ANSI/NFPA 120 An American National Standard February 11, 1994

NFPA 120 Standard for Coal Preparation Plants 1994 Edition

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

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

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NFPA 120

Standard for

Coal Preparation Plants

1994 Edition

This edition of NFPA 120, *Standard for Coal Preparation Plants*, was prepared by the Technical Committee on Mining Facilities and acted on by the National Fire Protection Association, Inc. at its Fall Meeting held November 15-18, 1993, in Phoenix, AZ. It was issued by the Standards Council on January 14, 1994, with an effective date of February 11, 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 120

This 1994 edition of Coal Preparation Plants was prepared by the Technical Committee on Mining Facilities and issued on January 14, 1994, with an effective date of February 11, 1994.

In 1977, with the formation of the Mining Committee, this standard, NFPA 120, formerly NFPA 653, was reassigned to the Committee on Mining Facilities. The change in numerical identity of the standard was in keeping with the numbering sequence assigned to the Mining Committee for other documents now under development. NFPA 120 represents a complete revision of former NFPA 653 and also includes changes in style in accordance with the NFPA *Manual of Style*.

The 1971 edition of Coal Preparation Plants, NFPA 653, which was the same as the 1959 edition, was adopted at the NFPA 1971 Annual Meeting. The 1959 edition of NFPA 653 was prepared by the NFPA Committee on Dust Explosion Hazards and was adopted at the 1958 Annual Meeting with an amendment adopted in 1959.

This latest 1994 edition includes a variety of technical and editorial updates. Previous editions not already mentioned include versions issued in 1984 and 1988.

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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 on safeguarding life and property against fire, explosion, and related hazards associated with underground and surface coal, metal, and nonmetal mining facilities and equipment.

Contents

NFPA 120

Standard for

Coal Preparation Plants

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

Information on referenced publications can be found in Chapter 5 and Appendix B.

Chapter 1 Introduction

1-1 Scope.

1-1.1* This standard covers minimum requirements for reducing the potential for loss of life and property from fire and explosion in coal preparation plants. Only plants designed to prepare coal for shipment are included in this standard. Other equipment and processes, such as coal pulverizers, used to condition coal for firing in boilers at power generating plants, gasification plants, or for utilization in certain special processes are not covered in this standard.

1-1.2 This standard is not retroactive, but operators are urged to avail themselves of any information that will prevent dust dispersions, eliminate sources of ignition, or otherwise reduce fire and explosion hazards by improving conditions in their plants.

1-1.3 Nothing in this standard is intended to prohibit 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 device is equivalent in quality, effectiveness, durability, and safety to that specified by this standard.

1-2 Purpose.

1-2.1 This standard is intended for the use and guidance of those charged with designing, constructing, and operating coal preparation plants.

1-2.2 Coal preparation plants shall be designed by experienced persons familiar with fire and explosion hazards in coal processing plants.

1-3 Definitions. The common terms used in this standard are in accordance with general usage or dictionary definitions. A number of special terms are defined individually in the text. The following terms are defined as indicated.

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.

Coal. Where the word "coal" is used in this standard, it is understood that the term includes lignite and all grades of coal that might present a fire or explosion hazard.

Coal Preparation.* The separation, crushing, screening, washing, drying, storage, and loadout of coal to make ready for market.

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.

Noncombustible Material. A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat. Materials reported as passing the test method of ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, shall be considered noncombustible materials.

Shall. Indicates a mandatory requirement.

Should. Indicates recommendations or that which is advised but not required.

Chapter 2 General

2-1 Materials and Construction.

2-1.1 Coal mine surface buildings and structures, housing, and supporting coal processing and handling equipment shall be of noncombustible construction.

2-1.2 Dry coal screening, crushing, dry cleaning, and other operations producing coal dust shall be conducted in open structures to prevent the accumulation of dust concentration levels that can create explosion hazards. Where open structures are impractical, enclosed buildings shall be provided with explosion venting in accordance with Section 4-7 and shall be located so as to minimize fire and explosion exposure to major buildings and equipment.

Exception: Location of these processes in the main plant building shall be permitted, provided the dust-producing area is equipped with explosion venting in accordance with Section 4-7 and is separated from the remainder of the building by construction designed to withstand the pressure buildup from an explosion prior to pressure relief by means of explosion vents.

2-1.3 Buildings and equipment shall be shaped, installed, or protected to minimize the surface area on which coal dust can accumulate. Adequate access for cleaning or washing down shall be provided.

2-1.3.1 Access platforms or walkways installed between floors shall be permitted to be open-grid construction to facilitate cleaning.

2-1.4 Walls or partitions isolating sections of the plant containing dust-producing operations shall be constructed and installed in such a manner as to prevent the transmission of dust to adjacent areas. To prevent the accumulation of dust on exposed wall or partition framing, metal siding or other equivalent material shall be installed on the side facing the dust-producing section.

2-1.5 Doors in the walls or partitions required by 2-1.4 shall be self-closing.

2-1.6 Drain systems shall be provided in areas where cleaning is accomplished by washing down.

2-2 Storage.

2-2.1* Coal bins, bunkers, and silos shall meet the following requirements:

(a) Storage shall be limited to as short a duration as feasible.

(b) Equipment shall be of noncombustible construction designed to minimize coal hangup.

(c) Means shall be provided to remove burning, wet, or smoldering coal so that it can be disposed of safely.

2-2.2 All interior bins handling dusty material shall be suitably vented in accordance with Section 4-6.

2-2.3 Storage bins for coal shall be located so that sources of heat not intended specifically to control the temperature of coal do not raise the temperature of the contents of the bin materially.

2-3 Driers.

2-3.1 Drying system structures shall be essentially open to facilitate optimum explosion venting.

Exception: Where winter conditions make open structures impractical, enclosed buildings shall be provided with explosion venting in accordance with Section 4-7 and shall be located to minimize fire and explosion exposure to other buildings and equipment.

2-3.2 Access floors, platforms, walkways, and stairs on the thermal drier structure shall be located so that personnel are not exposed directly to an explosion vent.

2-3.3 All newly constructed thermal coal drying systems shall be located at least 100 ft (30.5 m) from any underground coal mine opening.

2-4 Electrical Classification of Hazard.

2-4.1 Plant areas of open construction where coal dust or any combustible gases liberated from the coal are dispersed freely to the open atmosphere shall be classified nonhazardous.

2-4.2 Plant areas isolated from the coal process, such as control rooms, electrical equipment rooms, or substations, that are provided with adequate ventilation to prevent the accumulation of combustible gases or coal dust shall be classified nonhazardous.

2-4.3 Enclosed areas of processing plants where coal is sufficiently wet to prevent particles from becoming airborne, or where dry coal dust does not accumulate, shall be classified nonhazardous.

2-4.4 Enclosed areas where the failure or malfunction of the ventilation would result in the accumulation of ignitable concentrations of methane gas shall be designated as Class I, Division 2 locations in accordance with Article 500 of NFPA 70, *National Electrical Code®*.

Exception: Areas of a processing plant normally designated as Class I shall be permitted to be considered nonhazardous, provided the following conditions are met:

(a) Adequate ventilation,

(b) Fail-safe continuous methane monitoring designed to sound an alarm when the methane-air mixture reaches 20 percent (1 % methane by volume) of the lower explosive level (LEL),

(c) An interlock to stop the process equipment automatically when the methane-air mixture reaches 40 percent (2% methane by volume) of the LEL,

(d) An electrical system arranged so that, when methane concentrations reach 40 percent of LEL, all electrical circuits including control circuit conductors are de-energized,

(e) Any equipment that is needed to restore the plant to a safe condition, such as lighting, ventilation, or sump pumps, shall be installed in accordance with Class I, Division 1 requirements.

NOTE: Electrical components of ventilation equipment installed in the open and separated from the ventilation air being pulled from the hazardous area may be permitted to be considered nonhazardous.

2-4.4.1 Electrical equipment approved as "permissible" by the Mine Safety and Health Administration (MSHA) shall be acceptable in locations classified Class I, Division 1.

NOTE: Electrical equipment classified as "permissible" is certified as meeting the requirements of *Code of Federal Regulations*, 30 Chapter I, Part 18.

2-4.5 Enclosed areas in which coal dust normally is not in suspension in explosive or ignitable quantities, or in which

coal dust might be present in explosive or ignitable quantities or might be in suspension in the air due to a malfunction, shall be designated as Class II, Division 2 in accordance with Article 500 of NFPA 70, *National Electrical Code*.

NOTE: Approved, intrinsically safe electrical equipment may be permitted to be used in any areas classified hazardous.

2-4.6* The structure of a preparation plant shall be connected to a common and an adequate electrical ground.

2-4.6.1 Any electrical equipment that is mounted on a concrete pad shall be grounded to the metal structure with a shunt. Where the structure is nonmetallic, a separate grounding grid for equipment shall be provided.

2-5 Gas or Electric Welding and Cutting.

2-5.1 Gas or electric welding or cutting procedures shall be in accordance with NFPA 51B, *Standard for Fire Prevention in Use of Cutting and Welding Processes*, and the requirements of 2-5.2 through 2-5.9.

2-5.2 Welding and flame cutting shall be performed only by experienced personnel who have been instructed in precautions and procedures for safety in these operations. Before any cutting or welding is performed, prior approval shall be granted by the plant superintendent or designated agent.

2-5.2.1 All welding and cutting equipment shall be maintained in proper condition. Flashback preventers shall be installed at the outlets of all pressure regulators. When not in use, the compressed gas cylinder valve shall be closed. Appropriate personal protective equipment, including gloves, goggles, and welding hoods, shall be worn by personnel during welding or flame cutting operations.

2-5.3 All machinery and operations producing dust within range of welding sparks shall be shut down prior to the start of the welding or cutting operation and shall remain inoperative until a final inspection is completed.

2-5.4 The methane gas (CH_4) concentration shall be tested and determined to be less than 1 percent by volume (20 percent of LEL) before cutting or welding shall be permitted in any area where methane gas is likely to be present.

2-5.4.1 In confined areas, positive ventilation shall be established prior to start-up of cutting or welding operations.

2-5.5 Combustibles, such as oil, grease, and coal, within 15 ft (4.6 m) of the welding or flame cutting work, shall be cleaned up or wetted down before cutting or welding is begun. Open gear cases or other exposed machinery components containing lubricants located within 15 ft (4.6 m) shall be covered with noncombustible material.

2-5.5.1 Noncombustible barriers shall be installed below welding or cutting operations that are being performed in or over shafts, silos, and similar openings.

2-5.6 A charged water hose line or a multipurpose dry chemical hand portable extinguisher having a minimum nominal capacity of 20 lb (9.07 kg) shall be available at the work site before cutting or welding is begun.

2-5.7 Inspection for sparks, smoldering material and fire shall be made frequently during cutting or welding.

2-5.7.1 Where welding or cutting with an arc or flame is performed in the proximity of combustible materials that cannot be removed or protected from ignition sources, a responsible person equipped with extinguishing devices shall be stationed to guard against fire due to sparks. After completion of the work, a thorough search of the area, including the floors above and below, shall be made for fires and for potential development of smoldering fires.

2-5.8 If a major welding or cutting operation is to be undertaken and the plant cannot be shut down, special precautions shall be taken as deemed appropriate by the plant superintendent, or his or her designated representative, in addition to those required in 2-5.7.1.

2-5.9 Welding or cutting shall not be performed on flammable or combustible liquid or gas containers.

2-6 Maintenance. The user shall have responsibility for establishing a maintenance program that ensures that equipment is in proper working order. All coal-handling equipment and machinery shall be maintained in accordance with the manufacturer's recommendations.

2-7 Housekeeping. Provision shall be made for periodic cleaning to prevent the excessive accumulation of coal dust. Combustible waste materials shall not be permitted to accumulate in locations where a fire or explosion hazard can be created.

2-8 Flammable and Combustible Liquids.

2-8.1 The storage, use, and handling of flammable and combustible liquids in and around buildings and active operations shall conform with NFPA 30, *Flammable and Combustible Liquids Code*, except Sections 2-8, 4-7, 5-5, and Chapters 1, 6, 7, and 9. Where storage involves 1100 gal (4.2 m^3) or less, the applicable provisions of NFPA 395, *Standard for the Storage of Flammable and Combustible Liquids at Farms and Isolated Sites*, shall be permitted to be used.

NOTE: Combustible liquids may be permitted to be stored in collapsible tanks, provided that:

(1) The temperature of the liquid is maintained at less than its flash point;

(2) A liquidtight dike, at least 1½ times greater in volume, surrounds the tank;

(3) A vent having a free opening at least equivalent to the inlet port is provided;

(4) The tank is marked conspicuously "Combustible — Keep Fire and Flame Away"; and

(5) The names of the stored liquids are displayed prominently on the tank.

2-8.2 Upon request, the mine operator shall provide the authority having jurisdiction with information regarding the composition and flash point of the flammable and combustible materials.

2-8.3 Smoking and open flames shall be prohibited in areas or locations where fire or explosion hazards exist. Signs warning against smoking and open flames shall be posted conspicuously.

2-9 Lightning Protection. If lightning protection is required, it shall be in accordance with NFPA 780, *Lightning Protection Code*.

2-10 Flammable and Combustible Liquids and Gases.

2-10.1 Vehicles using liquid fuels shall be refueled only at locations designated for the purpose and from approved dispensing pumps and nozzles. Engines, except diesel engines, shall be shut off during refueling.

2-10.1.1* Bulk storage of flammable and combustible liquids shall be in accordance with the applicable provisions of NFPA 30, *Flammable and Combustible Liquids Code*, or NFPA 395, *Standard for the Storage of Flammable and Combustible Liquids at Farms and Isolated Sites.*

2-10.2 Liquefied Petroleum Gases. The storage, use, and handling of liquefied petroleum gases (LPG), such as propane or butane, shall conform with NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases.*

2-11 Battery Charging Installations.

2-11.1 Battery rooms shall be in accordance with applicable provisions of NFPA 70, *National Electrical Code*, Article 480.

2-11.2 Battery charging installations shall be located in a designated area that is protected against damage from mobile equipment.

2-11.3 Battery charging installations shall be equipped with the following:

(a) Approved portable multipurpose fire extinguishers;

(b) Adequate ventilation for the removal of generated gases from charging batteries; and

(c) Facilities for flushing spilled electrolyte.

Chapter 3 Fire Protection

3-1 Portable Extinguishers.

3-1.1 Every building or room of a plant where combustible material is present or dry coal is processed or handled shall be provided with approved portable multipurpose fire extinguishers. The number of such extinguishers, their type, and their distribution shall be in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*; except that the smallest extinguisher shall have a nominal capacity of 20 lb (9.07 kg) of agent and a minimum rating of 10A, 60BC.

3-1.2 Extinguishers employing agents having a sodium bicarbonate or potassium bicarbonate base shall be permitted to be used if the hazard is confined solely to electrical equipment.

3-2 Fixed Fire Suppression Systems.

3-2.1 Where required by the authority having jurisdiction, combustible construction or combustible occupancies shall be provided with fixed fire suppression systems where combustible construction or occupancy is present. Examples of where fixed suppression might be needed in coal preparation plants include: conveyor belts, galleries, tunnels, beneath bins, in transfer houses and silo head houses, and in other areas such as, switch gear rooms, control rooms, change houses, and combustible and flammable liquid storage or process areas. These areas shall be considered as ordinary hazard.

Exception: Where Class I or Class II liquids are stored.

3-2.1.1 Fire protection systems shall be designed by a qualified person in accordance with the appropriate NFPA standards, depending upon the extinguishing agent utilized. Working plans for the sprinkler system shall be submitted for approval to the authority having jurisdiction.

3-2.2 Automatic sprinkler systems shall be of the dry-pipe, preaction, or waterspray type or shall be filled with antifreeze solution if freezing temperatures might be encountered.

3-2.2.1 Antifreeze-protected systems shall be equipped with a soft seat check valve at or near the shutoff valve. The check valve and the shutoff valve shall be protected against freezing. The antifreeze solution shall be tested annually before the advent of cold weather to ensure that the solution is adequate for the lowest temperature that could be encountered.

3-3 Standpipe and Hose Systems.

3-3.1* Class III standpipe systems shall be provided in all coal preparation plants in accordance with the applicable sections of NFPA 14, *Standard for the Installation of Standpipe and Hose Systems.*

NOTE: When applying water, care should be exercised to avoid the use of solid hose streams in locations where they could create explosions by disturbing dust deposits.

3-3.2 When automatic sprinkler systems are to be supplied through the standpipe system, hydraulic calculations shall be used to ensure that the piping and water supply will be adequate to supply the hose and automatic sprinkler demands simultaneously.

3-4 Inspection and Maintenance.

3-4.1 Portable extinguishers shall be maintained in accordance with NFPA 10, *Standard for Portable Fire Extinguishers.*

3-4.2 Any fire suppression system, including sprinklers, installed in accordance with the requirements of this standard shall be maintained properly to provide maximum assurance that the system will operate effectively. Plant management is responsible for the condition and maintenance of the system and shall use diligence in keeping the system in good operating condition.

3-4.2.1 Any trouble or impairment shall be corrected promptly by competent personnel, and plant management shall be notified.

3-4.2.2 All persons who are anticipated to inspect, test, or maintain fire suppression systems shall be trained thoroughly in the functions they are expected to perform and shall receive periodic refresher instruction.

3-5 Training.

3-5.1 All plant employees shall receive annual instruction on the different classes of fires and types of fire-fighting equipment, fire prevention, and fire-fighting tactics.

3-5.2 All plant employees shall receive annual instruction on the procedures for discharging portable fire extinguishers and the proper method of fire attack.

3-5.3 All plant employees shall receive annual instruction on emergency evacuation procedures.

3-6 Surveillance. Periodic surveillance for fire hazards shall be conducted when the plant, or any part thereof, is not in operation and while constantly attended. Frequency of surveillance is dependent on the type of coal product involved and it's susceptibility to self-heating and other site conditions.

Chapter 4 Fire and Explosion Prevention of Specific Hazards

4-1 Chutes and Hoppers. Equipment such as chutework and hoppers that control the flow of material to and from screening or crushing equipment shall have minimum openings to the atmosphere to reduce dust dispersion.

4-2* Conveyors.

4-2.1* Belt conveyors installed in coal preparation plants shall meet the following minimum requirements:

(a) Conveyor belts shall be of a material designed to resist ignition.

(b) Belt alignment limit switches shall be provided on conveyors to shut down belts that are tracking improperly. Motion-sensing switches shall be provided to detect a slipping or jammed belt and shall be interlocked to shut off driving power when the belt stops or slows down by more than 20 percent of its normal speed. In addition, shut-off power shall be provided on contributing conveyors to prevent any operating conveyor from discharging material to a stopped downstream conveyor.

(c) Hydraulic systems for belt alignment, if provided, shall use only listed fire retardant hydraulic fluids or shall be protected by an automatic fire protection system.

(d) Means shall be provided to remove tramp metal and other foreign objects as early in the handling process as possible.

(e) Consideration shall be given to the possibility of static electrical discharge at conveyor head and tail pulleys where located in dry climates where bituminous and lower ranking-type coals are handled. Factors that shall be considered are belting materials, belt speed, and housekeeping of spilled coal dust. Where such conditions exist, the use of static dissipators or eliminators shall be considered.

4-2.2* Structure-supporting belt conveyors shall be designed to minimize coal accumulations. This includes any surface near the belting that can catch and retain fine coal liable to ignite spontaneously.

4-2.3 Special attention shall be given to preventing and cleaning of accumulations of fine coal dust beneath and relatively close to belt conveyors.

4-3 Dedusters. All dedusting equipment shall be connected directly to a suction system capable of moving enough air to prevent the leakage of dust from the system. The suction system shall discharge the dust-laden air by the shortest possible route to collectors outside the building.

4-4* Pneumatic Cleaners. Adequate dust-collecting systems with suction hoods at the cleaners, suction ducting that maintains at least a 4000 ft per minute fpm (20 m/s) air velocity, and dust collectors having pressure release venting shall be installed. Belt conveyor-type transfers and loading points associated with the cleaners shall be hooded similarly and connected to dust collectors.

4-5* Driers.

4-5.1 Drier heating units that are fired by pulverized coal shall be installed, operated, and maintained in accordance with NFPA 8503, *Standard for Pulverized Fuel Systems.*

4-5.1.1 Driers of the direct-fired type shall be designed and operated so that combustion is substantially complete within the furnace/air heater before the gases of combustion come in direct contact with the coal drying in the drying chamber.

4-5.1.2 Driers shall be designed and constructed to be dusttight, with smooth surfaces to prevent the accumulation of coal.

4-5.1.3 Where coal can be exposed to excessive heat on normal or emergency shutdown, a bypass stack with an automatically controlled damper shall be installed to direct the products of combustion away from the coal.

4-5.1.4 Thermal drier systems that have a hot gas inlet or plenum chambers where fly ash or coal siftings might accumulate shall be equipped with drop-out doors or ports to facilitate removal of these solids. Where continuous means of removing drop-out solids are not provided, frequent checking and manual clean-out shall be provided as conditions warrant.

4-5.1.5 All internal areas of thermal coal driers where coal solids possibly could hang up or accumulate under any abnormal operating condition, such as in the drying chamber or dry cyclone collector, shall be equipped with explosion relief vents that open directly to the outside atmosphere. These vents shall be of sufficient number, size, and location to operate in excess of the design normal pressure. Explosion vents shall be checked or tested at least once each month and records kept to verify these checks.

NOTE: For further information, see NFPA 68, *Guide for Venting of Deflagrations.*

4-5.1.6 During system operation, frequent visual checks shall be made of all the mechanical components and equipment associated with the drying system.

4-5.2 Instrumentation and control panels on thermal driers shall be located in an area relatively free of moisture, vibration, dust, and noise. The panel shall be located within the range and view of the supervising operator. The operator control room shall be provided with windows or other means, such as video cameras, that give visual contact with the thermal drying system. The panel shall include recording-type control instruments, monitoring indicators, alarms, and temperature limits set to maintain proper operation. Audible and visual alarms shall be interlocked electrically to provide safe shutdown of the drier when unsafe temperatures or other emergency malfunctions occur. Control instruments shall be checked and serviced by a qualified technician at least every 3 months.

4-5.2.1 Where pneumatic controls are used, instrument quality air shall be provided.

4-5.3 Drying chambers shall be protected by an automatic water spray system. The automatic spray system shall include

a manual control. The source for the fire protection water shall be such that the required volume flow rate and pressure of clean (solid-free) water is available at all times and that the exposed piping is protected against freezing.

4-5.4 All main fans shall be inspected on a regular basis and shall have bearing temperature and vibration detectors.

4-5.5 Driers that have been shut down because of a fire or any other emergency condition during regular operation shall be checked to ensure that there is no burning material within the system before being placed back in service. Driers that have remained idle for a long period shall be inspected carefully before being placed back in operation.

4-5.6 Driers shall be designed and installed, if possible, with their explosion vents opening directly to the outside. This usually can be accomplished by installing the drier along an outside wall of the building, directly under the roof, or by having a portion of the drier extend through the roof. If such locations are not practicable, ducts to the outside of the building shall be as short as possible and designed to withstand explosion pressure.

NOTE: Guidance for design of vent ducts is provided in NFPA 68, *Guide for Venting of Deflagrations.*

4-5.7 Cyclone collectors used with driers shall be equipped with explosion vents equal in size to the cross-sectional area of the exhaust sleeve to supplement the venting area provided at the exhaust opening.

4-5.8 Thermal Oil Heating Systems. Indirect heat exchange-type driers, such as thermal disk processors, shall be given special consideration when designing fire protection for the dryer and dryer building.

NOTE: Chapter 9 of NFPA 664 is the primary reference in NFPA standards for thermal oil systems used in industrial processes. While this standard addresses loss prevention in a specified occupancy (wood products), other standards might be applicable to any industrial process featuring thermal oil systems. Reference should be made to NFPA 664, *Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities*, Chapter 9.

4-6 Dust Collectors and Dust Removal Equipment.

4-6.1 Those areas in which combustible dust is or might be in suspension in the air continuously, intermittently, or periodically under normal operating conditions shall be provided with a dust-collecting system or systems to collect such dust and prevent its discharge to the atmosphere.

4-6.1.1 All coal-handling equipment or machinery that produces dust shall be connected to a dust collector with ducts and hoods that have sufficient suction volume and velocity to collect and transport all the dust produced. Hoods, enclosures, and ducts shall be of noncombustible construction, designed and maintained in accordance with the *Industrial Ventilation Manual of Recommended Practice* by the American Conference of Governmental Industrial Hygienists, and NFPA 91, *Standard for Exhaust Systems for Air Conveying of Materials.*

4-6.1.2 All dust collectors, other than those that are an integral part of dust-producing equipment, shall be located outside the working areas, preferably outside the building or in separate rooms properly vented to the outside.

4-6.2 When a plant or handling facility is planned, special consideration shall be given to the location of the dust-producing equipment with respect to the location of the dust collection devices to ensure that the connecting ducts will be as straight and as short as possible.

4-6.2.1 All dry dust collectors shall be of noncombustible construction, equipped with adequate explosion doors or vents.

NOTE: For further information, see NFPA 68, *Guide for Venting of Deflagrations.*

4-6.2.2 The entire dust-collecting system shall conform to NFPA 91, *Standard for Exhaust Systems for Air Conveying of Materials.*

4-6.3 In no case shall the design of the dust removal system be such that the dust is drawn through the fan before entering the collector. Fans shall be of noncombustible construction.

4-6.4 Ducts shall be designed to maintain a velocity of not less than 4500 fpm (22.9 m/s) to ensure the transport of both coarse and fine particles and to ensure reentrainment if for any reason the particles should fall out before delivery to the dust collector (e.g., in the event of a power failure).

4-6.4.1 Round ducts shall be used wherever possible. Rectangular ducts shall be used only where clearance prevents the use of round ducts. Rectangular ducts shall be made as nearly square as possible to minimize the deposit of combustible materials. All ducts shall have a minimum number of bends and irregularities that could interfere with free airflow.

4-6.4.2 In bag-type dust collectors, the bags shall be constructed of antistatic, fire resistant material and shall be provided with a suitable electrical ground.

4-6.4.3 Dust collector hoppers shall be sloped at approximately 60° to ensure material flow. Zero speed switches and high level alarms shall be used to identify conditions that can lead to spontaneous combustion. Hopper discharge valves or screw conveyors shall be provided to discharge the dust continually. Hoppers shall not be used as storage bins.

4-6.4.4 Hood take-offs shall have a minimum area of four times the area of the duct. Duct work also shall be supplied with blast gates and dampers for individual pickup volume adjustment.

4-7 Explosion Venting.

4-7.1* Explosion venting shall be provided in areas where coal dust might be present in explosive or ignitible quantities, such as in coal preparation plant buildings, and sections of buildings housing screens, pneumatic coal-cleaning equipment, dryers, and other dust-producing machinery.

NOTE: Reference should be made to NFPA 68, *Guide for Venting of Deflagrations*, when sizing explosion vents.

4-7.2 Ventilating hoods and exhaust ducts shall not be acceptable as explosion venting devices unless they are designed properly for a dual purpose and function to provide direct release of excess pressure to the outside.

4-7.3 Equipment vents or ducts used to direct the energy of an explosion in equipment to the outside of the building or a safe location shall be as short as possible and shall be designed to withstand the explosion pressure. Vent closures, which may be necessary to permit proper functioning of equipment and to prevent the escape of dust during normal operation, shall be designed to open at the lowest possible increase in pressure or shall be of flexible or frangible materials that blow out or rupture readily to permit the release of explosion pressure.

4-8 Process Control Rooms. Positive pressure shall be maintained in process control rooms to prevent the entry of fugitive dust.

4-9 Electrical Equipment Rooms. Positive pressure shall be maintained in electrical equipment rooms such as switch gear, motor control centers, and cable spreading rooms to prevent the entry of fugitive dust.

4-10 Miscellaneous Equipment. Powder-actuated tools shall not be used in hazardous atmospheres.

4-11* Coal Storage. Coal storage piles shall meet the requirements of this section.

4-11.1 Spontaneous Ignition. The key concept in coal storage is to prevent spontaneous combustion. Preventing spontaneous combustion requires the following:

(a) Eliminating air entrainment in the coal,

(b) Eliminating heat sources near the storage, and

(c) Preventing moisture in the coal.

4-11.2 Coal Silos.

4-11.2.1 Avoid storing coal in silos and bunkers for long periods. If coal must be stored for a long period, prevent air entrainment using the following methods:

(a) Covering the top of the stored coal with a binder material, and

(b) Inerting the stored coal with recommended inert gas.

4-11.2.2 Remove areas in the storage (hideouts) that can allow pockets of coal to form, dry, and combust spontaneously.

4-11.3 Coal Piles.

4-11.3.1 Coal piles shall be designed to minimize the entrainment of air. This can be achieved best by developing a compacted edge around the pile. This edge shall be sealed with binder to aid in sealing.

4-11.3.2 All layers in the coal pile shall be compacted.

4-11.3.3 Hot spots or areas of spontaneous combustion shall be removed by digging.

4-11.3.4 The use of water for extinguishment shall be used at a minimum.

Chapter 5 Referenced Publications

5-1 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.

5-1.1 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 14, *Standard for the Installation of Standpipe and Hose Systems*, 1993 edition.

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

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

NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*, 1992 edition.

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

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

NFPA 395, *Standard for the Storage of Flammable and Combustible Liquids at Farms and Isolated Sites*, 1993 edition.

NFPA 780, *Lightning Protection Code*, 1992 edition.

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

5-1.2 Other Publications.

5-1.2.1 ASTM Publication. American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103.

ASTM E136-1981, *Standard Test Method for Behavior of Materials In a Vertical Tube Furnace at 750°C.*

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-1-1.1 The record of fires in and around coal preparation plants has been studied since the passage of the Coal Mine Health and Safety Act of 1969, using the data from "An Annotated Bibliography of Coal Mine Fire Reports" prepared by the Allen Corp. under Bureau of Mines Contract No. JO275008. Additional reports were obtained from MSHA covering the period since the Allen report through 1980.

After eliminating certain fires that occurred in wooden structures, a simplified classification of these fires that covered the 11-year period was created. (*See Table A-1-1.1.*)

It is recognized that Table A-1-1.1 is incomplete, since only fires having a duration in excess of 30 minutes have to be reported. Also, many fires that ignite spontaneously in storage piles and silos are loaded out and extinguished without incident. Many of these stored coal fires are not reported. However, certain generalizations can be made.

Because of the wide range of chemical and structural characteristics of coals, it is not possible to rate comprehensively the spontaneous ignition characteristics of coals. In general, coals of lower volatility do not ignite readily. Coals of higher sulfur content and higher oxygen content ignite more readily. Usually, experience with a given coal is the only way to understand how it should be handled and compacted or how long it can be stored before it begins to heat significantly. As new mines are opened to mine the lower rank coals of the western United States, the problems of spontaneous ignition and fires in stored coal will increase.

Table A-1-1.1

	Preparation Plant			Coal Storage		Belt	
	Belt	Dryer	Other	Bins/ Silos	Stock-piles	Tunnels	Galleries
1970	0	0	1	2	0	0	0
1971	1	1	0	0	0	0	0
1972	0	0	0	0	0	0	0
1973	1	0	0	0	0	0	0
1974	0	0	0	0	0	0	0
1975	0	1	0	1	0	0	0
1976	0	0	0	0	1	0	0
1977	0	0	0	1	0	1	0
1978	0	1	0	0	0	0	0
1979	0	1	0	1	0	0	1
1980	0	1	0	2	0	1	0
1981	1	0	2	3	1	0	2
1982	1	1	3	0	0	0	0
1983	2	0	3	0	0	1	0
1984	0	0	3	2	0	0	1
1985	1	1	3	1	0	0	1
1986	1	2	4	1	2	0	0
1987	2	0	9	4	1	0	0
1988	4	8	10	4	0	0	0
1989	1	0	10	1	2	0	0
1990	1	0	5	3	1	0	0
1991	3	1	3	1	3	0	0
TOTAL	19	18	56	27	11	3	5

Compiled from MSHA Denver Safety and Health Technology Center, Mine Information Services Division, Denver, CO.

A-1-3 Coal Preparation. A typical coal preparation plant process begins with raw coal entering a breaker where coal and undesirables, such as rocks, are separated. From the breaker, the coal is crushed and screened-to-size and then transferred, usually by belt conveyor, to the washing process. During the washing process, the dirty coal is separated from clay and rock by water washing or by chemical flotation. From the washing process, the cleaned, wet coal is conveyed to a drying process whereby surface moisture is reduced. A variety of dryers may be used, such as centrifugal, fluidized bed, or thermal disk processors. From the drying process the clean, dry coal is conveyed to storage facilities, such as bins, silos, and coal barns, and then loaded out for transport or shipment by rail, surface, or conveyor for downstream use. (*See Figure A-1-3.*)

A-2-2.1 Provision for removing burning coal to a safe area utilizing conveyors should be considered. These conveyors might require manual water spray to cool smoldering coal. Flanged openings can be used for removing burning coal if adequate planning and equipment have been provided.

A-2-4.6 The intent of this requirement is the avoidance of arcing ignition sources resulting from differing electrical potentials between metal structural elements or between any such element and ground. The metal building elements might include the building frame (beams, columns, etc.), roof panels, building or control room panels, building utilities such as piping, ducts, or conduit, or other items. The objective of connecting metal parts to a ground is recognized as

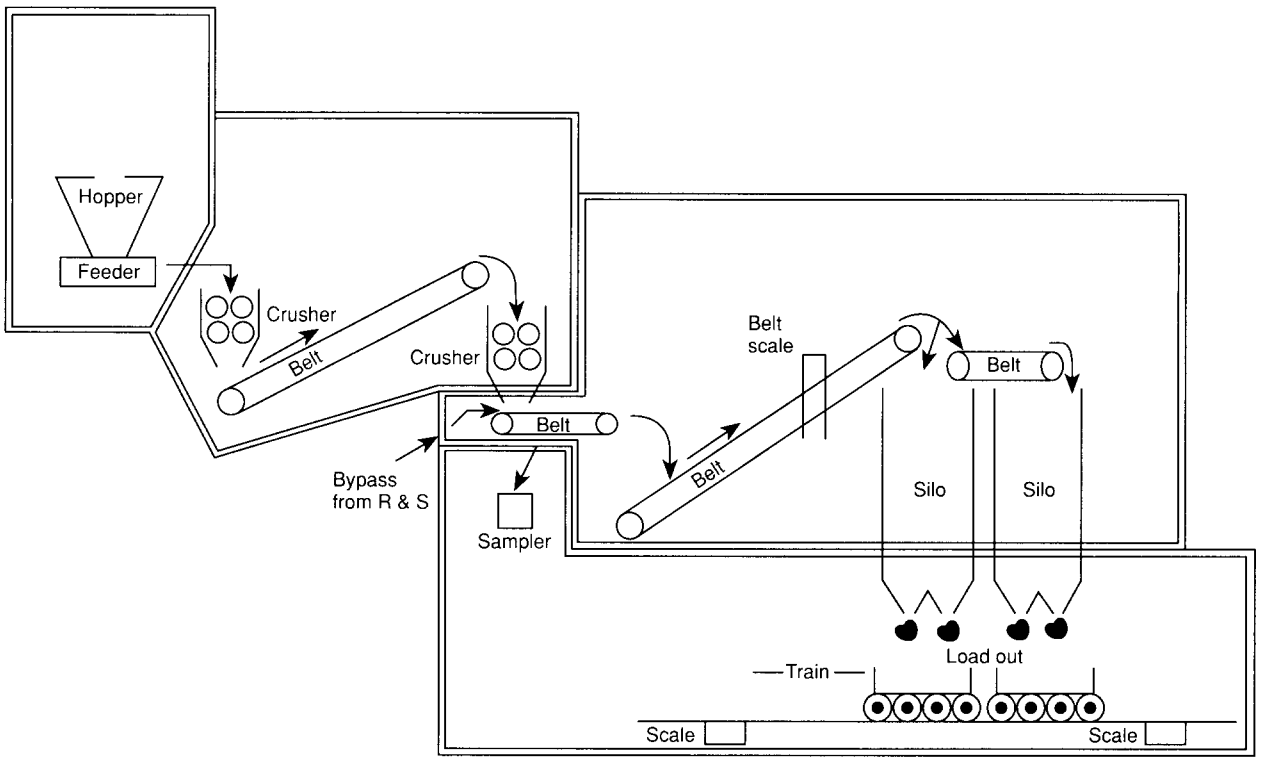

Figure A-1-3 Typical coal preparation plant.

the best means of avoiding arcing between building elements or between those elements and ground or other grounded items. Any arrangement that provides both a good ground and a system of metal continuity from the ground to all metal elements achieves the intent. Where construction provides solid, secure metal-to-metal contact, the necessary continuity normally is provided. In any case where grounding is in question, resistance measurements should be made between the most remote and/or suspected elements and ground. If tests show less than 0.1 ohm resistance to ground, the arrangement may be permitted to be considered satisfactory. Testing should be done during dry weather when ground moisture is at a minimum. If lightning protection is provided (*see Section 2-9*), additional bonding of major building members to lightning system conductors might be required. Such bonding, however, may be permitted to serve the grounding needs covered by this requirement.

A-2-10.1.1 Bulk storage of Class II combustible liquids should be located outside the preparation plant and should be appropriate for the nature of the liquids and the quantities being stored. Tanks within the preparation plant should be of limited size, holding no more than the quantities needed for one and one-half shifts of operation. Each tank should be fitted with an overflow pipe of ample size to return the full volume of the transfer pump to the bulk storage tank. Tanks within the preparation plant should be isolated from the rest of the plant. The isolated area containing the tanks should be protected with an automatic sprinkler system that can provide a density of 0.15 gpm/sq ft (6.1 Lpm/m^2) over the entire area with all heads flowing. The floors beneath these tanks should have curbs, adequate slope, and floor drains able to handle the liquid from the tanks as well as the discharge from all automatic sprinklers.

A-3-3.1 In plants where the vibration anticipated is sufficient to cause movement of the fire protection system resulting in the wear of water piping at the hangers, it might be necessary to install vibration absorbers.

A-4-2 Unless the conveyor is very long, burning coal on a moving belt is not likely to ignite the belt. Also, if the belt should ignite, the burning of the belt is likely to be extinguished after the burning coal has been discharged and the belt continues to run. No reports of running conveyor belts in and around preparation plants that have caught fire and burned have been located. Every reported case of belts catching fire and burning has occurred after the belts have been stopped.

Some preparation plants use the froth flotation process to separate impurities from fine coal. The agents typically used in froth flotation are Class II combustible liquids. The coal recovered from the froth cells is coated minimally with these agents. It has been found that frothed coal carried on conveyor belts will coat the belting with the agents causing the coated belting to ignite easily and the flame spread to become significantly more rapid than usual. It is recommended that belts that carry frothed coal be protected with automatic sprinklers. While the froth flotation process operates as a water slurry and presents no risk of fire, the reagents normally used are No. 2 fuel oil and methyl isobutyl carbinol (MIBC), which are Class II combustible liquids.

A-4-2.1 U.S. Mine Safety and Health Administration Standards for fire retardant conveyor belt materials should be used as a guide. Fire retardant belt materials will burn and, therefore, might require additional fire protection.

A-4-2.2 A steel deck, which often is placed between the top and bottom strands of a belt conveyor, should not be used. It is recommended that existing decks be removed.

Belt galleries that use supporting trusses with substantial length of span should be set entirely beneath the belt so that, in the event of a fire, the loaded structural members of the truss are not seriously exposed to the heat of the burning belt. The supports for the troughing and return idlers should not be structural parts of the truss. The covering for the belt should be partially open on the walkway side, allowing access to the belt and to the belt idlers for maintenance and fire fighting.

Belts that are located entirely within relatively long span supporting trusses should be protected by a fixed fire protection system.

A-4-4 Pneumatic coal-cleaning systems employ low-pressure air, usually pulsed, to effect a separation between relatively dry coal and the mechanically associated impurities. The coal is usually $^3/_4$ in. (19 mm) and smaller with up to 4 percent surface moisture. The pickup of fines from the feed coal in the process air stream creates a potentially explosive mixture. However, approximately 400 fpm (2.03 m/s) air velocity dissipates methane from the coal and, in practice, has caused explosion and fire hazards of very low proportions inside the equipment. Nonetheless, in the area surrounding the equipment a potential fire hazard exists from unintentionally vented fine coal, and the potential for all hazards increases where the cleaners are preceded by thermal driers.

A-4-5 Thermal coal driers may be permitted to be of any type that conforms to the requirements of Section 4-5, including rotary driers, continuous carrier driers, vertical tray and cascade driers, multilouver driers, suspension or flash driers, and fluidized bed driers. These direct-fired convection-type driers constitute the majority of the current operational units. Almost all of these units utilize special direct-fired air heater-type furnaces, usually coal fired by stokers or by pulverized fuel systems.

A-4-5.8 Thermal oil systems are used in coal preparation plants to indirectly dry coal in thermal disk processors. Severe losses have occurred due to lack of inadequate sprinkler protection, poor siting and confinement of expansion and storage tanks and heaters, improper piping arrangement, and inadequate interlocks and controls. NFPA 664, *Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities*, Appendix A, Section A-9, covers hazards and protection concepts for typical thermal oil systems. Even though the woodworking industry has unique equipment that needs hot oil applications, the hot oil heating and distribution systems are similar, and the concepts provided in this standard can be utilized for the coal preparation industry.

A-4-7.1 Provision of 1 ft^2 (0.1 m^2) of building vent for each 80 ft^3 (2.3 m^3) of volume or space in which an explosion might occur generally is considered adequate for coal preparation plants, although the amount of venting needed to minimize structural damage that might be caused by a dust explosion varies according to the strength of the building, extent of the hazard, location and distribution of vents, properties of the coal dust, and other factors.

A-4-11 Fortunately, evidence of heating is easy to detect. During the early stage of heating, the odor is unmistakable. When heating is more advanced, smoke and steam also might be apparent. If the hot coal is in an exposed storage pile, the hot material can be dug out and wetted. If the hot material has to be loaded onto a conveyor belt, the loading areas should be hosed down and water should be applied to the hot material before or as it is loaded onto the belt.

Tunnels under silos or storage piles should be ventilated adequately and should be protected with a system of automatic sprinklers. Hoses for wash-down and for fire fighting should be provided. The main tunnel should have exit routes at opposite ends of the tunnel.

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

B-1.2 Code of Federal Regulations. U.S. Government Printing Office, Washington, DC 20402.

30 CFR Chapter I, Part 18.

Coal Mine Health and Safety Act of 1969, "An Annotated Bibliography of Coal Mine Fire Reports."

Index

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

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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.

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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).

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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.

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"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.

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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

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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)

FOR OFFICE USE ONLY
Log # _____
Date Rec'd _____

2. Proposal recommends: (Check one)
- ❑ **new text**
- ❑ **revised text**
- ☒ **deleted text**

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

Delete exception.

SAMPLE

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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Signature (Required)

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