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NFPA 123 Fire Prevention and Control in Underground Bituminous Coal Mines 1987 Edition

National Fire Protection Association Batterymarch Park, Quincy, MA 02269

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

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

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

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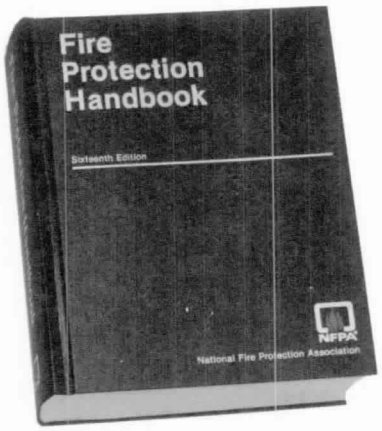

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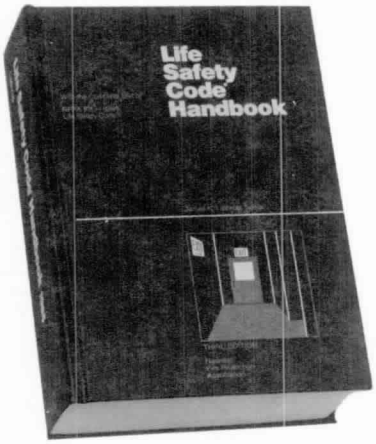

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NFPA 123

Standard for Fire Prevention and Control in

Underground Bituminous Coal Mines

1987 Edition

This edition of NFPA 123, *Standard for Fire Prevention and Control in Underground Bituminous Coal Mines*, was prepared by the Technical Committee on Mining Facilities, and acted on by the National Fire Protection Association, Inc. at its Annual Meeting held May 18-21, 1987 in Cincinnati, Ohio. It was issued by the Standards Council on June 10, 1987, with an effective date of June 30, 1987.

The 1987 edition of this standard has been approved by the American National Standards Institute.

Origin and Development of NFPA 123

In 1978 the Technical Committee on Mining Facilities through its membership and current Mine Safety and Health Administration regulations identified the need for guidance in fire prevention and control in underground coal mines. This new document, NFPA 123, was developed through several subcommittee and committee meetings.

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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.

Contents

Foreword

Fire in a coal mine can be difficult to control and extinguish because of the size and extent of a mine, the virtually unlimited fuel, the potential for delay in fire detection, the delay in organizing an effective fire fighting operation, the approach, which can be only from the up-wind side (while a fire can spread rapidly on the downwind side), the toxicity of combustion products, and the possibility that smoke can block the escape of persons trapped inby the fire.

When a fire in an underground coal mine involves coal, generally the most effective extinguishing agents for direct attack are water or foam.

The last resort in fighting a coal mine fire is sealing, preferably just the fire area. When this is not possible, the mine may have to be sealed at the surface. Sealing a fire in a coal mine can increase the potential for explosion until the oxygen concentration in the sealed area is reduced to a safe level. Such explosions have violently destroyed underground seals and seals at the surface. Inert gases have been used successfully to lower the oxygen concentration in sealed areas, thereby controlling fires and preventing explosions.

An effective fire fighting operation is a difficult, dangerous operation that may involve many people for long periods of time. The experience, knowledge, and judgement of those in charge is crucial to success.

The Committee examined a record of fires in underground coal mines compiled from 1970 to 1981, inclusive, and the study assisted the Committee in addressing this document (see A-1-1.1).

The major ignition sources of fires in underground coal mines are:

Electrical.

Spontaneous.

Friction.

Cutting and Welding.

Materials that may burn in underground coal mines include the coal, methane gas, wood, conveyor belting, diesel fuel, lubricants, hydraulic fluids, hoses, insulation, electrical cables, brattice fabric, rubber tires, and some maintenance materials, including paint, flammable solvents, and gases used for cutting and welding.

When a mine fire is not quickly controlled, it may endanger personnel inby the fire and may spread to the coal seam, where, with unlimited fuel, it can grow to a size usually limited only by the availability of oxygen. While the fire damage to equipment can be serious, a fire involving the coal seam is a threat to the entire coal mine.

It should be noted that in certain geographical regions where low volatile content coal is mined, the risk of igniting the coal seam may be low.

In contrast, in some other geographical regions, the coal, when exposed by mining, may ignite spontaneously.

Fires in coal mines usually involve ordinary combustible solids (Class A). Even when fires initially involve lubricants (Class B), these materials are quickly consumed and burning of combustible solids continues.

Dry chemicals of the B-C type and compressed gas (halon and carbon dioxide) extinguishing agents are not generally recommended, since they are less effective on combined Class A and Class B fires than multipurpose (ABC) dry chemical.

The most suitable agent for general use is water. It can be dispensed as straight stream, or spray, or as low, medium, and high expansion foam. It is effective, readily available, and inexpensive. Its effectiveness as a stream or spray may be enhanced by use of wetting agents. Its principal disadvantage is freezing. This can be prevented by antifreeze, insulation, burying, constant flow, dry pipes, or a combination of two or more of the foregoing.

For methane fires where burning coal or other combustibles are present, a combined attack with water and multipurpose (ABC) dry chemical is generally the best approach. Water is used first to extinguish and cool burning coal or other material, thereby preventing reignition. The methane fire can then be extinguished with multipurpose (ABC) dry chemical.

Rock dust is used primarily for explosion suppression, but may be used to cover and control small fires.

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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 4.

Chapter 1 Introduction

1-1 Scope.

1-1.1* This standard covers minimum requirements for reducing loss of life and property from fire in underground bituminous coal mines. This standard does not cover explosion hazards; nor does it cover the use, handling, and storage of diesel fuel or diesel powered equipment.

1-1.2 This standard is based upon the present state of the art. Application to existing installations is not mandatory. Nevertheless, operating mines are urged to adopt those features of this standard that are considered applicable and reasonable for existing installations.

1-1.3 Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, reliability, strength, fire resistance, effectiveness, durability, and safety to those prescribed by this standard, providing technical documentation or other proof, such as demonstration, is submitted to the authority having jurisdiction to demonstrate equivalency and the system, method, or device is approved for the intended purpose.

1-2 Purpose.

1-2.1 This standard is prepared for the use and guidance of those charged with designing, constructing, installing, examining, approving, operating, and maintaining fire prevention, fire protection, and fire fighting equipment in underground bituminous coal mines. It may be necessary for many of those charged with purchasing, inspecting, testing, approving, operating, and maintaining fire protection equipment to consult a competent fire protection engineer, experienced in the field of coal mining, in order to more effectively discharge their respective duties.

1-3 Definitions. The terms in this standard are in accord with general usage or dictionary definitions. Those listed below are used with the meanings indicated. A number of special terms are individually defined in the text.

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

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

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

NOTE: The phrase "authority having jurisdiction" is used in NFPA documents in a 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, health department, building official, electrical inspector, or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the "authority having jurisdiction." In many circumstances the property owner or his designated agent assumes the role of the "authority having jurisdiction"; at government installations, the commanding officer or departmental official may be the "authority having jurisdiction."

Closed Container. A container so sealed by means of a lid or other device that neither liquid nor vapor will escape from it at ordinary temperatures.

Container. Any approved vessel of 60 U.S. gallons or less used for transporting or storing liquids.

Fire Resistant Construction. Masonry walls or equivalent having at least a 1-hour fire rating including compressible materials having an equivalent fire resistant capability.

Flammable and Combustible Liquids. For fire protection purposes, an arbitrary division of liquids that will burn has been established in NFPA 321, *Basic Classification of Flammable and Combustible Liquids.*

(a) *Flammable liquid.* A liquid having a flash point below 100°F (37.8°C) and having a vapor pressure not exceeding 40 psi (2068.6 mm) at 100°F (37.8°C) shall be known as a Class I Liquid.

Class I liquids shall be subdivided as follows:

Class IA shall include those having flash points below 73°F (22.8°C) and having a boiling point below 100°F (37.8°C).

Class IB shall include those having flash points below 73°F (22.8°C) and having a boiling point at or above 100°F (37.8°C).

Class IC shall include those having flash points at or above 73°F (22.8°C) and below 100°F (37.8°C).

(b) *Combustible Liquids.* A liquid having a flash point at or above 100°F (37.8°C) and shall be subdivided as follows:

Class II liquids shall include those having flash points at or above 100°F (37.8°C) and below 140°F (60°C).

Class III liquids shall include those having flash points at or above 140°F (60°C) and may be subdivided as follows:

Class IIIA liquids shall include those having flash points at or above 140°F (60°C) and below 200°F (93.4°C)

Class IIIB liquids shall include those having flash points at or above 200°F (93.4°C).

Flash Point. The minimum temperature at which a liquid gives off vapor in sufficient concentration to form an ignitible mixture with air near the surface of the liquid within the vessel as specified by appropriate test procedure and apparatus as follows:

The flash point of a liquid having a viscosity less than 45 SUS at 100°F (37.8°C) and a flash point below 200°F (93.4°C) shall be determined in accordance with ASTM D-56, *Standard Method of Test for Flash Point by the Tag Closed Tester.*

The flash point of a liquid having a viscosity of 45 SUS or more at 100°F (37.8°C) or a flash point of 200°F (93.4°C) or higher shall be determined in accordance with ASTM D-93-1985, *Standard Method of Test for Flash Point by the Pensky Martens Closed Tester.*

As an alternative, ASTM D-3278, *Standard Method of Tests for Flash Point of Liquids by Setaflash Closed Tester*, may be used for paints, enamels, lacquers, varnishes, and related products and their components having flash points between 32°F (0°C) and 230°F (110°C), and having a viscosity lower than 150 stokes at 77°F (25°C).

Inby. A mining term meaning in the direction of the face or farther into the mine.

Labeled. Equipment or materials to which has been attached a label, symbol or other identifying mark of an organization 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.

Liquid. For the purpose of this document, any material with fluidity greater than that of 300 penetration asphalt when tested in accordance with ASTM D-5, *Test for Penetration for Bituminous Materials.*

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.

Mobile. Any equipment in use without its own motive power train and normally moved by self-propelled equipment.

Noncombustible Material. A material which, in the form 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, when tested in accordance with ASTM E136-82, *Standard Method for Behavior of Materials in a Vertical Tube Furnace at 750°C* (1382°F), shall be considered noncombustible materials.

Operating Area. Area where mining of coal takes place or area where construction is underway.

Outby. A mining term meaning in the direction away from the face or toward the outside, opposite of inby.

Safety Can. An approved metal container, of not more than 5 gal (0.019 m^3) capacity, having a spring-closing lid and spout cover and so designed that it will safely relieve internal pressure when subjected to fire exposure.

Self-Propelled. Equipment that contains a motive power train as an integral part.

Shall. Indicates a mandatory requirement.

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

Substantial Construction. Construction of such strength, material, and quality that enables an object to object withstand reasonable shock, wear, and usage to which it will be subjected.

Suitable. That which fits, and has the qualities or qualifications to meet a given purpose, occasion, condition, function, or circumstance.

Tank. An approved vessel having a liquid capacity in excess of 60 gal (0.23 m^3).

Chapter 2 Fire Prevention

2-1 General.

2-1.1 Fire prevention in an underground coal mine requires good housekeeping and cleanliness, safe operation of equipment and processes, proper supervision and operation of cutting and welding, and regular electrical and mechanical maintenance of equipment, facilities and machinery.

2-1.2 Smoking and carrying of smoking materials, matches, or lighters underground shall not be permitted.

2-2 Housekeeping.

2-2.1 Efforts shall be made to remove, cover, or inert combustible materials.

2-2.2 Waste paper and other light combustibles shall not be allowed to accumulate.

2-2.3 Excessive amounts of coal dust shall be cleaned up, covered, or inerted with rock dust.

2-3 Storage and Use of Flammable Liquids.

2-3.1 Whenever possible, the storage and use of Class I flammable liquids underground shall be avoided.

2-3.1.1 Paints and special solvents shall be available only in original containers or cans of not over one gallon (3.8 L) capacity. Solvents purchased in larger quantity shall be transferred, while on the surface, to a listed safety can of not over one gallon (3.8 L) capacity before being taken underground.

2-3.1.2 All aerosol cans shall be treated as containing Class I liquids unless specifically identified to the contrary.

2-3.1.3 Containers, safety cans, and aerosol cans for flammable liquids shall be marked to identify the liquid content.

2-3.2 Class I liquids in underground storage areas as defined in 2-4.5 and in underground shops as defined in 2-6 shall be stored in approved storage cabinets.

2-3.3 In operating areas, containers of Class I liquids and aerosol cans shall be stored at least 25 ft (7.6 m) away from potential ignition sources such as energized trolley wire, energized electrical equipment, cutting and welding and other operating equipment.

2-3.3.1 The quantity of Class I liquids and number of aerosol cans shall not exceed that required to meet the needs of three consecutive days of normal operations.

2-3.4 Class I liquids shall only be used in well-ventilated areas, at least 50 ft (15.2 m) from cutting or welding operations.

2-4 Storage, Transport, and Use of Combustible Liquids.

2-4.1 Class II and III liquids, shall be kept in closed containers, safety cans or tanks marked to identify the liquid content.

Exception: Grease cartridges may be kept in the original shipping carton.

2-4.2 Combustible liquids shall be transported in closed containers, safety cans or tanks. When a vehicle is being used as a mantrip, it shall not be used for transporting combustible liquids.

2-4.2.1 Containers and tanks loaded on rail or trackless vehicles shall be secured against shifting and damage during transit. When loaded on a rail car for transport on a trolley wire-powered rail system, no container or tank shall be higher than the sides of the coal haulage mine car. When coal haulage is not by rail, the container or tank shall be at least 12 in. (30 cm) from any trolley wire.

2-4.2.2 Tanks for handling combustible liquids shall be substantially constructed, fitted with filler caps and vents, and have discharge valves that are protected in the event of derailment or ribbing of the vehicle.

2-4.2.3 Rail or trackless vehicles that carry supplies for production sections in addition to combustible liquids shall have provisions for securing or separating supplies from the lubricants so that, in the event of derailment or ribbing, the supplies will not puncture containers or tanks.

2-4.2.4 Vehicles carrying combustible liquids shall be kept clean of accumulations of oil, grease, and other combustible material. Combustible liquids spilled shall be cleaned up promptly. Any remaining residue shall be covered with an oil absorbent or rock dust.

2-4.3 When combustible liquids (lubricants) are stored on a vehicle located in an operating area, the vehicle shall not be parked under a trolley or trolley wire unless the wire is deenergized or insulated. Off loaded liquid containers or tanks shall be stored at a location outby the last open crosscut, not in an active roadway, and at least 25 ft (7.6 m) from trolley wires.

2-4.3.1* The quantity of combustible liquids stored in an operating area shall not exceed three days supply, except when the quantity in a single container exceeds three days supply.

2-4.4 Transferring of liquids from containers or tanks shall be accomplished by approved transfer pump or by gravity flow. Where needed, containers or tanks shall be equipped with approved vent. If a manual valve is used it shall be of the self-closing type.

2-4.4.1 Spillage shall be cleaned up promptly. Remaining residue shall be covered with an oil absorbent or rock dust.

2-4.5 Underground storage areas where quantities of combustible liquid are stored in excess of that allowed in an operating area, shall meet the following requirements.

2-4.5.1 Storage areas shall be located a minimum of 100 ft (30 m) from explosive magazines, electrical substations, shops, or other combustible liquid storage places and at least 25 ft (7.6 m) from normally energized trolley wire.

2-4.5.2 The storage areas shall be of fire-resistive construction or shall be enclosed and protected by an approved automatic fire suppression system. (*See Chapter 3 for information on fire suppression systems.*)

2-4.5.3 All enclosed combustible liquid storage areas, fire-resistive construction or not, shall be built of noncombustible materials, including floor, roof, roof supports, doors, and door frames.

2-4.5.4 Enclosed storage areas shall be constructed to provide for suitable spill containment or shall be provided with a suitable floor drain to course spilled liquid to a containment sump or vessel.

2-4.5.5 All openings to the storage place shall be sealed with substantial, fire resistive stoppings. The access opening through which containers are moved shall be on the intake side. The access opening shall be equipped with self-closing metal door(s). A metal man door shall be provided at the opposite end of the storage area.

2-4.5.6 The storage place shall be vented directly to the return.

2-4.5.7 Combustible liquid containers shall be stored as follows:

(a) 55 gal (208 L) drums and 30 gal (114 L) drums shall be set vertically and not over one drum high.

(b) 16 gal (61 L) drums shall be set vertically and not over two drums high.

(c) 5 gal (19 L) pails shall be set vertically and not over four pails high.

(d) Cartons holding grease cartridges shall not be stacked over three cartons high.

(e) Containers shall be kept closed during storage.

2-5 Cutting and Welding.

2-5.1 Cutting and welding shall be performed only by experienced persons instructed in precautions and procedures for safe operation.

2-5.2 All cutting and welding equipment shall be maintained in good operating condition. Flashback preventers shall be installed at the outlets of all pressure regulators and ahead of the hoses used in cutting, welding, brazing, and soldering. When not in use, the valves of the compressed gas cylinder shall be closed tightly and protected from physical damage.

NOTE: Occasionally flashbacks have damaged or ruptured hoses. Additional flashback preventers attached to torches are recommended.

2-5.3 Before cutting and welding operations are undertaken in an underground shop, the following precautions shall be observed:

(a) Flammable and combustible liquids shall not be dispensed during cutting and welding operations. Freshly painted surfaces shall be allowed to dry sufficiently so that ignitable vapor is not present before cutting or welding.

(b) Class II and III combustible liquid cleaning vats shall be covered or removed to prevent ignition during cutting and welding operations.

(c) Combustibles such as oil, grease, and coal, located within 15 ft (4.6 m) of the cutting or welding shall be cleaned up in a reasonable manner. Any remaining material shall be covered with a noncombustible oil-absorbent material or rock dust. Open gear cases or other machinery components containing lubricants within 15 ft (4.6 m) shall be covered with noncombustible material.

(d) Extinguisher(s) having a minimum nominal capacity of 20 lbs (9.1 kg) of multipurpose (ABC) dry chemical extinguishing agent shall be readily available.

(e) Manifolding of cylinders containing gases used for cutting and welding shall be permitted only in well-ventilated shops. The equipment shall be electrically grounded and maintained in accordance with the safety precautions provided by the manufacturer.

(f) Oxygen shall be used only for its intended purpose. It shall not be used to blow coal dust from clothing or machinery.

2-5.4 Before cutting and welding operations are permitted in other areas underground, the following precautions shall be observed:

(a) The immediate area shall be thoroughly wetted down with water or shall be thoroughly coated with rock dust.

(b) Fire extinguishing equipment, including multipurpose (ABC) dry chemical extinguishers, rock dust or a water hose shall be immediately available.

(c) When equipment to be modified or repaired can be moved, it shall be moved outby the last open crosscut before cutting or welding.

(d) When cutting or welding is necessary inby the last open crosscut, a continuous fire watch shall be maintained. A qualified person shall also check for the presence of methane. Cutting and welding operations shall not be allowed unless the concentration of methane is less than 1 percent by volume.

(e) Open gear cases and combustible machine components located close to cutting or welding shall be covered with noncombustible material.

(f) Positive ventilation shall be established prior to cutting or welding.

2-5.5 Upon completion of cutting or welding, a fire watch shall be maintained until all material has cooled sufficiently to touch with the bare hand.

2-5.6 Cylinders of compressed gas for cutting and welding shall not be transported on mantrips.

2-5.7 Compressed gas cylinder for cutting or welding being transported shall be:

(a) Disconnected from regulators.

(b) Protected with a metal cap or headband (fence-type metal protector around the valve stem).

(c) Secured by devices that will hold the cylinders in place during transit on conveyor belts, mobile or self-propelled equipment.

(d) Placed in electrically insulated, substantial containers designed to hold the cylinders during transit on a trolley wire haulage system.

(e) Compressed gas cylinders for cutting or welding shall be clearly labeled "empty" or "MT" when the gas has been expended.

2-5.8 Compressed gas cylinders stored in an underground coal mine for cutting or welding shall be:

(a) Placed in storage areas designated for the purpose. These areas shall be well rock dusted, free of trash, and combustible or flammable liquids.

(b) Stored and secured in an upright position, if the height of the coal seam permits, or angled with the valve end higher.

(c) Protected against damage from falling material, contact with power lines and energized electrical machinery and heat from cutting or welding operations.

2-5.9 Compressed gas cylinders shall not be stored or left unattended inby the last open crosscut of an underground coal mine.

2-5.10 Valves on unattended compressed gas cylinders shall be closed. When located in other than underground shops, compressed gas cylinders not in use shall have regulators removed and, if appropriate, the valves covered with protective metal caps or approved equivalent protection.

2-6 Underground Maintenance Shops.

2-6.1 Underground maintenance shops that are intended for use longer than six months, shall be of fire resistive construction or shall be enclosed and protected with an automatic fire suppression system. (*See Chapter 3 for information on fire suppression systems.*)

2-6.2 All enclosed maintenance shops, fire-resistive construction or not, shall be built of noncombustible materials, including floor, roof, roof supports, and door frames.

2-6.3 Entrances to the shop shall be equipped with a closeable metal door(s).

2-6.4 The shop area shall be ventilated directly to the return.

2-7 Belt Conveyors.

2-7.1* Belt conveyors installed in underground coal mines shall meet the following minimum requirements:

(a) Conveyor belting shall be approved.

(b) Entries in which belt conveyors are installed shall be kept reasonably free of accumulations of coal and coal dust, and shall be rock dusted.

(c) All belt conveyors shall be equipped with slippage switch systems designed to shut down the belt if sliding friction develops between the drive pulley(s) and the belt. On each new installation, the slippage switch system shall be tested before the conveyor is used for the transport of coal. Thereafter the slippage switch system shall be tested weekly.

(d) All conveyor belt systems shall be equipped with suitable interlock systems, which will shut down inby belt conveyors or other coal-feeding equipment if any conveyor in the system should stop or reduce its normal speed.

(e) Fixed combustible material such as posts, cribbing, and roof supports shall be either metal guarded from contact by the belt or located at least half the width of the belt from any idler or pulley. An alternate method to minimize potential frictional ignition is the use of alignment switches at intervals sufficient to prevent the belt from contacting such materials. Machinery guarding in the drive area and at other points along the belt shall be of metal construction.

(f) New installations of belt conveyors shall utilize structure that does not provide a deck between upper and lower strands of belt.

Exception: Belts that carry the load of the belt on a low friction metal deck without rollers.

2-8 Hydraulic Fluids.

2-8.1 Fire-resistant hydraulic fluid shall be an approved type.

2-8.2 Samples of fire-resistant fluids in use of the invert-emulsion type shall be collected quarterly. These samples shall be tested individually to determine if the water content is sufficient to make the fluid fire resistant. When the sample shows that the water content is insufficient for the fluid to be considered fire resistant, the fluid shall be replaced or water shall be added to raise the water content above the minimum safe level. When water is added to the hydraulic system of any machine, a sample shall be taken and analyzed within twenty-four hours.

2-9 Electrical Systems.

2-9.1 Electrical systems shall be approved.

Chapter 3 Fire Protection

3-1 Portable Fire Extinguishers.

3-1.1 General Requirements.

3-1.1.1 Portable fire extinguishers used in underground coal mines shall be listed, multipurpose (ABC) dry chemical types having a minimum nominal capacity of 5 lbs (2.3 kg) of extinguishing agent.

NOTE: Larger capacity extinguishers which provide more agent and longer discharge time are recommended.

3-1.1.2 Portable extinguishers shall be kept in their designated places.

3-1.1.3 Extinguishers shall be conspicuously located where they will be readily accessible in the event of fire.

Exception: In areas where visual obstruction cannot be completely avoided, visible markings shall be provided to indicate the location.

3-1.1.4 Extinguishers installed under conditions in which they are subject to dislodgement shall be installed in brackets specifically designed to cope with this problem.

3-1.1.5 Extinguishers shall be protected from physical damage. Damaged extinguishers shall be repaired, replaced, or removed from service.

3-1.2 Selection and Application.

3-1.2.1 Portable fire extinguishers having a minimum nominal capacity of 20 lbs (9.1 kg) of multipurpose (ABC) dry chemical agent shall be located just outside the main entrance doors of storage areas as defined in 2-4.5 and maintenance shops as defined in 2-6.1. At least 240 lbs (190 kg) of bagged, dry rock dust shall be stored outby the entrance doors. A fire hydrant with sufficient hose and nozzle to reach all points in the storage area and maintenance shop shall be provided outby within 100 ft (30.5 m) of the entrance doors area.

3-1.2.2 Multipurpose (ABC) dry chemical extinguishers having a minimum nominal capacity of 10 lbs (4.6 kg) of agent shall be provided for the protection of fixed installations including:

(a) Ventilation doors on trolley wire-supplied track haulways.

(b) Pumps and pump rooms.

(c) Conveyor belt drives.

(d) Belt head loading equipment.

(e) Compressor rooms.

(f) Electrical equipment such as transformers, load centers, rectifiers, circuit breakers, tie breakers, and starters.

(g) Shops and maintenance areas.

(h) Flammable and combustible materials storage areas.

(i) Rotary dump areas.

(j) Battery-charging area.

3-1.2.3 Two extinguishers of lesser individual capacity shall not be used to fulfill the requirements of 3-1.2.2.

3-1.2.4 At least one multipurpose (ABC) dry chemical extinguisher having a minimum nominal capacity of 30 lb (13.6 kg) of agent shall be provided in each working section of a mine. If the coal seam is exceptionally gaseous and gas blowers are present, two multipurpose (ABC) dry chemical extinguishers having a minimum nominal capacity of 30 lb (13.6 kg) of agent each shall be provided.

Exception: In low coal, where a 30 lb (13.6 kg) extinguisher may be too large to employ, three 10 lb (4.6 kg), two 20 lb (9.1 kg) or one of each shall be acceptable.

3-1.2.5 All vehicles, self-propelled equipment, and mobile equipment shall be equipped with a portable multipurpose (ABC) dry chemical extinguisher including:

(a) Locomotives, portal busses, mantrip vehicles.

(b) Battery tractors and other haulage units.

(c) Self-propelled production equipment including miners, shuttle cars, roof bolters, scoops.

(d) Mobile equipment including air compressors, feeder breakers.

3-1.2.5.1 The installation of an automatic or manually operated fire suppression system shall not eliminate the requirement for a portable fire extinguisher.

3-1.3 Maintenance.

3-1.3.1 Portable fire extinguishers shall be inspected, maintained, and recharged as specified in NFPA 10, *Standard for Portable Extinguishers*, Chapter 4, Inspection, Maintenance and Recharging, including the following.

3-1.3.1.1 Portable fire extinguishers shall be visually inspected at least monthly.

3-1.3.1.2 The visual inspection shall confirm that: the extinguisher is in its designated place, the tamper seals are intact, the extinguisher gage is in the operable range (if extinguisher is stored pressure type), and that there is no obvious physical damage or condition to prevent operation.

3-1.3.1.3 Extinguishers that are deficient shall be replaced.

3-1.3.1.4 Extinguishers shall be subjected to a thorough maintenance examination at least once every twelve months.

3-1.3.1.5 Maintenance procedures shall include a thorough examination of the extinguisher, including mechanical parts, extinguishing agent, and expelling means.

3-1.3.1.6 Any detected troubles or impairments shall be immediately corrected by competent personnel.

3-1.3.1.7 Each extinguisher shall have a durable tag or label securely attached on which the date and the initials of the person performing the maintenance services, shall be recorded. The same record tag or label shall also indicate if recharging was performed.

3-1.3.1.8 All extinguishers shall be recharged after use, as indicated by an inspection, or when performing maintenance.

3-1.3.2 Portable extinguishers shall be hydrostatically tested at intervals not exceeding those specified in NFPA 10, *Standard for Portable Fire Extinguishers*, Chapter 5, Hydrostatic Testing.

3-2 Water Supply for Mine Fire Protection.

3-2.1 General Requirements.

3-2.1.1 Three factors shall be used to determine the type of water supply required:

(a) Height of coal.

(b) Roof material.

(c) Coal volatility.

NOTE: The higher the coal seam, a combustible roof and the amount of volatile matter in the coal itself will cause fires of coal in place to be more severe.

3-2.2 Selection and Application.

3-2.2.1 A Class I water supply shall be capable of supplying one fire hose stream with a nozzle pressure of at

least 50 psig (345 kPa) and a flow rate of at least 50 gpm (3.2 L/sec) each applied through the maximum expected lay of hose. A Class I water supply shall be the minimum required, when the mine roof is noncombustible and the volatile matter is 20 percent or less, and the height of the coal seam is less than 48 in. (1.2 m).

3-2.2.2 A Class II water supply shall be capable of supplying simultaneously two hose streams, each with a nozzle pressure of at least 50 psig (345 kPa) and a flow rate of at least 50 gpm (3.2 L/sec), applied through the maximum expected lay of hose. A Class II water supply shall be the minimum required when the mine roof is combustible, or the volatile matter is more than 20 percent, or the height of the coal seam is 48 in. (1.2 m) or more.

3-2.2.3 The mine shall have the capability of meeting the required water supply continuously for 24 hours.

3-2.2.4* Water distribution lines shall extend from the surface to each operating area.

Exception: Where a suitable underground supply of water exists, water lines can extend from that supply rather than from the surface provided the power for the pump(s) is safeguarded from fire.

3-2.2.5 Where applicable, water lines shall be protected against freezing.

3-2.2.6 Water lines that are 2 in. (51 mm) or larger in diameter shall be joined with flanges, mechanical grooved gasketed fittings, threaded fittings, or other suitable fittings. At least every third joint shall be capable of allowing limited motion and emergency rearrangement.

3-2.2.7 Pipe and fittings shall be adequate for the water pressure. Their burst strength shall be at least four times the static pressure.

3-2.2.8 Water lines shall be equipped with shut-off valves at intervals not to exceed 5000 ft (1525 m). A shut-off valve shall be provided in each branch line at the point where it is coupled to the main water line.

3-2.3 Maintenance.

3-2.3.1 The water supply system shall be maintained in good operating condition.

3-3 Fire Detection Systems.

3-3.1 General Requirements.

3-3.1.1 All fire detectors shall be listed or approved for the intended use and installed in accordance with NFPA 72E, *Standard on Automatic Fire Detectors*, the manufacturer's instructions, or as specifically permitted in this standard.

Exception: Where detectors are installed on wiring, they shall not be installed more than 12 in. (305 mm) from the roof.

3-3.1.2 Fire detectors and related detection system components used to initiate an audible and visual alarm, automatic actuation of a fire suppression system, or equipment shutdown shall be listed or approved for use in coal mines.

3-3.1.3 Detection system input, alarm and releasing circuits shall be supervised. The presence of a fault related to any of these circuits shall initiate an electrical supervision fault signal in the protected area and remotely in a constantly attended location.

Exception: Detection systems that give local warning to operating personnel need not give a trouble signal at a remote location(s), providing equipment and the area protected are inspected upon shutdown at end of the shift.

3-3.1.4 All detection systems shall be installed in accordance with the appropriate NFPA signaling systems standard.

Exception: A trouble signal shall not be provided when the main power supply is intentionally shut off during periods of mine activity.

3-3.1.5 Sprinkler systems with a water flow switch connected to the detection system shall be acceptable in lieu of fire detectors, but only in the area covered by the sprinkler system.

3-3.2 Selection and Application.

3-3.2.1 Fire detection systems shall be installed over all belt conveyors and at all unattended automatic belt heads (where mine cars are loaded automatically). The same fire detection system may be extended to cover the automatic belt head and the belt feeding that belt head.

NOTE: The detector loop wiring and detectors may be installed on one side of the conveyor belt to permit safe maintenance and repair of the circuit wiring without shutting down the conveyor belt.

3-3.2.2 The spacing of detectors shall not exceed that allowable in NFPA 72E, *Standard on Automatic Fire Detectors*.

3-3.2.3 All fire detection systems and associated equipment shall be tested in accordance with the appropriate NFPA standard and the manufacturer's or designer's manual of instruction.

3-3.3 Maintenance.

3-3.3.1 Maintenance shall be as required by NFPA 72E, *Standard on Automatic Fire Detectors*. Useful information is also provided in NFPA 72H, *Guide for Testing Procedures for Local, Auxiliary, Remote Station and Proprietary Protective Signaling Systems*.

3-4 Fixed Fire Suppression Systems.

3-4.1 Sprinkler systems shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

3-4.2 Water spray fixed systems for fire protection shall be installed in accordance with NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*.

3-4.3 Deluge foam-water sprinkler systems and foam-water spray systems shall be installed in accordance with NFPA 16, *Standard on Deluge Foam-Water Sprinkler and Foam-Water Spray Systems.*

3-4.4 Dry chemical extinguishing systems shall be installed in accordance with NFPA 17, *Standard for Dry Chemical Extinguishing Systems.*

3-4.5 Water tanks for fire protection shall be in accordance with NFPA 22, *Standard for Water Tanks for Private Fire Protection.*

3-4.6 Automatic fixed fire suppression systems shall be provided for the protection of the following equipment and facilities:

(a)* Drive areas of belt conveyors, including drive motor, reducer, and takeup (takeup includes power unit).

(b) Flammable and combustible liquid storage areas as defined in 2-4.5 and not of fire-resistive construction.

(c) Maintenance shops as defined in 2-6.1 and not of fire-resistive construction.

(d) Unattended electrically powered non-mobile equipment, such as car spotters. This type of equipment must also use fire resistant hydraulic fluid.

(e) Unattended air compressors.

(f) Unattended electrical equipment such as enclosed electric motors, electrical controls, transformers, rectifiers, and other similar equipment that does not have a hydraulic system, shall be either:

1. Protected with an automatic fire suppression system; or

2. Located on noncombustible material and spaced at least 2 ft (.61 m) from coal or other combustible material; or

3. Located on noncombustible material and separated from coal and other combustible material by 4 in. (10.2 cm) of masonry walls, having a minimum thickness of 4 in. (10.2 cm) of block or 2 in. (5 cm) of reinforced gunite or metal walls spaced at least 4 in. (10.2 cm) from ribs.

Exception: All dry-type electrical equipment in a ventilated metal enclosure or its surface temperature does not exceed 150°C.

3-4.7 Automatic or manual fixed fire suppression systems shall be provided for protection of the following equipment:

(a) Attended electrically powered mobile equipment such as coal cutters, continuous miners, roof and coal drills, loaders, shuttle cars, and locomotives that use hydraulic fluid.

Exception No. 1: Equipment using approved fire-resistant hydraulic fluid are exempt from this requirement.

Exception No. 2: Cutting machines and continuous miners that are supplied water through a hose for dust control while mining, may use this water source for fire protection, providing a diversion valve(s) is provided at or outby the operator's station, which will permit quick and convenient diversion of water to the fire suppression nozzles.

(b) Attended electrically powered non-mobile air compressors.

3-5 Hand Hose Line Systems.

3-5.1 General Requirements.

3-5.1.1* Hand hose line systems shall meet the requirements of NFPA 14, *Standard for the Installation of Standpipe and Hose Systems.*

3-5.1.2* The mine operator shall choose the entry in which the hydrants are located and shall locate main doors and provide sufficient fire hose to reach parallel entries where risk of fires may exist.

3-5.2 Selection and Application.

3-5.2.1* Fire hose for use in underground coal mines shall be 1½ in. (38 mm) or 2 in. (51 mm) diameter, single or multiple jacket, of a type suitable for coal mine use in 50, 100, 150 ft (15, 30, or 46 m) lengths or longer if mine conditions warrant. The hose shall meet the minimum applicable standards of NFPA 1961, *Standard for Fire Hose.* Hoses employing natural fibers shall not be used in underground coal mines.

3-5.2.2* Couplings for fire hose used in underground coal mines shall have straight iron pipe threads (NPSH) or National Standard Thread (NH also known as NST and NS). Rocker lug couplings are preferred to pin-type couplings.

NOTE: Most mines use NPSH threads because the couplings will attach to male pipe threads of the same size.

3-5.2.2.1 When hose or hose connected equipment may be brought in from outside the mine, compatible adaptors shall be available.

3-5.2.3* Hose nozzles shall be capable of delivering a solid stream and a spray discharge.

3-5.2.4* Fire hose shall be stored in caches, and contain sufficient hose to reach all areas covered from hydrants which the cache will serve. Each cache shall contain at least one hose nozzle and one hose wrench.

3-5.2.5 Caches of fire hose shall be provided at strategic locations underground as follows:

(a) At intervals of 5,000 ft (1525 m) along the main haulageway or travelway.

(b) Near each intersection with an active sub-main.

(c) Near the mouth of each panel.

(d) Near and on the intake side of each conveyor belt drive.

(e) Near the entrance to each shop and storage area as defined in 2-4.5 and 2-6.

(f) In each operating area.

NOTE: A single hose cache may satisfy more than one of the required locations.

3-5.3 Maintenance.

3-5.3.1 Caches of fire hose shall be checked at least every six months to assure that the inventory of hose, nozzles, wrenches, and adaptors is complete and in good condition.

3-6 Portable Foam Generating Devices.

3-6.1 General Requirements.

3-6.1.1 Portable foam generating devices and associated equipment shall be approved for the purpose.

3-6.2 Selection and Application.

3-6.2.1 Portable foam generators, fire hose, foam concentrate, and stopping materials shall be accessible for immediate transport.

3-6.3 Maintenance.

3-6.3.1 At least annually, a thorough maintenance examination of the foam generating devices and associated equipment, including foam concentrate, shall be made by the mine operator. Operation of foam generating equipment during training sessions conducted at least annually shall satisfy the maintenance examination requirement.

3-7 Rock Dust.

3-7.1 At least 240 lb (109 kg) of bagged dry rock dust shall be stored upwind and kept available for fire fighting at or near the following areas:

(a) Maintenance and shop areas.

(b) Combustible liquid storage area.

(c) Working section.

(d) Belt drive area.

(e) Belt head loading area.

(f) Ventilation doors on trolley wire-supplied track haulways.

Exception: When it is impractical to store for fire extinguishment purposes, rock dust may be replaced with an additional portable extinguisher having a minimum nominal capacity of 10 lbs (4.6 kg) of multipurpose (ABC) dry chemical extinguishing agent.

3-8 Emergency Materials.

3-8.1 Emergency materials for fighting mine fires shall be readily available near the shaft bottom or other entrance to the mine. If the shaft bottom or other entrance to the mine is over two miles from a working section, additional materials shall be readily available at locations within two miles of the working section(s).

3-8.2 Emergency materials shall include fire hose, adaptors, wrenches and nozzles, brattice boards and cloth, wood posts, cap pieces, wood wedges, spad guns and spads, nails, bags of wood fibreplaster or cement, saws, hammers, axes, shovels, and picks.

3-8.3 Caches of emergency materials shall be checked at least every six months to assure that the inventory of materials is complete.

3-9* Training.

3-9.1 All operating employees shall be instructed annually in fire prevention and fire fighting techniques.

3-9.2 All employees shall be instructed on emergency evacuation procedures.

Chapter 4 Referenced Publications

4-1 The following documents or portions thereof are referenced within this document and shall be considered part of the requirements of this document. The edition indicated for each reference shall be the current edition as of the date of the NFPA issuance of this document. These references shall be listed separately to facilitate updating to the latest edition by the user.

4-1.1 NFPA Publications. National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

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

NFPA 13-1987, *Standard for the Installation of Sprinkler Systems*

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

NFPA 15-1985, *Standard for Water Spray Fixed Systems for Fire Protection*

NFPA 16-1986, *Standard on Deluge Foam-Water Sprinkler and Foam-Water Spray Systems*

NFPA 17-1985, *Standard for Dry Chemical Extinguishing Systems*

NFPA 22-1987, *Standard for Water Tanks for Private Fire Protection*

NFPA 321-1987, *Standard for Classification of Flammable and Combustible Liquids*

NFPA 1961-1987, *Standard for Fire Hose*

4-1.2 Other Publications. The following publications are available from the American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103.

ASTM D-5-83, *Test for Penetration for Bituminuous Materials*

ASTM D-56-82, *Test for Flash Point by the TAG Closed Tester*

ASTM-D-93-80, *Test for Flash Point by the Pensky Martens Closed Testor*

ASTM D-3278-82, *Tests for Flash Point of Liquids by Setaflash Closed Testor*

ASTM E-136-82, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.*

Appendix A

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

A-1-1.1 In the formulation of this document, the subcommittee examined data available in the "Annotated Bibliography of Coal Mine Fire Reports" prepared by the Allen Corp. of America under Bureau of Mines Contract Number J0275008, dated July, 1978. This bibliography covers the period from 1950 to mid-1977. Data since mid-1977 were taken from fire reports furnished by MSHA.

The record of fires together with the record of underground coal production and percentage of production by continuous miners is shown in Figures A-1-1.1 (a) and (b).

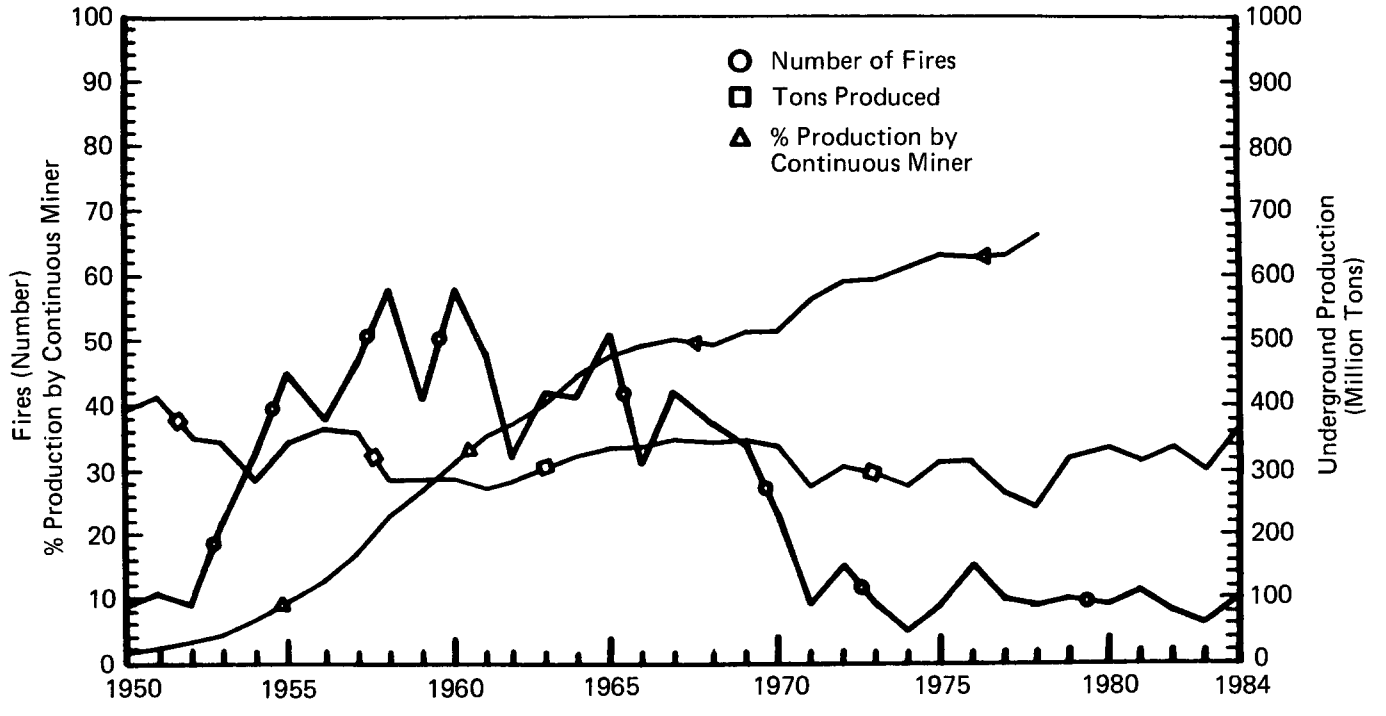
It is believed that this data provides logical reasons for the seemingly unaccountable increase of fire incidents that were at a low annual figure during the early 1950's, grew rapidly from 1952 to 1960, and then fell at a somewhat lesser rate back down to the original low incident rate of 1971.

A number of observers working in the industry throughout this period opine that the introduction of continuous miners in the late 1940's caused demands on

HALF-HOUR FIRES SINCE 1969

	YEAR															
DESCRIPTION	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	TOTAL
Electrical																
Mobile Equip.	3	1	2	0	0	0	1	1	1	1	1	3	0	0	2	16
Trailing Cable	6	2	0	2	0	1	2	0	1	0	1	0	1	0	0	16
Fixed Equipment	2	0	3	1	0	0	2	1	0	0	0	1	2	2	1	15
Trolley Wire	2	1	3	1	0	4	2	3	2	0	0	1	1	0	0	20
Friction																
Belt Drive Area	3	0	0	0	0	0	0	0	0	0	0	1	0	1	0	5
Belt Other Areas	1	1	0	1	1	0	1	2	0	0	2	1	1	1	1	13
Other Friction	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Flame Cutting & Welding	1	1	2	1	1	0	1	0	1	0	1	1	3	1	2	16
Spontaneous	0	2	5	1	2	1	3	0	3	5	3	2	0	1	1	29
Miscellaneous	2	1	0	1	1	2	3	1	1	1	1	1	0	0	0	15
Unknown	2	0	0	1	0	1	0	2	0	3	0	0	0	0	3	12
TOTAL	23	9	15	9	5	9	15	10	9	10	9	11	8	6	10	158

Figure A-1-1.1(a)



TIME TRENDS FOR UNDERGROUND FIRES

Figure A-1-1.1(b)

the existing underground direct current (DC) power systems, which they could not handle. Starting a DC powered continuous miner produced a current flow that approached that of a bolted fault. The power systems which were available for a DC powered continuous miner were unable to respond to an arcing fault. Fires were a result. The industry was just not accustomed to using and maintaining wiring and trailing cables carrying the required current capacity. Many fires originated from bad connections, bad cables, and bad splices. During this same period, there was a substantial growth in the number of belt conveyors used, and the incident of belt fires became serious.

After 1960, the incidence of fire fell back to the early 1950 experience. In addition to the fact that the industry was learning safer use of the new equipment, technical solutions were being developed and adopted. The most noteable contributor was the introduction of AC power for face equipment, first tested in the mid-1950's. By the early 1960's the change from DC to AC was underway and the incidence of belt fires decreased as the industry learned how to setup and maintain belt conveyors. The virtual elimination of timber for roof support in favor of roof bolts also helped reduce fires. So, while the changing technology of the 1950's caused the increased incidence of fires, technical solutions adopted during the 1960's have served to reduce the fire problem.

Please note that the subcommittee is aware that the data in the Allen Report and available from MSHA is based upon the legal requirement that only those fires which burned for thirty minutes or longer are required to be reported. However, the subcommittee believes that a similar reduction in unreported fires has occurred.

A-2-4.3.1 The greatest risk of fire involving substantial quantities of combustible liquids exists when rail supply cars are being moved, especially on a trolley wire-powered rail system. In contrast, cars parked where trolley and feed wire are absent or deenergized represent a distinctly lesser risk. Therefore, limiting the storage of lubricants in operating areas to a three-day rather than a one-day supply will reduce the frequency of need to transport and the overall risk of fire.

A-2-7.1 Belt fires originating away from the drive area have usually been caused by idlers with defective or stuck bearings. Tests have shown that such idlers can become moderately hot, in the order of 200°F (93°C) to 300°F (149°C). The Subcommittee has been unable to find reliable evidence that idlers can become hot enough to ignite fire retardant belting directly.

It appears that a warm or hot idler can cause fine coal dust accumulated around the idler to ignite. Then, when the belt has been stopped, coal burning beneath the belt will ignite the belting.

The key to avoiding this type of fire is to prevent the accumulation of fine coal around idlers. If a metal deck is not provided between the carrying strand and the return strand of the belt, there will not be accumulations of coal dust around the troughing idlers. When possible, return idlers should be supported at a good height above the bottom so that coal dust is not likely to build up around return idlers. With good clearance beneath these idlers, accumulations of coal dust can be cleaned up more easily.

Slat-type, self-cleaning tail pulleys are recommended. Coal dust discharged by such pulleys should be cleaned up frequently. Good maintenance and good fire prevention both require that noisy bearings, which may indicate probable failure, be changed promptly before they can become hot.

If a fire has been detected in a belt entry, it is recommended that the belt not be stopped, if it is not on fire, until an effective fire fighting operation is organized and underway.

Fires of conveyor belts have been caused by belts running off of proper alignment and the edge of the moving belt then contacting combustible material. Loss of alignment can result from a number of causes, including displacement of idlers or pulleys and movement of supporting structure, spillage of conveyed material, and failure of a bearing (typically on a pulley). When alignment is greatly affected, the edge of the belt may rub severely on the structure and objects near the edge of the belt. If the object on which the belt rubs is metal, the metal may be worn and heated. The edge of the belt may be damaged extensively, but it is believed that the belt will not ignite. This is because a point on the edge of the moving belt is in contact with the metal for only a very short period and will cool before it returns to the point of contact again. The metal can get quite warm; but, because it is a good conductor of heat, it will not get hot enough to ignite the belt if the belt stops. But, if the material contacted is wood or an other combustible, the combustible material may be heated by the friction of the edge of the moving belt until it ignites. Keeping combustible material away from the edge of the belt and use of alignment switches should prevent such fires.

A-3-2.2.4 Routing of water lines has caused a severe problem in fighting a few fires at certain large mines. These mines had multiple intake shafts spaced considerable distances apart. Such ventilation creates a neutral point between the shafts, and fresh air from each shaft will move toward this neutral point. During the development of the mine, the water source was established to provide for the first mining. Over the years, mining developed away from the first mine opening and, eventually, reached the second opening with the water line following the mining. But now, the air from the second opening moved in the mine entries toward the neutral point in a direction opposite to the water flow. Fires have occurred in the mine entries where these opposite flows of air and water existed. The fire had to be approached and fought from the new opening. When the water line broke, as it came through the fire area, fire fighting was no longer possible and sealing was necessary. One large coal mining company now provides a new water source at each new intake shaft.

The possibility of this problem appears to be increasing as more mines are ventilating belt entries with airflow moving outby. The water flow direction continues to be inby. In a number of cases, mine management has recognized the problem and has developed procedures to change ventilation direction, in the event of a fire, toward the face. Then, the fire can be approached and fought with air and water flow in the same direction.

Mines that obtain their water supply from an underground source may have this problem of ventilation air and water flow directions and can also be vulnerable to loss of power for water supply pumps. A fire can destroy the power cable feeding the pumps. If this cable is fed from the high-voltage cable that supplies the mine and the fire reached the high-voltage cable anywhere in the mine, it might trip the entire system and shut down the pumps. Coordination of electrical protective equipment, or even a separate power supply might be needed to assure that the pumps will continue to supply water for fire fighting.

A-3-4.6(a) Schedule 40 steel pipe with extra strength threaded fittings is recommended for sprinkler piping. Grooved fittings, which allow some motion of the pipe, are especially useful. Copper or aluminum pipe is acceptable if adequate for the pressure.

Two-inch pipe is believed to be adequate for even a large number of sprinklers located over a sizeable length of belt; however, if sprinkler piping may extend over several hundred feet and water supply pressure is marginal, hydraulic calculation may be needed. Full scale fire tests have demonstrated that only two sprinklers opened when standard, high temperature sprinklers at 10 ft (3.0 m) spacing were used at 10 psi (69 kPa) residual pressure. The conveyor belt structure did not have a deck between top and bottom strands and the structure was not inclined so steeply that the belt, after burning in two, could gravitate to the lower end.

A-3-5.1.1 The objective of the hydrant locations is to assure that fire hose can be laid quickly from hydrants, located on the water line in any of the allowed entries, through crosscuts to a fire located in parallel entries or crosscut rather than just being convenient for use in the entry where the water line is located.

A-3-5.1.2 Experience has shown that water lines can be damaged if they are in the entry where the fire occurs. If the water line is hung from the roof, caving of the roof in the fire area has often broken the water line. A water line laid on the bottom and close to the rib is less vulnerable to caving and heat; however, severe falls of rock can still damage water lines, especially if thin wall metal pipe or plastic pipe is used. Unfortunately, many mines find that water lines laid on the bottom are damaged by corrosion, machinery abuse, or heaving bottom.

A number of mines have prepared short lengths of pipe fitted with a number of hydrants and grooved for use with the groove-type couplings. The usual plan is to store this multiple hydrant with the emergency material covered in Section 3-8 of this standard. In the event of a fire, the water line is shut off and broken at a grooved coupling outby the fire and the multiple hydrant quickly connected. Then, with the water turned on, a number of hoses can be connected to the water line. Since most modern, large coal mines use 3-in. (76-mm), 4-in. (102-mm), or sometimes 6-in. (152-mm) water lines, a number of hoses can be supplied adquately. Multiple hoses cannot be supplied adequately if hydrants are 500 ft (152 m) [or even 300 ft (91 m)] apart.

The multiple hydrant can be very useful in a fire emergency, in addition to solving the problem of water line vulnerability.

A-3-5.2.1 Fire hose requires special consideration at coal mines. Cotton- or linen-jacketed hoses should not be used, as they are subject to mildew attack. Even mildew-treated hose does not endure. Rubber-lined and rubber-jacketed hose resists mildew attack; but this hose is heavy, stiff, and expensive. Probably the best hose for mine use is neoprene lined, polyester hose with rocker lug couplings. The pins of pin-type couplings are easily broken or knocked off and their use should be avoided.

In low coal and where the water supply can deliver about 50 gpm (3.2 L/sec) at good pressure, 1½ in. (38 mm) hose should be used. When the water supply is able to provide 100 to 120 gpm (6.3-7.6 L/sec) at good pressure, 2 in. (51 mm) hose is better. 2½ in. (64 mm) hose has no advantage over 2 in. (51 mm) hose and the extra weight and cost of 2½ in. (64 mm) hose is considerable.

Many mines have standardized on 1½ in. (38 mm) fire hose, even though their water lines can supply substantially more water than is required to get a good discharge from a 1½ in. (38 mm) hose nozzle. Some of these mines provide at least two valved connections (hydrants) in operating areas so that more than one 1½ in. (38 mm) hose line can be used if needed. In some cases, short lengths of pipe with two or more hydrants are available for use at other points along the water lines. These multiple hydrants can be put in the line at joints where the water line is joined with grooved couplings.

While the total water flow of two 1½ in. (38 mm) hose lines is about the same as one 2 in. (51 mm) hose line, in the opinion of many experienced mine fire fighters, two 1½ in. (38 mm) hose lines give greater flexibility during a fire fighting operation.

A-3-5.2.2 Threads of 1½ or 2 in. (38 or 51 mm) hose couplings should be straight iron pipe thread, now labeled NPSH. While it is always preferable to use fire hose adapters, NPSH couplings can be attached to standard male pipe threads. This is especially important with the large number of hydrants required on water lines.

Two additional points should be mentioned: (1) When the gasket of a fire hose coupling is good condition, the coupling should be tightened with bare hand pressure only. It usually will not leak. Hose wrenches are needed to uncouple hose only. (2) Tightening couplings with hose wrenches will harm the gaskets.

A-3-5.2.3 It should be noted that most mines are now shifting to 1½ in. (38 mm) plastic, adjustable nozzles, which are not available in 2 in. (51 mm) size.

A-3-5.2.4 In many fire situations, fire hose may have to be carried to the fire. If manual transport may be required, the hose should be coiled into "bundles" or "doughnuts" with the male coupling at the center. In this manner, the hose is in proper orientation for use, and the exposed threads of the male coupling are protected. Hose lengths should be limited to 150 ft (46 m) or less as greater lengths make the hose "bundle" too large and heavy.

A-3-9 While regulatory agencies have legal powers and responsibilities in a mine fire situation, the mine operator should have a preplanned organization capable of managing an effective fire fighting effort. This organization must be prepared, resolute, and capable. As part of periodic training, the organization should conduct its own fire drills that involve all levels of the mine management. The regulatory agencies should be invited to participate in fire drills also. Training will develop management capability and will promote cooperation between concerned agencies and mine management.

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SUBMITTING PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

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

INSTRUCTIONS

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

1. For each document on which you are proposing amendment indicate:
   (a) The number and title of the document
   (b) The specific section or paragraph.

2. Check the box indicating whether or not this proposal recommends new text, revised text, or to delete text.

3. In the space identified as "Proposal" include the wording you propose as new or revised text, or indicate if you wish to delete text.

4. In the space titled "Statement of Problem and Substantiation for Proposal" state the problem which will be resolved by your recommendation and give the specific reason for your proposal including copies of tests, research papers, fire experience, etc. If a statement is more than 200 words in length, the technical committee is authorized to abstract it for the Technical Committee Report.

5. Check the box indicating whether or not this proposal is original material, and if it is not, indicate source.

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

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

(a) identification of the submitter and his affiliation (Committee, organization, company) where appropriate, and

(b) identification of the document, paragraph of the document to which the proposal is directed, and

(c) a statement of the problem and substantiation for the proposal, and

(d) proposed text of proposal, including the wording to be added, revised (and how revised), or deleted.