and Handling Starch*, 1989 edition.

NFPA 61B, *Standard for the Prevention of Fires and Explosions in Grain Elevators and Facilities Handling Bulk Raw Agricultural Commodities*, 1989 edition.

NFPA 61C, *Standard for the Prevention of Fire and Dust Explosions in Feed Mills*, 1989 edition.

NFPA 61D, *Standard for the Prevention of Fire and Dust Explosions in the Milling of Agricultural Commodities for Human Consumption*, 1989 edition.

NFPA 65, *Standard for the Processing and Finishing of Aluminum*, 1993 edition.

NFPA 69, *Standard on Explosion Prevention Systems*, 1992 edition.

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

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

NFPA 80, *Standard for Fire Doors and Fire Windows*, 1992 edition.

NFPA 85C, *Standard for Prevention of Furnace Explosions/Implosions in Multiple Burner Boiler-Furnaces*, 1991 edition.

NFPA 86, *Standard for Ovens and Furnaces*, 1990 edition.

NFPA 91, *Standard for Exhaust Systems for Air Conveying of Materials*, 1992 edition.

NFPA 101, *Life Safety Code*, 1994 edition.

NFPA 220, *Standard on Types of Building Construction*, 1992 edition.

NFPA 480, *Standard for the Storage, Handling and Processing of Magnesium Solids and Powders*, 1993 edition.

NFPA 481, *Standard for the Production, Processing, Handling, and Storage of Titanium*, 1987 edition.

NFPA 482, *Standard for the Production, Processing, Handling, and Storage of Zirconium*, 1987 edition.

NFPA 490, *Code for the Storage of Ammonium Nitrate*, 1993 edition.

NFPA 496, *Standard for Purged and Pressurized Enclosures for Electrical Equipment*, 1993 edition.

NFPA 650, *Standard for Pneumatic Conveying Systems for Handling Combustible Materials*, 1990 edition.

NFPA 651, *Standard for the Manufacture of Aluminum Powder*, 1993 edition.

NFPA 655, *Standard for Prevention of Sulfur Fires and Explosions*, 1993 edition.

NFPA 664, *Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities*, 1993 edition.

NFPA 8501, *Standard for Single Burner Boiler Operations*, 1992 edition.

NFPA 8503, *Standard for Pulverized Fuel Systems*, 1992 edition.

## 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-1-5 Combustible Dust.** Any time a combustible dust is processed or handled, a potential for deflagration exists. The degree of deflagration hazard will vary depending on the type of combustible dust and processing methods used.

A dust deflagration has three requirements, all of which must be met:

- (a) The dust must be combustible.
- (b) The dust particles must form a cloud in an oxidizing gas at or exceeding the minimum explosive concentration.
- (c) A source of ignition must be present.

Evaluation of a combustible dust explosion hazard and the prevention techniques employed are determined by means of actual test data. All combustible dusts that can produce a dust explosion should be tested to determine the following data:

- (a) Particle size distribution;
- (b) Moisture content as received and dried;
- (c) Minimum dust concentration to ignite;
- (d) Minimum energy required for ignition (joules);
- (e) Maximum rate of pressure rise at various concentrations;
- (f) Layer ignition temperature; and
- (g) Maximum explosion pressure, at optimum concentration.

Optional testing should include:

- (a) Dust cloud ignition temperature.
- (b) Maximum permissible oxygen content to prevent ignition.
- (c) Electrical resistivity measurement.

**A-1-5 Hybrid Mixtures.** The presence of flammable gases and vapors, even at concentrations less than the lower explosive limit (LEL) of the flammable gases and vapors, will add to the violence of a dust-air combustion.

The resulting dust/vapor mixture is called a "hybrid mixture" and is discussed in NFPA 68, *Guide for Venting of Deflagrations*.

Hybrid mixtures can be of concern even if the dust is normally considered to be "nonexplosive." For example, polyvinyl chloride is considered to be a "nonexplosive" dust. However, tests have shown that PVC can form explosive hybrid mixtures with methane at concentrations below the lower explosive limit.

**A-2-2.2** Window ledges, girders, beams, and other horizontal projections or surfaces can have the tops sharply sloped, or other provisions can be made to minimize the deposit of dust thereon. Overhead steel I-beams or similar structural shapes can be boxed with concrete or other noncombustible material to eliminate surfaces for dust accumulation.

**A-2-2.9** The use of load bearing walls should be avoided to prevent structural collapse should an explosion occur.

**A-2-3.1** The design of explosion venting should be based on information contained in NFPA 68, *Guide for Venting of Deflagrations*.

**A-2-3.2** For further information on restraining vent closures, see NFPA 68, *Guide for Venting of Deflagrations*.

**A-3-1** The following items are areas of concern during the design and installation of process equipment.

(a) The elimination of friction by use of detectors for slipping belts, temperature supervision of moving or impacted surfaces, etc.

(b) Pressure resistance or maximum pressure containment capability and pressure relieving capabilities of:

- 1. The machinery or process equipment,
- 2. The building or room.

(c) The proper classification of electrical equipment for the area and condition.

(d) Proper alignment and mounting to minimize or eliminate vibration and overheated bearings.

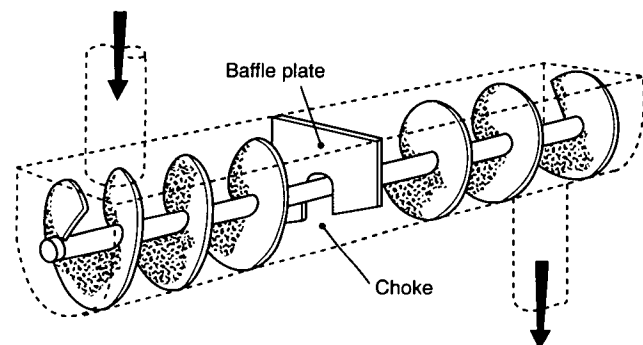
(e) The use of electrically conductive belting, low speed belts, and short center drives as a means of reducing static electricity accumulation. See Section 5-3.

(f) When power is transmitted to apparatus within the processing room by belt or chain, it should be encased in a practically dusttight enclosure, constructed of substantial noncombustible material that should be maintained under positive air pressure. Where power is transmitted by means of shafts, these should pass through close-fitting shaft holes in walls or partitions.

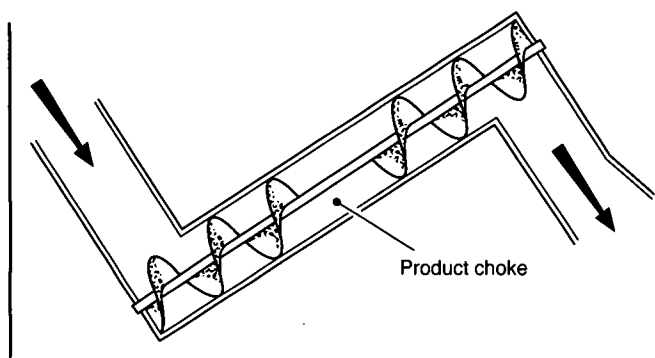
**A-3-1.1(b)** For explosion relief venting through ducts, consideration should be given to the thrust forces generated and the length of the ducts. The relief duct should be restricted to no more than three meters. Where explosion venting is used, its design should be based on information contained in NFPA 68, *Guide for Venting of Deflagrations*.

**A-3-1.1(d)** Inerting also can be done by product dilution using a noncombustible dust, such as talc or lime, to reduce the concentration of the combustible dust to below the minimum explosive concentration. This technique is used in coal mines.

**A-3-1.2(a)** The following diagrams illustrate two different designs of chokes.



Example 1



Example 2

Figure A-3-1.2(a) Screw conveyor chokes.

**A-3-1.2(b)** When rotary valves are installed in both the inlet and outlet of equipment, care should be taken to ensure that the rotary valve on the inlet is stopped before the unit becomes overfilled. See Figure A-3-1.2(b).

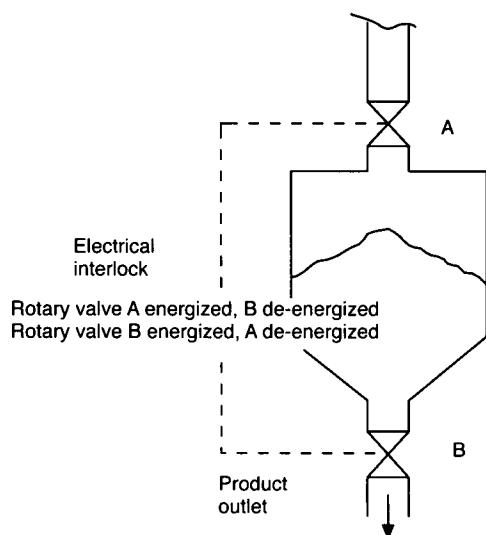


Figure A-3-1.2(b) Rotary valves.

**A-3-2.4** Horizontal projections can have the tops sharply sloped to minimize the deposit of dust thereon. Efforts should be made to minimize the amount of surfaces where dust can accumulate.

**A-3-3.1.1** Ducts for dust conveying systems should be as straight as possible; right angle bends should be avoided.

**A-3-3.1.1 Exception** For information on bonding and grounding, see NFPA 77, *Recommended Practice on Static Electricity*.

**A-3-3.2.4** Where it is desired to prevent propagation of an explosion from the elevator leg to another part of the facility, an explosion blocking system should be provided at the head, boot, or at both locations.

**A-3-3.3.2** Some chemical and plastic dusts release residual flammable vapors such as residual solvents, monomers, or resin additives. These vapors can be released from the material in the conveying system or in its final storage unit. Design of the system should be based on a minimum air flow sufficient to keep the concentration of the particular flammable vapor in the air stream below 25 percent of the lower explosive limit of the vapor.

Start-up and shutdown periods are the times when pneumatic conveying systems pass through the explosive range. Correct sequencing can reduce this:

Start-up: Full air first; then full load dust flow.

Shutdown: Dust stop quickly first; then run full air flow to clean.

**A-3-3.4.3** Dusts should not pass through a fan or blower.

**A-3-5** Explosion protection should be provided when the hazard is significant. (See 3-1.1.)

**A-3-6.1** Mixers and blenders should, where possible, operate under slight negative pressure to avoid emitting dust to the immediate atmosphere.

**A-3-7.1** Dryers commonly found in industry include tray, drum, rotary, fluidized bed, pneumatic, spray, and vacuum.

**A-3-7.2** Heating by indirect means is less hazardous than by direct means and is therefore preferred. Improved protection can be provided for direct-fired dryers by providing an approved automatic spark detection and extinguishing system.

**A-4-1.2.1** For information on designing explosion vents, see NFPA 68, *Guide for Venting of Deflagrations*.

**A-4-2.1** A relatively small initial dust explosion will disturb and suspend in air dust that has been allowed to accumulate on the flat surfaces of a building or equipment. This dust cloud provides fuel for the secondary explosion, which usually causes the major portion of the damage. Reducing dust accumulations is, therefore, a major factor in reducing the hazard in areas where a dust hazard can exist.

Using a bulk density of 75 lb/ft<sup>3</sup> (1200 kg/m<sup>3</sup>) and an assumed concentration of 0.35 oz/ft<sup>3</sup> (350 g/m<sup>3</sup>), it has been calculated that a dust layer that averages 1/32 in. (0.8 mm) thick covering the floor of a building is sufficient to produce a uniform dust cloud of optimum concentration, 10 ft (3 m) high, throughout the building. This is an idealized situation and several factors should be considered.

First, the layer will rarely be uniform or cover all surfaces and, secondly, the layer of dust will probably not be completely dispersed by the turbulence of the pressure wave from the initial explosion. However, if only 50 percent of the  $\frac{1}{32}$  in. (0.8 mm) thick layer is suspended, this is still sufficient material to create an atmosphere within the explosive range of most dusts.

Consideration should be given to the proportion of building volume that could be filled with an explosive dust concentration. Since floor area is a measure of volume, the percentage of floor area covered can be used as a measure of the hazard. For example, a 10 ft  $\times$  10 ft (3 m  $\times$  3 m) room with a  $\frac{1}{32}$ -in. (0.8-mm) layer of dust on the floor is obviously hazardous and should be cleaned. Now consider this same 100 ft<sup>2</sup> (9.3 m<sup>2</sup>) area in a 2,025 ft<sup>2</sup> (188 m<sup>2</sup>) building; this also is a moderate hazard. This area represents about 5 percent of a floor area and is about as much coverage as should be allowed in any plant. To gain proper perspective, the overhead beams and ledges should also be considered. Rough calculations show that the available surface area of the bar joist is about 5 percent of the floor area. For steel beams, the equivalent surface area can be as high as 10 percent.

From the above information, the following guidelines have been established:

(a) Dust layers  $\frac{1}{32}$  in. (0.8 mm) thick can be sufficient to warrant immediate cleaning of the area [ $\frac{1}{32}$  in. (0.8 mm) is about the diameter of a paper clip wire or the thickness of the lead in a mechanical pencil].

(b) The dust layer is capable of creating a hazardous condition if it exceeds 5 percent of the building floor area.

(c) Dust accumulation on overhead beams and joists contributes significantly to the secondary dust cloud and is approximately equivalent to 5 percent of the floor area. Other surfaces, such as the tops of ducts and large equipment, can also contribute significantly to the dust cloud potential.

(d) The 5 percent factor should not be used if the floor area exceeds 20,000 ft<sup>2</sup> (1858 m<sup>2</sup>). In such cases, a 1,000 ft<sup>2</sup> (93 m<sup>2</sup>) layer of dust is the upper limit.

(e) Due consideration should be given to dust that adheres to walls, since this is easily dislodged.

(f) Attention and consideration should also be given to other projections such as light fixtures that can provide surfaces for dust accumulation.

(g) Dust collection equipment should be monitored to be certain it is operating effectively. For example, dust collectors using bags operate most effectively between limited pressure drops of 3 in. to 5 in. of water (0.74 kPa to 1.24 kPa). An excessive decrease or low drop in pressure indicates insufficient coating to trap dust.

The energy required to ignite dust in air is about 10.0 millijoules or 20 to 50 times greater than that required to ignite flammable vapors. Surface voltage of less than 5,000 volts might be considered safe except that such voltages might be indicative of higher voltages elsewhere in the system. Ungrounded metal parts having such high voltages would be hazardous because the energy stored and deliverable would be much greater. The minimum bond and ground wire size recommended is No. 8 or No. 10 AWG.

The above guidelines will serve to establish a cleaning frequency.

**A-4-2.2** Vacuum cleaning systems are preferred for this purpose.

**A-5-1.1** See Figures A-5-1.1(a) and (b) for examples of tramp metal removal.

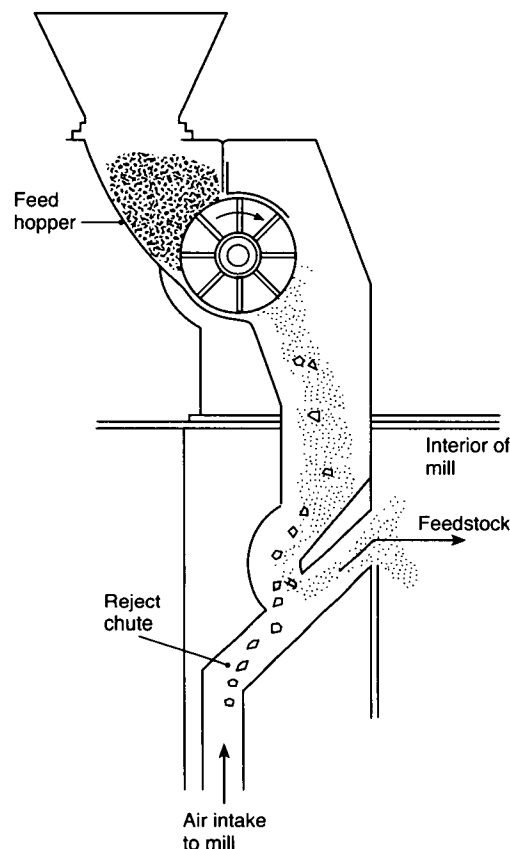


Figure A-5-1.1(a) Pneumatic separator.

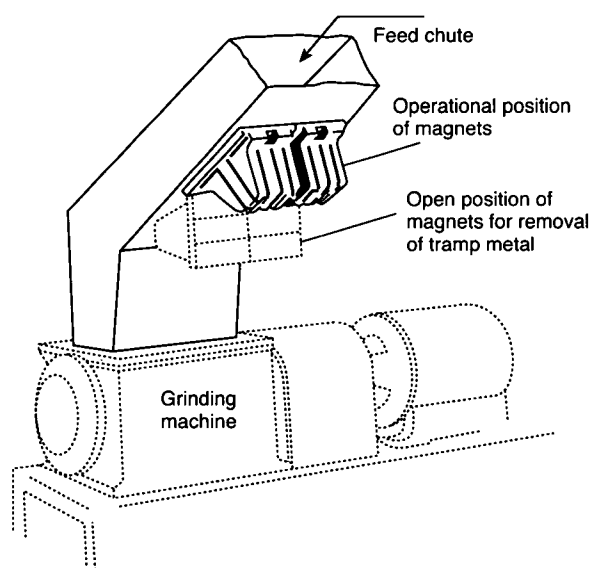


Figure A-5-1.1(b) Magnetic separator.

**A-5-1.2** Transmission of power by direct drive should be used, where possible, in preference to belt or chain drivers.

**A-5-3** Bonding minimizes the potential difference between metallic objects. Grounding minimizes the potential difference between objects and the ground. See NFPA 77, *Recommended Practice on Static Electricity*, for information on this subject.

**A-6** Fire extinguishing equipment should be utilized in such a way to minimize the generation of dust clouds during the discharge.

**A-6-3** Automatic sprinkler protection within dust collectors, silos, and bucket elevators should be considered. Considerations should include the combustibility of the equipment, the combustibility of the material, and the amount of material present. Where the combustible dust can react with water, automatic sprinkler systems should not be installed.

**A-7-2.1(e)** Safety interlocks should be calibrated and tested every six months in the manner in which they are intended to operate with written test records maintained for review by management.

**A-7-2.3** All plant personnel, including management, supervisors, and maintenance and operating personnel, should be trained to participate in plans for controlling plant emergencies. Trained plant fire squads or fire brigades should be maintained.

The elements of an emergency plan should:

- (a) Include a signal or alarm systems.
- (b) Include identification of means of egress.
- (c) Minimize the effect on operating personnel and the community.
- (d) Keep property and equipment losses to a minimum.
- (e) Ensure interdepartmental and interplant cooperation.

(f) Ensure the cooperation of outside agencies.

(g) Promote the release of accurate information to the public.

Simulated emergency drills should be performed by process operators. Malfunctions of the process should be simulated and emergency actions undertaken. "Disaster" drills that simulate a major catastrophe situation should be undertaken periodically with the cooperation and participation of public fire, police, and other local community emergency units and nearby cooperating plants. The emergency plans should be tested annually.

## 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 68, *Guide for Venting of Deflagrations*, 1994 edition.

NFPA 69, *Standard on Explosion Prevention Systems*, 1992 edition.

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

NFPA 77, *Recommended Practice on Static Electricity*, 1993 edition.

NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Maintenance, and Operation*, 1992 edition.

## Index

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# **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.

# **Sequence of Events Leading to Publication of an NFPA Committee Document**

Call for proposals to amend existing document or for recommendations on new document.



Committee meets to act on proposals, to develop its own proposals, and to prepare its report.



Committee votes on proposals by letter ballot. If two-thirds approve, report goes forward.  
Lacking two-thirds approval, report returns to committee.



Report is published for public review and comment. (Report on Proposals - ROP)



Committee meets to act on each public comment received.



Committee votes on comments by letter ballot. If two-thirds approve, supplementary report goes forward. Lacking two-thirds approval, supplementary report returns to committee.



Supplementary report is published for public review. (Report on Comments - ROC).



NFPA membership meets (Annual or Fall Meeting) and acts on committee report (ROP and ROC).



Committee votes on any amendments to report approved at NFPA Annual or Fall Meeting.



Complaints to Standards Council on Association action must be filed  
within 20 days of the NFPA Annual or Fall Meeting.



Standards Council decides, based on all evidence, whether or not to issue standard  
or to take other action, including hearing any complaints.



Appeals to Board of Directors on Standards Council action must be filed  
within 20 days of Council action.

# FORM FOR PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

Mail to: Secretary, Standards Council

National Fire Protection Association, 1 Batterymarch Park, Quincy, Massachusetts 02269-9101

Fax No. 617-770-3500

Note: All proposals must be received by 5:00 p.m. EST/EDST on the published proposal-closing date.

If you need further information on the standards-making process, please contact the  
Standards Administration Department at 617-984-7249.

Date 9/18/93 Name John B. Smith Tel. No. 617-555-1212

Company \_\_\_\_\_

Street Address 9 Seattle St., Seattle, WA 02255

Please Indicate Organization Represented (if any) Fire Marshals Assn. of North America

1. a) NFPA Document Title National Fire Alarm Code NFPA No. & Year NFPA 72, 1993 ed.

b) Section/Paragraph 1-5.8.1 (Exception No.1)

2. Proposal recommends: (Check one) ☐ new text  
☐ revised text  
☒ deleted text

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Date Rec'd \_\_\_\_\_

3. Proposal (include proposed new or revised wording, or identification of wording to be deleted):

Delete exception.

4. Statement of Problem and Substantiation for Proposal: (Note: State the problem that will be resolved by your recommendation; give the specific reason for your proposal including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication.)

A properly installed and maintained system should be free of ground faults. The occurrence of one or more ground faults should be required to cause a "trouble" signal because it indicates a condition that could contribute to future malfunction of the system. Ground fault protection has been widely available on these systems for years and its cost is negligible. Requiring it on all systems will promote better installations, maintenance and reliability.

5. ☒ This Proposal is original material. (Note: Original material is considered to be the submitter's own idea based on or as a result of his/her own experience, thought, or research and, to the best of his/her knowledge, is not copied from another source.)

☐ This Proposal is not original material; its source (if known) is as follows: \_\_\_\_\_

Note 1: Type or print legibly in black ink.

Note 2: If supplementary material (photographs, diagrams, reports, etc.) is included, you may be required to submit sufficient copies for all members and alternates of the technical committee.

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John B. Smith  
Signature (Required)

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