State of West Virginia
Office of Miner's Health, Safety & Training

UNDERGROUND OUTBY MINE EXAMINER STUDY GUIDE

2024 Edition

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SOURCE MATERIAL

This publication was prepared utilizing material from the following sources:

1. West Virginia State Code Chapter 22A.

2. West Virginia Mine Safety Regulations.

3. *Dictionary of Mining Mineral and Related Terms*, U. S. Department of the Interior, Bureau of Mines

INTRODUCTION

Coal is a black or brownish black solid combustible substance formed by the partial decomposition of vegetable matter without free access of air and under the influence of moisture and often increased pressure and temperature. Each coal seam or bed represents a period of plant growth followed by a gradual sinking of the land. Where the land subsided below the water level, the plants decayed and formed peat. This step is believed to be the first in the process of converting plant materials to coal. The next step occurred many thousands of years later with the peat under layer of soil and thus under pressure, which led to the production of lignite and ultimately coal. Approximately 5 to 10 feet of plant matter was needed for each foot of coal. Thus a 7-foot seam of coal would have required a 35-to-70-foot layer of plant material. This process of coal formation of multiple coal seams separated by varying layers of dirt and rock. The uppermost layers can often be seen in cuts along highwalls and hilly regions.

Since the early 1800's coal has been mined in West Virginia. Coal mining and its related industries have continually had a major economic impact on the region. Historically, mining has always been a dangerous occupation. Proper supervision of working miners by trained supervisory personnel has proven to be a major step towards improving mine safety. The 1909 West Virginia Legislature passed an act establishing requirements for the certification of supervisory personnel in West Virginia mines. The first West Virginia Mine Foreman certifications were issued the following year. Since 1910 approximately 40,000 underground mine foreman certifications have been issued.

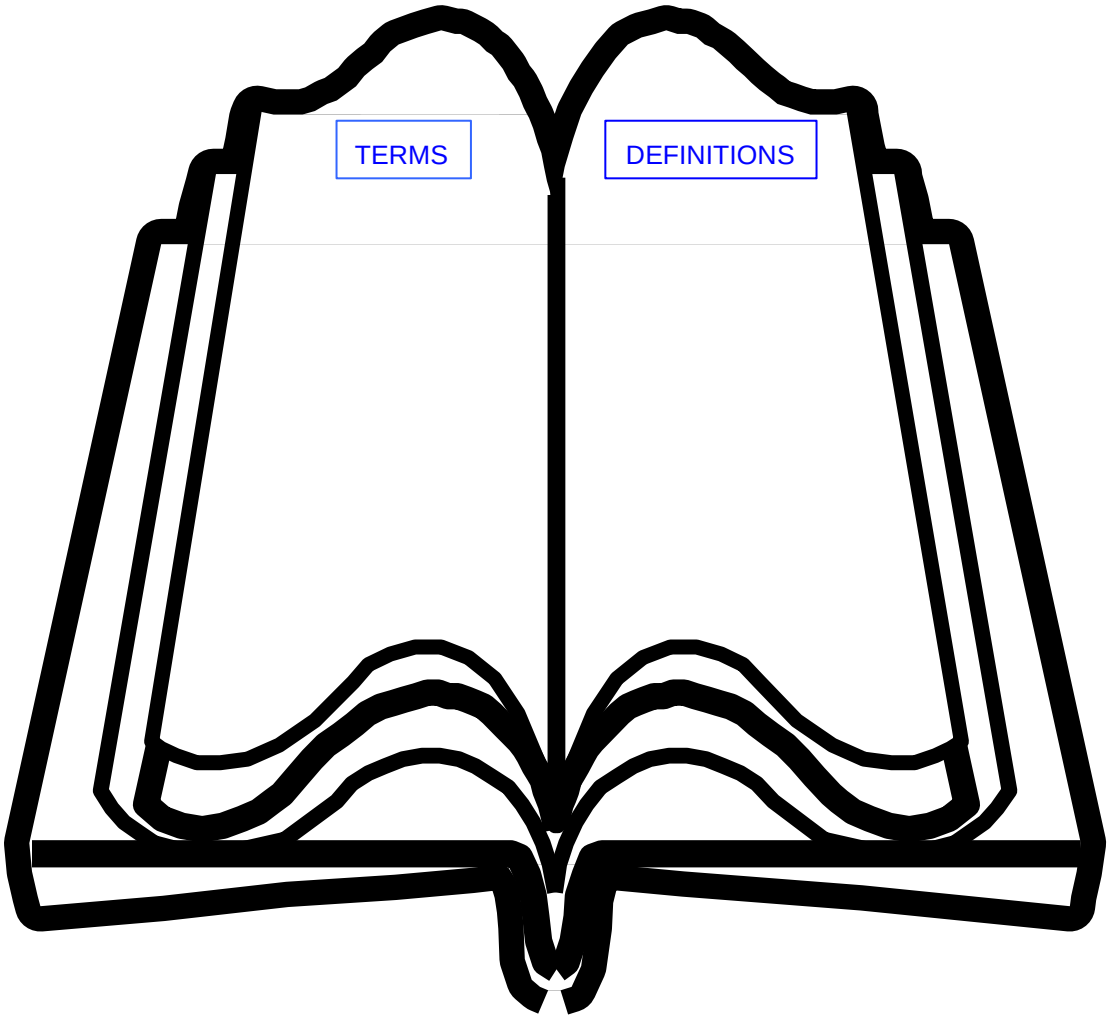
All applicants for **Underground Outby Mine Examiner** must meet the following requirements:

Be a resident or employed in a mine in this state and hold a valid West Virginia Miners' Certificate.

Have had a least two (2) years of experience in underground mining

This publication is intended as a guide for West Virginia underground outby mine examiner. The questions contained in this guide are based on current West Virginia mine safety laws and regulations. As the laws and regulations are changed, new editions of this guide will be issued

TERMS AND DEFINITIONS



TERMS and DEFINITIONS

Abandoned Workings: The term “Abandoned Workings” means excavation, either caved or sealed, that are deserted and in which further mining is not intended, or open workings which are ventilated and not inspected regularly.

AC: The term “AC” means alternating current.

Accident: The term “Accident” means:

(1) A death of an individual at a mine.

(2) An injury to an individual at a mine which has a Reasonable potential to cause death.

(3) An entrapment of an individual.

(4) An unplanned inundation of a mine by a liquid or gas.

(5) An unplanned ignition or explosion of gas or dust.

(6) An unplanned ignition or explosion of a blasting agent or an explosive.

(7) An unplanned fire in or about a mine not extinguished within five (5) minutes of ignition.

(8) An unplanned roof fall at or above the anchorage zone in active workings where roof bolts are in use; or an unplanned roof or rib fall in active workings that impairs ventilation or impedes passage.

(9) A coal or rock outburst that causes withdrawal of miners or which disrupts regular mining activity for more than one (1) hour.

(10) An unstable condition at an impoundment, refuse pile, or culm bank which requires emergency action in order to prevent failure, or which cause individuals to evacuate an area; or, failure of an impoundment, refuse pile, or culm bank.

(11) Damage to hoisting equipment in a shaft or slope which endangers an individual or which interferes with use of the equipment of more than (30) minutes.

(12) An event at a mine which causes death or bodily injury to an individual not at the mine at the time the event occurs.

Active Workings: The term “Active Workings” means all places in a mine that are ventilated and inspected regularly.

Afterdamp: The term “Afterdamp” means the mixture of gases which remain in a mine after a mine fire or an explosion which may contain irrespirable gases.

Agent: The term “Agent” means any person charged with the responsibility for the operations of all or a part of an underground mine, or the supervision of the miners in an underground mine.

ANSI: The term “ANSI” means American National Standards Institute.

Approved: The term “Approved” shall mean in strict compliance with mining law, or, in the absence of law, accepted by a recognized body or organization whose approval is generally recognized as authoritative on the subject.

Armored Cable: The term “Armored Cable” shall mean a cable provided with a wrapping of metal, usually steel wires, or tapes, primarily for the purpose of mechanical protection.

Assistant Mine Foreman: The term “Assistant Mine Foreman” shall mean the certified person designated to assist the mine foreman in the supervision of a portion or the whole of a mine, and/ or of the persons employed therein.

ATRS: The term “ATRS” means automated temporary roof support system.

Barricaded: The term “Barricaded” means to obstruct passage of person. vehicles, or flying materials.

Berm: The term “Berm” means a pile or mound of material or equivalent capable of restraining a vehicle.

Blackdamp: The term “Blackdamp” means a mine atmosphere deficient in oxygen incapable of supporting life. Blackdamp is heavier than air and lies along the floor.

Blasting Agent: The term “Blasting Agent” means any material consisting of a mixture of a fuel and oxidizer which:

(a) is used or intended for use in blasting.

(b) is not classified as an explosive by the Department of Transportation.

(c) passes all United States DOT tests defining blasting agent, including insensitivity to a No. 8 blasting cap in accordance with CFR49,173.114a.

Blasting Area: The term “Blasting Area” shall mean the area near blasting operations in which concussion or flying material can reasonably be expected to cause injury.

Board of Appeals: The term “Board of Appeals” shall mean as provided for in Chapter 22A, Article 5, Section 1 of the West Virginia Code.

Brake Systems: The term “Brake System” means:

(A) Service brake system - the primary brake system used for stopping a vehicle.

(B) Emergency stopping system - the system used for stopping a vehicle in the event of any single failure in the service brake system.

(C) Parking system - a system to hold a stopped vehicle in a stationary position.

Branch Circuit: The term “Branch Circuit” shall mean any circuit, alternating current or direct current, connected to, and leading from the main power lines.

Bump: The term “Bump” means the bursting of coal by excessive pressure on the mine roof and ribs.

Cast Primer or Booster: The term “Cast Primer or Booster” shall mean a case or pressed block of solid high explosives (i.e., not nitroglycerin sensitized) which is normally used to detonate insensitive or non- cap-sensitive explosives.

Cable: The term “Cable” shall mean a standard conductor (single conductor cable), or a combination of conductors insulated from one another (multiple conductor cable).

Certified Electrician: The term “Certified Electrician” shall mean any person who is qualified as a mine electrician and who has passed an examination given by the Office of Miners’ Health, Safety and Training, or has at least three (3) years of experience in performing electrical work underground in a coal mine, in the surface work area of an underground coal mine, in a surface coal mine, in a non-coal mine, in the mine equipment manufacturing industry, or in any other industry using or manufacturing similar equipment, and has satisfactorily completed a coal mine electrical training program approved by the Office of Miners’ Health, Safety and Training.

Certified Engineer: The term “Certified Engineer” means a person qualified under provisions of law to perform the planning and projections of a coal mine.

Certified Person: The term “Certified Person” when used to designate the kind of person to whom the performance of a duty in connection with the operation of a mine shall be assigned, shall mean a person who is qualified under the provisions of the law to perform such duty.

Check-in Check-out System: The term “Check-in Check-out System” means a system to provide positive identification of persons underground at any one time.

Circuit Breaker: The term “Circuit Breaker” shall mean a device for interrupting a circuit between separable contacts under normal or abnormal conditions.

Comprehensive Mine Safety Program: The term “Comprehensive Mine Safety Program” means a mine specific set of rules and regulations to govern the health and safety of all employees of the mine.

Conspicuous: The term “Conspicuous” means easy to notice; obvious.

Construction Work: The term “Construction Work” means the building, rebuilding, alteration, or demolition of any facility or addition to existing facility at a surface mine or surface area of an underground mine, including painting, decoration, or restoration associated with such work, and the excavation of land connected therewith, but excluding shaft and slope sinking and work performed on the surface incidental to shaft or slope sinking.

Creep: The term “Creep” means the action of an excessive weight upon a weak floor or roof causing the floor to hoove or the roof to sag.

Danger Board: The term “Danger Board” means a conspicuous sign or physical barrier at the entrance to dangerous areas.

DC: The term “DC” means direct current.

Deep-cut: The term “Deep-cut” means any mining machine cut extended beyond the normal depth of generally 20 feet.

Defect: The term “Defect” means any characteristic or condition which tends to weaken or reduce the strength of a tool, object, or structure of which it is a part.

Delta Connected: The term “Delta Connected” shall mean a power system in which the windings or transformers or S. C. generators are connected to form a triangular phase relationship, and with phase conductors connected to each point of the triangle.

Department: The term “Department” shall mean the state Office of Miners’ Health, Safety and Training provided for in Chapter 22A, Article 1, Section 1 of the West Virginia Code.

Detonator: The term “Detonator” means electric blasting cap.

Detonating Cord: The term “Detonating Cord” shall mean a flexible cord containing a center core of high explosives to detonate other explosives with which it comes in contact.

Detonating Cord Millisecond Delay Connectors: The term “Detonating Cord Millisecond Delay Connectors” shall mean nonelectric shot interval (millisecond) delay devices for use in delaying blasts which are surface initiated by detonating cord.

Director of the Office of Miners’ Health, Safety and Training: The term “Director of the Office of Miners’ Health, Safety and Training” shall mean the Director of the Office of Miners’ Health, Safety and Training provided for in Chapter 22A, Article 1, Section 3 of the West Virginia Code.

Drift: The term “Drift” means a horizontal or approximately horizontal opening through the strata or in a coal seam and used for the purpose of ventilation, drainage, and transportation of men and material, in connection with the mining of coal.

Effectively Grounded: The term “Effectively Grounded” is an expression which means grounded through grounding connection of sufficiently low impedance (inherent or intentionally added or both) so that fault grounds which may occur cannot build up voltages in excess of limits established for apparatus, circuits, or systems so grounded.

Electric Blasting Caps: The term “Electric Blasting Caps” shall mean instantaneous electric blasting caps and all types of delay electric blasting caps.

Electrical Work: The term “Electrical Work” shall mean work consisting primarily of electrical construction, installation, testing, inspection, maintenance and repair tasks on electrical coal mining equipment, apparatus, circuits, and/or distribution circuits used in or around a coal mine.

Emergency Stop Switch: The term “Emergency Stop Switch” means a device to quickly de-energize the equipment in the event of an emergency.

Emergency Vehicle: The term “Emergency Vehicle” means a form of transportation provided on the section to quickly remove an injured person.

Explosives: The term “Explosives” shall mean any or all of the following, but is not limited to water gel slurries, dynamites, permissible, pellet powder, blasting caps, electric blasting caps, non-electrical delay blasting caps, cast primers and boosters, detonating cord, and detonating cord delay connections.

Face Equipment: The term “Face Equipment” means all mobile mining machinery traveling into or inby the last open crosscut of the working section.

Firedamp: The term “Firedamp” means a combustible gas, chiefly methane, occurring naturally in coal mines and forming explosive mixtures with air.

Flame Path: The term “Flame Path” means two or more adjoining, or adjacent surfaces between which escape of flame is prevented.

Flame-Resistant Cable, Portable: The term “Flame-Resistant Cable, Portable” shall mean a portable flame-resistant cable that has passed the flame test of the USBM / MSHA.

Ground Or Grounding Conductor (Mining): The term “Ground or Grounding Conductor (Mining)”, also referred to as a safety ground conductor, safety ground, and frame ground, shall mean a metallic conductor used to connect the metal frame or enclosure of any equipment, device, or wiring system with a mine track or other effective grounding medium.

Grounded (earthed): The term “Grounded (earthed)” shall mean that the system, circuit, or apparatus referred to is provided with a ground.

Hazardous Substance: The term “Hazardous Substance” means a substance which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, or otherwise harmful, is likely to cause death or injury.

High Voltage Powerline: The term “High Voltage Powerline” means any uninsulated suspended power conductor carrying high voltage.

High Voltage: The term “High Voltage” shall mean voltages of more than one thousand (1,000) volts.

Imminent Danger: The term “Imminent Danger” means the existence of any condition or practice in a mine which could be expected to cause death or serious physical harm before such condition or practice can be abated.

Inactive workings: The term “Inactive Workings” includes all portions of a mine in which operations have been suspended for an indefinite period but have not been abandoned.

Independent Contractor: The term “Independent Contractor” shall mean any firm, corporation, partnership, or individual that contracts to perform services or construction at a coal mine, excluding mine vendors, office equipment supplier, services, or delivery personnel.

Inspector: The term “Inspector” shall mean an underground mine inspector employed by the Office of Miners’ Health, Safety and Training.

Intake Air: The term “Intake Air” means a ventilating air current used to ventilate a working section.

Interested Persons: The term “Interested Persons” shall include the operator, members of any mine safety committee at the mine affected and other duly authorized representatives of the mine workers, and the Office of Miners’ Health, Safety and Training.

Lanyard: The term “Lanyard” means a rope, suitable for supporting one person. One end is fastened to a safety belt or harness and the other end is secured to a substantial object or a safety line.

Lifeline: The term “Lifeline” means a rope, suitable for supporting one person, to which a lanyard or safety belt (or harness) is attached.

Lightning Arrestor: The term “Lightning Arrestor” shall mean a protective device for limiting surge voltage on equipment by discharging or bypassing surge current; it prevents continued flow or follow current to ground and is capable of repeating these functions as specified.

Longwall Mining: The term “Longwall Mining” means the extraction of coal from its natural deposit along a continuous face generally (1,000) feet in length.

Low Voltage: The term “Low Voltage” shall mean up to and including six hundred sixty (660) volts.

Main Entry: The term “Main Entry” means the principal entry or set of entries driven through the coalbed from which cross entries, room entries, or rooms are turned.

Mechanical Working Section: The term “Mechanical Working Section” means an area of a mine, (A) in which coal is loaded mechanically, (B) which is comprised of a number of working places that are generally contiguous, and (C) which is of such size to permit necessary supervision during shift operation, including pre-shift and on-shift examinations and tests required by law.

Medium Voltage: The term “Medium Voltage” shall mean voltages from six hundred sixty-one (661) to one thousand (1,000) volts.

MHST: The term “MHST” means West Virginia Office of Miners’ Health, Safety and Training.

Mine Foreman: The term “Mine Foreman” shall mean the certified person whom the operator or superintendent shall place in charge of the workings of the underground mine and of the persons employed therein.

Mine Power Center or Distribution Center: The term “Mine Power Center or Distribution Center” shall mean a combined transformer or distribution unit, complete within a metal enclosure from which one (1) or more low-voltage power circuits are taken.

Miner: The term “Miner” shall mean any individual working in an underground mine who is certified by the Office of Miners’ Health, Safety and Training.

MSHA: The term “MSHA” means Federal Mine Safety and Health Administration.

Neutral (derived): The term “Neutral (derived)” shall mean a neutral point or connection established by the addition of a “zigzag” or grounding transformer to a normally underground power system.

Neutral Point: The term “Neutral Point” shall mean the connection point of transformer or generator winding from which the voltage to ground is nominally zero (0), and is the point generally used for system groundings in wye-connected a.c. power systems.

Nonelectric Delay Blasting Caps: The term “Nonelectric Delay Blasting Caps” shall mean a blasting cap with an integral delay element in conjunction with and capable of being detonated by a detonation impulse or signal from a miniaturized detonating cord.

Notice of Assessment: The term “Notice of Assessment” shall mean a notice issued for the assessment of a civil penalty pursuant to the provisions of Chapter 22A, Article 1, Section 21 of the Code.

Notice of Violation: The term “Notice of Violation” shall mean a notice issued pursuant to the provisions of Chapter 22A, Article 1, Section 15 of the code.

Occupational Injury: The term “Occupational Injury” means any injury to a miner which occurs at a mine for which medical treatment is administered, or which results in death or loss of consciousness, inability to perform all duties on any day after an injury, temporary assignment to other duties, or transfer to another job.

On-shift Examination: The term “On-shift Examination” means an examination performed every two (2) hours by the section foreman during his production shift.

Operator: The term “Operator” shall mean any firm, corporation, partnership, or individual operation at any coal mine or part thereof or engaged in the construction of any facility associated with a coal mine and shall include any independent contractor at a coal mine.

Outburst: The term “Outburst” means the sudden explosion of coal from one or more coal pillars or faces accompanied by a violent release of energy.

Outcrop: The term “Outcrop” means a coal seam which appears at or near the surface.

Panel: The term “Panel” means workings that are or have been developed off of sub-main entries which do not exceed three thousand feet in length.

Permanent Underground Battery Charging Station: The term “Permanent Underground Battery Charging Station” means a battery charging station that has been located in a specific location for a period of time exceeding one (1) year.

Permissible: The term “Permissible” means any equipment, device or explosive that has been approved as permissible by MSHA/USBM.

Person: The term “Person” shall mean any individual, partnership, association, corporation, firm, subsidiary of a corporation, or other organization.

Portable (Trailing) Cable: The term “Portable (Trailing) Cable” shall mean a flexible cable or cord used for connecting mobile, portable, or stationary equipment in mines to a trolley system or other external source of electric energy where permanent mine wiring is prohibited or is impracticable.

Pre-shift Examination: The term “Pre-shift Examination” means an examination conducted by a certified foreman within three (3) hours prior to the beginning of each shift and before any miner enters the mine.

Primary Escapeway: The term “Primary Escapeway” means the main, direct escape route from the working section to the surface, located in intake air.

Primer: The term “Primer” shall mean a cartridge or container of explosives into which a detonator or detonating cord is inserted or attached, and whose purpose is to initiate the main explosive charge.

Probe: The term “Probe” means equipment used to make an examination for methane in unsupported roof.

Production Operator: The term “Production Operator” shall mean any owner, lessee, or other person who operates, controls, or supervises a coal mine.

Qualified Person: The term “Qualified Person” shall mean a person who has completed an examination and is considered qualified on record by the Office of Miners’ Health, Safety and Training.

Regulator: The term “Regulator” means a variable, partial opening in a stopping built to regulate air flow.

Representative of Miners: The term “Representative of Miners” shall mean a person or organization designated by a group of miners to act as their representative before the Office of Miners’ Health, Safety and Training.

Return Air: The term “Return Air” means a ventilating air current that has been used to ventilate a working section.

Roof Control Plan: The term “Roof Control Plan” means a mine specific set of rules and regulations used to govern the support procedures of the mine roof.

Safety Belt: The term “Safety Belt” means a device, usually worn around the waist, which, by reason of its attachment to a lanyard and lifeline to a structure, will prevent a worker from falling.

Safety Fuse: The term “Safety Fuse” shall mean a flexible cord containing an internal burning medium by which fire or flame is conveyed at a continuous and uniform rate from the point of ignition to the point of use, usually a blasting cap.

Seal: The term “Seal” means a stopping built of greater thickness and more substantial construction used to isolate abandoned areas of a mine from the active workings.

Secondary Escapeway: The term “Secondary Escapeway” means a designated alternate escape route, to be used when other routes of escape cannot be used.

Serious Personal Injury: The term “Serious Personal Injury” means an event at a mine which causes bodily injury to an individual which requires such individual to be admitted to a medical facility overnight for reasons other than strains, sprains or observation as determined by a physician**.**

Shaft: The term “Shaft” means a vertical opening through the strata that is or may be used for the purpose of ventilation, drainage, and the hoisting and transportation of men and material, in connection with the mining of coal.

Shall: The term “Shall” means mandatory.

Shelter Hole: The term “Shelter Hole” means an area along haulageways to provide safety from moving trips.

Should: The term “Should” means recommended.

Shot Firer: The term “Shot Firer” means any person having had at least two (2) years of practical experience in coal mines, who has a knowledge of ventilation, mine roof and timbering, and who has demonstrated his knowledge of mine gases, and the use of a multi-gas detector or other approved devices by examination and certification given him by the West Virginia Office of Miners’ Health, Safety and Training.

Slope: The term “Slope” means a plane or incline roadway, usually driven to a coal seam from the surface and used for the purpose of ventilation, drainage, and the hoisting and transportation of men and material, in connection with the mining of coal.

Squeeze: The term “Squeeze” means the action of excessive weight upon coal pillars not strong enough to support that weight.

Stoppings: The term “Stoppings” means a partition across openings erected to direct the ventilation current and to form escapeways.

Suitable: The term “Suitable” means that which fits and has the qualities or qualifications to meet a given purpose, occasion, condition, function, or circumstances.

Superintendent: The term “Superintendent” shall mean the person who shall have, on behalf of the operator, immediate supervision of one (1) or more mines.

Supervisor: The term “Supervisor” shall mean a superintendent, mine foreman, assistant mine foreman, or any person specifically designated by the superintendent or mine foreman to supervise work of employees and who is acting pursuant to such specific designation and instructions**.**

Surface Construction Project: The term “Surface Construction Project” shall mean any construction work being performed on the surface of any underground coal mine or surface coal mine by an employer but shall not include any work performed on the surface incidental to shaft or slope sinking.

Surface Construction Worker: The term “Surface Construction Worker” means a person employed at a surface construction project.

Surface Mine: The term “surface mine” shall mean all areas surface mined or being surfaced mined as well as adjacent areas as ancillary to the operations, together with preparation and processing plants, storage areas and haulageways, roads, shops, and trails, which are covered by the provisions of Chapter 20, Article 6 of the Code, and coal prospecting subject to Section 8, Article 6, Chapter 20 of the Code.

Transformer: The term “Transformer” means a device used to step up or step-down AC voltages.

Underground Mine: The term “Underground Mine” means an open excavation in the earth for the purpose of extracting coal.

USBM: The term “USBM” means United States Bureau of Mines.

Whitedamp: The term “Whitedamp” means an atmosphere containing carbon monoxide which is extremely toxic even in low concentration.

Work of Preparing the Coal: The term “Work of Preparing the Coal” shall mean the breaking, crushing, sizing, cleaning, washing, drying, mixing, storing, loading, and removing of over-burden from the top of the coal for the purpose of extracting coal.

Working Face: The term “Working Face” means any place in a coal mine in which work of extracting coal from its natural deposit in the earth is performed during the mining cycle.

Working Place: The term “Working Place” means the area of a coal mine inby the last open crosscut.

Working Section: The term “Working Section” means all areas of the coal mine from the loading point of the section to and including the working faces.

Working Unit: The term “Working Unit” means an area of a mine in which coal is mined with a set of production equipment; a conventional mining unit by a single loading machine; a continuous mining unit by a single continuous mining machine, which is comprised of a number of working places.

Wye-Connected: The term “Wye-Connected” shall mean a power system connection in which one (1) end of each phase winding or transformers or a.c. generators are connected together to form a neutral point, and a neutral conductor may or may not be connected to the neutral point, and the neutral point may or may not be grounded.

Zig-zag Transformer (Grounding Transformer): The term “Zigzag Transformer (Grounding Transformer)” shall mean a transformer intended primarily to provide a neutral point for grounding purposes.

COAL and COAL DUST

COAL & COAL DUST

1. Q. What are the general ingredients of coal?

   A. Moisture, fixed carbon, volatile matter, and ash.

2. Q. What is the principal heat producing ingredients of coal?

   A. Fixed carbon and volatile matter.

3. Q. What is volatile matter in coal?

   A. Substances which are readily gasified by increased temperatures.

4. Q. What is ash?

   A. Inorganic residue remaining after ignition of the combustible substances in coal.

5. Q. What undesirable elements exist in coal in varying small quantities?

   A. Sulphur and phosphorus

6. Q. What is Sulphur?

   A. An element found in coal seams which produces harmful effects in both mining and utilization.

7. Q. Why is Sulphur undesirable in coal?

   A. It corrodes metal when burned, and affect the quality of iron, when coke containing Sulphur is used.

8. Q. What is the general specific gravity of West Virginia coals?

   A. About 1.30.

9. Q. What is the average weight of solid coal per cubic foot?

   A. About eighty (80) pounds

10. Q. How many net tons (2,000 lbs.) are generally considered to be in a foot acre of coal?

A. Approximately one thousand eight hundred (1,800) tons.

11. Q. How is the heating value of coal usually expressed?

A. By the number of B.T.U. per pound of coal.

12. Q. What is a B.T.U.?

A. British Thermal Unit---the quantity of heat required to raise the temperature of one (1) pound of water one degree Fahrenheit (1°) at sixty-two degrees (62°) Fahrenheit.

13. Q. What is the average weight of loose coal per cubic foot?

A. About 65 pounds.

14. Q. What is the principal gas contained in coal?

A. Methane (CH4).

15. Q. What causes the propagation of explosions throughout large areas of mines?

A. Coal dust.

16. Q. How does coal dust contribute to the severity of an explosion?

A. By being raised in clouds and ignited, the explosion is propagated through the mine.

17. Q. When is it possible to have an explosion in a coal mine with no methane present?

A. When quantities of coal dust are raised in a sufficiently dense cloud in the presence of a source of ignition.

18. Q. Under what circumstances does coal dust explode?

A. When the particles are suspended as a cloud in the presence of a flame or spark.

19. Q. What are the main causes of coal dust explosions?

A. Explosions of methane, electric arcs, and explosives.

20. Q. How much dust is sufficient to propagate a coal dust explosion?

A. About eight hundredths (.08) or one twelfth (1/12) of an ounce per cubic foot of air

21. Q. What are the largest size particles of coal dust which will start an explosion?

A. Any particle of coal dust which will pass through a twenty (20) mesh screen.

22. Q. What effect does fineness of coal dust have upon its explosibility?

A. Fineness will increase the explosibility.

23. Q. Will damp coal dust explode?

A. Yes, dampness causes the dust particles to cohere, and greater force is required to separate them and bring them into suspension. Once in suspension, if ignited, they will explode.

24. Q. How can the explosibility of coal dust be reduced?

A. By the addition of incombustible material.

25. Q. What is the maximum amount of moisture that coal dust will retain?

A. About twenty percent (20%).

26. Q. What shall be done with accumulations of fine, dry coal dust in a mine?

A. Fine, dry coal dust shall be removed from the mine.

27. Q. How should dry and dusty operating sections be treated?

A. They should be thoroughly rock dusted.

28. Q. What benefit is derived from rock dusting?

A. The explosibility of coal dust and the danger of an explosion being propagated is reduced.

29. Q. What kind of rock dust should be used?

A. Dusts with a low free silica content.

30. Q. What is the maximum allowable percentage of silica in rock dust?

A. A maximum of five percent (5%).

31. Q. What is the required size of rock dust?

A. All will pass through a twenty (20) mesh screen and not less than seventy percent (70%) will pass through a two hundred (200) mesh screen.

32. Q. How close to working faces must rock dust be applied?

A. In and beyond the last open crosscut to within forty (40) feet of the face.

33. Q. What entries shall be rock dusted?

A. All intake airways, trackways, beltlines and return airways.

34. Q. What shall be the minimum percentage of incombustible material after rock dust has been applied (other than return entries)?

A. Eighty percent (80%).

35. Q. What shall be the minimum percentage of incombustible material after rock dust has been applied to return entries?

A. Eighty percent (80%).

36. Q. What should be done before fine coal dust is loaded from haulageways?

A. Water, calcium chloride or other dust allaying materials should be applied.

37. Q. How shall unusual quantities of coal dust be kept out of suspension?

A. By sprinkling or other dust allaying devices.

38. Q. Who shall approve methods of allaying dust in mines?

A. The Director of MHST.

39. Q. Who shall be required to wear respirators?

A. Miners exposed for short periods to gas, dust, fumes, and mist

40. Q. After applications of rock dust are made in a coal mine, how may the incombustible content of the mine be determined?

A. After collection samples of dust from the sides, roof and floor and analyzing them for total incombustibility with a device known as a “volumeter”, or by proximate analysis.

41. Q. What effect does the presence of small amounts of methane have upon the explosibility of coal dust?

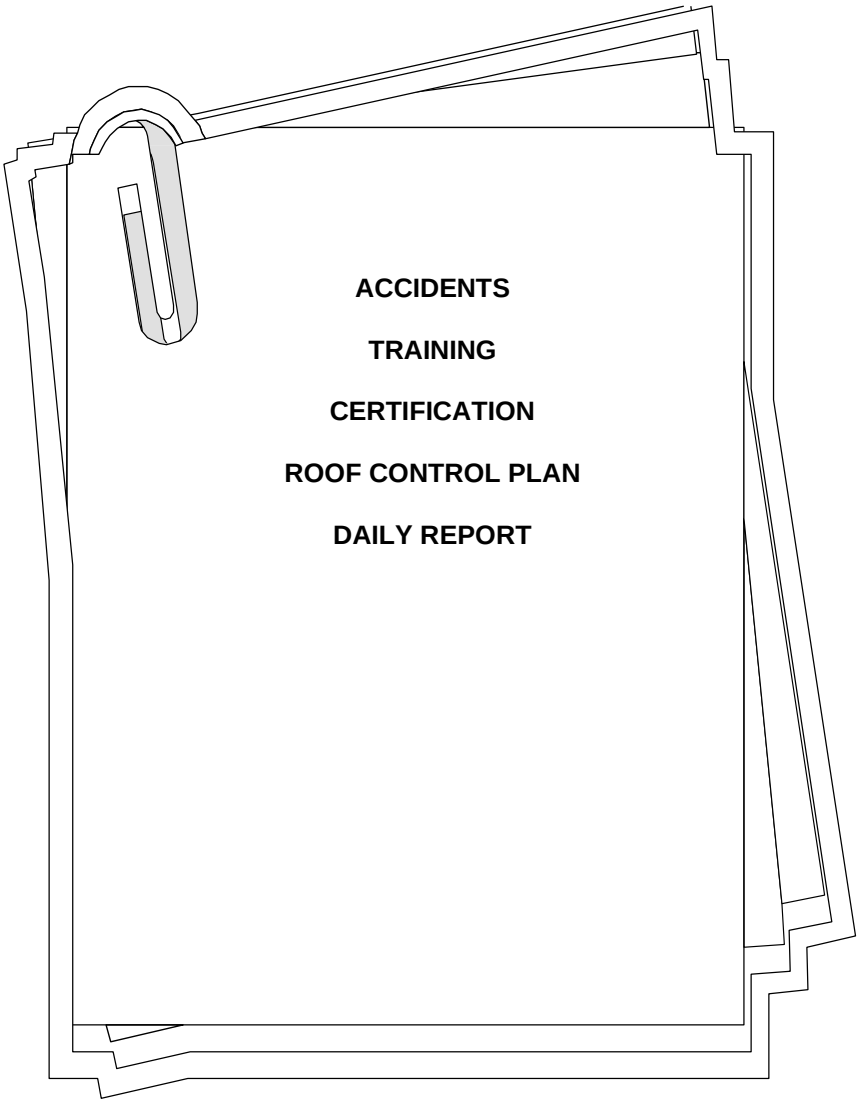
A. It increases the explosibility.

42. Q. What effect does the volatile matter in coal have upon its explosibility?

A. Increase in volatile matter tends to increase the explosibility.

Notes:

RECORDS and NOTIFICATIONS



RECORDS AND NOTIFICATIONS

1. Q. In the event of an explosion, death, or serious personal injury, who must be notified?

   A. Within 15 minutes of the incident the Mine and Industrial Accident Rapid Response System must be notified. (**Mine Emergency Notification Phone Number: 1-866-987-2338)** The Director of MHST and the district mine inspector should also be notified.

2. Q. When must the Director of MHST and the district mine inspector be notified of an explosion, death, or serious personal injury?

   A. Immediately.

3. Q. When an accident in or about any coal mine results in injury or death who shall be notified?

   A. The Director of MHST and district mine inspector.

4. Q. How soon must a written report be furnished to MHST in case of death in or about any coal mine?

   A. Within twenty-four (24) hours.

5. Q. Who must be notified in the event of a fire in or about any mine?

   A. The Director of MHST and the district mine inspector.

6. Q. How soon must MHST be notified in case of a mine fire?

   A. Immediately.

7. Q. Who must be notified before coal is removed within five hundred (500) feet of an oil or gas well?

   A. MHST and the well operator.

8. Q. What record of ventilation should be kept?

   A. A weekly record of the air measurements taken at the inlet and outlet near the faces of advanced headings.

9. Q. How must the record of air measurements be kept?

   A. In a book prescribed by the Director of MHST.

10. Q. What daily report must the mine foreman or his assistant keep?

    A. A record of any dangerous conditions or practices found at each working place in the mine.

11. Q. What record of examination of air courses, roads and openings that give access to old workings or falls must the outby mine examiner keep?

A. A weekly record of the condition of all places.

12. Q. How shall records of all dangerous conditions be kept?

A. Recorded in ink or indelible pencil in a book provided for this purpose.

13. Q. What daily report shall be kept by the fire boss?

A. A written record of his examination, in a book prescribed by the Director of MHST.

14. Q. What is the duty of the outby mine examiner relative to the daily report of the fire boss?

A. He shall carefully read and countersign the daily report of the fire boss each day.

15. Q. Who is permitted to inspect the daily reports of outby mine examiner and fire bosses?

A. All interested persons.

16. Q. What should be repeated on the daily report?

A. Unsatisfactory conditions and practices previously reported but not corrected.

17. Q. What record of man-hoists should be kept?

A. A daily record of inspection.

18. Q. What record relative to fans must be kept?

A. A daily record of the inspection of the main fan or by adequate facilities provided to permanently record the performance of the fan and to give warning of an interruption.

19. Q. Where must the certificate of the inspection of a mine be posted?

A. On the mine bulletin board.

20. Q. How long should the certificate of inspection remain posted?

A. Until replaced by a subsequent certificate.

21. Q. What certificate is required of all underground employees before they are certified as a miner?

A. A miner’s certificate.

22. Q. Where should the record of the outby mine examiner's certificates be kept?

A. At the mine.

23. Q. Who shall maintain a copy of the record of the examination of persons for competency in the use of multi-gas detectors or other approved devices?

A. MHST and the operator.

24. Q. How often shall persons required to use multi-gas detectors or other approved devices be examined to check competency by MHST?

A. Annually.

25. Q. What type of report shall the operator of every coal mine submit at the end of each quarter with the Director of MHST covering the preceding quarter on forms furnished by MHST or online using the MHST portal. Such report shall state the number of accidents which have occurred, the number of persons employed, the days worked, and actual tonnage of coal mined.

A. Quarterly report.

26. Q. Who shall be notified before sealed areas, temporary or permanent, are reopened?

A. The Director of MHST.

27. Q. Who shall an outby mine examiner notify, in writing, of his inability to comply with any of the requirements of the mining laws?

A. Operator or superintendent and the Director of MHST.

28. Q. What records of electrical equipment examinations are required to be kept?

A. A record of weekly examinations and monthly tests shall be kept and made available to representatives of MHST and to the miners at such mine.

29. Q. What records shall be made available by the operator within (5) days of request by the Director of MHST?

A. State certifications containing name and social security numbers of all current employees.

Use Indelible Pencil or Ink

PRESHIFT-MINE EXAMINER'S REPORT

Report shall be signed when made

Date of Examination APRIL 15 20 19 Section or Area Examined 002 SECTION

Time of Examination: from 5:00 (a.m.) or p.m. to 7:30 (a.m.) or p.m.

Was this report phoned to outside: Yes ✓ no

By whom JOHN DOE Time 7:45 (A.M.) P.M.

Report received by James Smith (Signed)

Violations and other Hazardous Conditions Observed and Reported

	Location	Violation or Hazardous Condition	Action Taken
1.	NO. 1 ENTRY	LOOSE BROKEN ROOF 50 FT	DANGERED OFF
2.		OUTBY THE FACE	
3.	NO. 2 ENTRY	SPILLAGE FROM TAILPIECE	REPORTED
4.		INBY FOR 20FT	
5.	NO. 3 ENTRY	CH_4 ACCUM. 2.5% AT FACE	DANGERED OFF REPAIRED
6.			CURTAIN NEW READING 0.5%
7.	NO. 4 ENTRY	2,250 CFM AT FACE	REPAIRED LINE CURTAIN
8.			NEW READING 3,200 CFM
9.	NO. 5 ENTRY	ROCKDUST 50FT FROM FACE	REPORTED
10.			

Air Measurements

Location	CFM	Location	CFM
NO. 1 RETURN	19,480	NO. 3 INTAKE	38,760
NO. 5 RETURN	18,920		

Remarks:

This is to certify that: (a) This section of the mine was properly examined by me, (b) all violations of the W. Va. Mining Laws and the Federal Coal Mine Health and Safety Act of 1969 and other unsatisfactory conditions and practices observed by me are listed in this report.

Signed By	John Doe (Preshift-Mine Examiner)	35277-85 (Certificate No.)		(Certificate No.)
Countersigned	James Smith (Mine Manager / Mine Foreman)	27631-74	(Assistant Foreman)	
	Joe White (Assistant Foreman)	30659-79		
			Jake Adams (Superintendent or Assistant)	

Use Indelible Pencil or Ink

DAILY AND ONSHIFT REPORT
MINE FOREMAN OR ASSISTANT

Report shall be signed when made

Date 4-15-2019 Shift 1ST DAY Area or Section 002 SECTION

Violations and other Hazardous Conditions Observed and Reported

	Location	Violation or Hazardous Condition	Action Taken
1.	NO.1 ENTRY	LOOSE BROKEN ROOF 50 FT	SCALED INSTALLED
2.		OUTBY THE FACE	METAL STRAPS
3.	NO. 2 ENTRY	SPILLAGE FROM DRILPIETE	CLEANED AND ROCK
4.		INBY FOR 20 FT.	DUSTED.
5.	NO. 3 ENTRY	NONE OBSERVED	NONE
6.	NO. 4 ENTRY	NONE OBSERVED	NONE
7.	NO. 5 ENTRY	ROCKDUST 50FT FROM FACE	ROCKDUSTED
8.			
9.			
10.			

Examinations for Methane in Working Places

	Location	Time	Methane Content		Location	Time	Methane Content
1.	NO.1 ENTRY	8:25AM	0.0 %	11.	NO.1 ENTRY	12:25PM	0.1 %
2.	NO.2 ENTRY	8:30AM	0.1 %	12.	NO.2 ENTRY	12:30PM	0.0 %
3.	NO.3 ENTRY	8:35AM	0.5 %	13.	NO.3 ENTRY	12:35PM	0.0 %
4.	NO.4 ENTRY	8:40AM	0.0 %	14.	NO.4 ENTRY	12:40PM	0.4 %
5.	NO.5 ENTRY	8:45AM	0.0 %	15.	NO.5 ENTRY	12:45PM	0.0 %
6.	NO.1 ENTRY	10:25AM	0.0 %	16.	NO.1 ENTRY	2:25PM	0.2 %
7.	NO.2 ENTRY	10:30AM	0.0 %	17.	NO.2 ENTRY	2:30PM	0.0 %
8.	NO.3 ENTRY	10:35AM	0.3 %	18.	NO.3 ENTRY	2:35PM	0.1 %
9.	NO.4 ENTRY	10:40AM	0.1 %	19.	NO.4 ENTRY	2:40PM	0.3 %
10.	NO.5 ENTRY	10:45AM	0.0 %	20.	NO.5 ENTRY	2:45PM	0.0 %

Examinations for Methane in Return Aircourses

	Location	Time	Methane Content		Location	Time	Methane Content
1.	NO.1 RETURN	8:20AM	0.2 %	6.			
2.	NO.5 RETURN	8:50AM	0.1 %	7.			
3.	NO.1 RETURN	12:20PM	0.0 %	8.			
4.	NO.5 RETURN	12:50PM	0.1 %	9.			
5.				10.			

Number of Bolts Tested 40

Number of Bolts Torqued Above Range 5 Below Range 15

If majority of bolts tested in any working place falls outside approved torque range, state what action was taken ROOF BOLTER WAS REPAIRED AND AREA REBOLTED.

Remarks (Statement as to General Conditions of Mine or Area of Mine)

Joe White — Assistant Mine Foreman

30659-79 — Certificate No.

James Smith — Mine Foreman-Mine Manager

27631-74 — Certificate No.

Jake Adams — Superintendent or Assistant

Use Indelible
Pencil or Ink

Weekly Examinations—Week Ending _____ 20____

Air Measurements

Location	Working Face	Main Intake	Main Return	Volume Cubic Feet Per Minute: Intake Split	Return Split(s)	Bleeder Split	Last Open Crosscut	Date	Person Taking Air Measurements

Examination for Hazardous Conditions Including Tests for Methane

Location	Intake and Return Air Courses Traveled	Hazards Noted	Date	Signature of Examiner

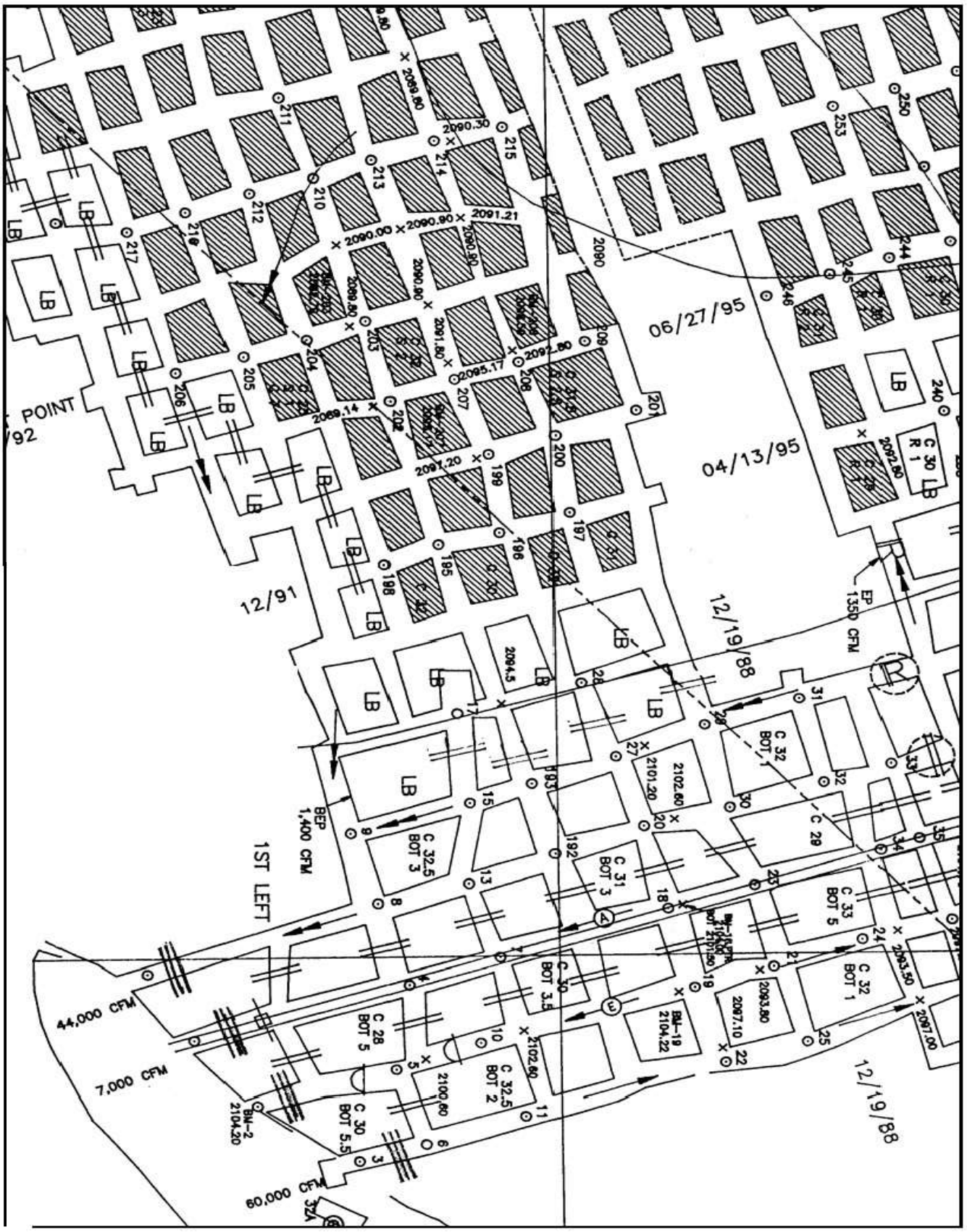
Examination of pillar falls, seals, idle workings, abandoned areas

Actions taken _____

Signature _____ Mine Foreman _____ Certificate No. _____ Signature _____ Superintendent or Assistant

Notes:

MINE MAPS


06/27/95
04/13/95
12/91
12/19/88
12/19/88
POINT
/92
1ST LEFT
BEP
1,400 CFM
EP
135D CFM
44,000 CFM
7,000 CFM
60,000 CFM
LB
C 32.5
BOT 3
C 31
BOT 3
C 32
BOT 1
C 29
C 33
BOT 5
C 30
BOT 3.5
C 28
BOT 5
C 32.5
BOT 2
C 30
BOT 5.5
BM-2
2104.20
BM-19
2104.22
C 30
R 1
2092.80
2094.5
2101.20
2102.60
2093.50
2097.00
2093.80
2097.10
2100.60
2102.60

Mine Map Symbols

The first step in reading any type of map is to understand the symbols used to depict its features. When reading a road map many of the symbols are familiar and do not require any additional interpretation on the part of the user. This knowledge has been gained through experience aided by the availability of road maps for public use. Mine maps are no different. Once an understanding of the symbols is attained, the map can be read and understood. Although many mine map symbols are standardized, some are not. It is important that a legend be placed on the map to illustrate the meaning of each symbol. The reader must consult the legend to understand the map.

SCALE

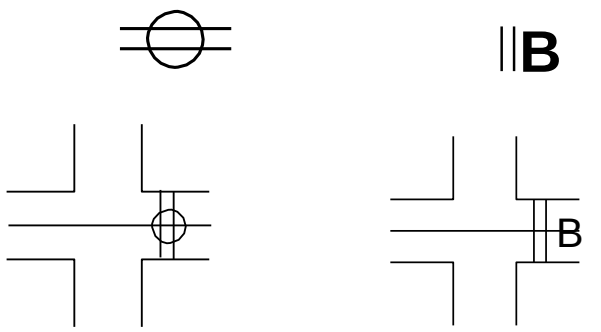
The mine map must have a scale to indicate the distances. The scale tells the reader the distance equal to one inch on the map. Examples:

SCALE 1" = 100"

Both above scales indicate that one inch on the mine map represents one hundred (100) feet in the mine, the lower scale indicates that one small block represents twenty-five (25) feet.

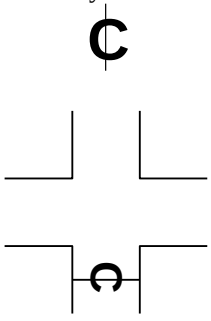
Box Check-- A stopping with a hole in it to allow a conveyor to pass through used to prevent intake air from flowing across the conveyor.

a) option (1) b) option (2)



a) Example (1) b) Example (2)

Check Curtains-- A partition made of incombustible material, used to deflect air to the working place, constructed in a manner to allow the passage of miners and machinery.



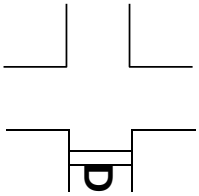
Example

Door-- A partition made of incombustible material, used to deflect air to the working place, constructed in a manner to allow the passage of miners and machinery.

NOTE: Symbol should point in the direction door(s) open.

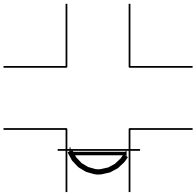
D

a) Stopping with Man door



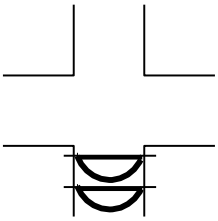
Example

b) Mine Door or Machine Door



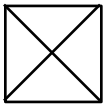
Example

c) Set of Airlock Doors

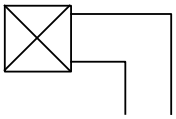


Example

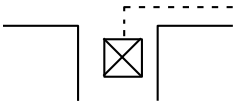
Fan-- A mechanical device powered by an electrically driven motor to pull or push air through the mine workings.



a) Mine Fan outside



b) Fan and Tubing

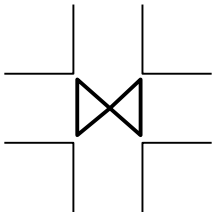


Line Brattice-- A partition made of incombustible material used to direct air to the working face, usually maintained to within ten (10) feet of the face.

- - - -

Overcast-- An enclosure built in an intersection of mine passages which allows two air currents to cross without mixing. One air current crosses the other above the coal seam or in some instances through pipes.

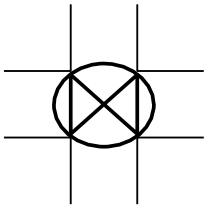
a) proposed b) built



Example

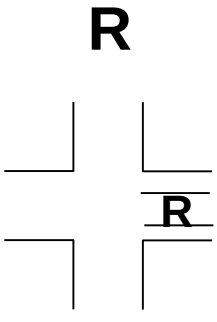
Undercast-- Similar to an overcast except that one air current passes under the other below the coal seam.

a) proposed b) built



Example

Regulator-- An adjustable door or opening in a stopping generally built across a return airway and used to adjust the amount of air passing through the airway in order to properly distribute airflow.

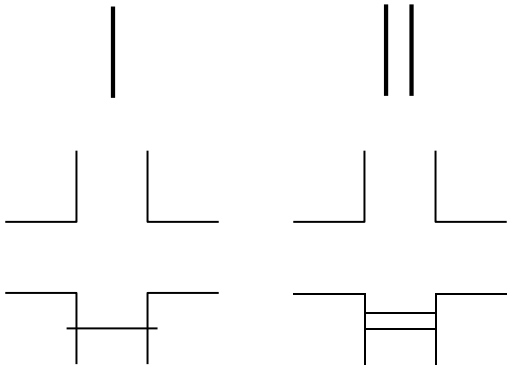


Example

Stoppings-- A **permanent stopping** is a solid, incombustible, substantial wall built across a mine passage used to separate intake air from return air to direct air through the mine, to form escapeways, and to isolate belt conveyor entries. A **temporary stopping** is built of less substantial material than permanent ones, used in places where the ventilation will be changed and generally replaced by permanent stoppings.

*NOTE: Proposed stoppings should use **dashed** symbols.*

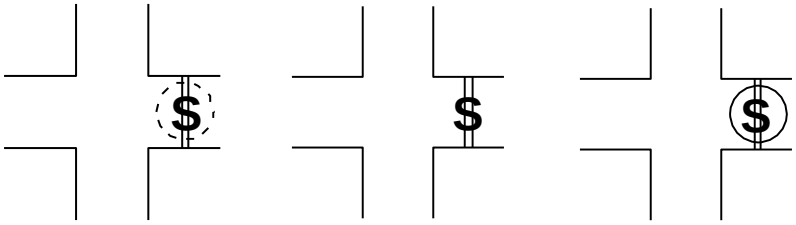
a) temporary b) permanent



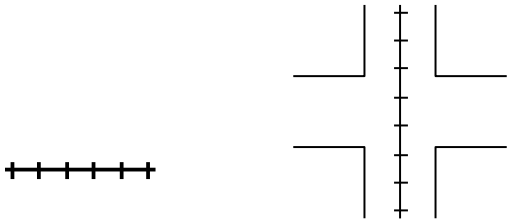
a) Example b) Example

Seal-- A stopping built of greater thickness and more substantial construction than a stopping, used to isolate abandoned areas of a mine from the active workings.

a) proposed b) built c) to be removed

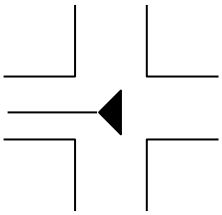


Track --



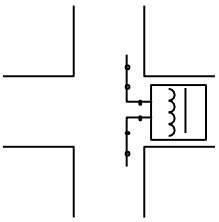
Example

Loading Point--



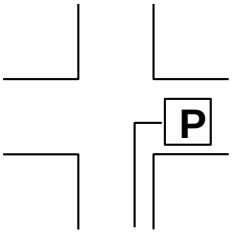
Example

Power Center--



Example

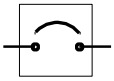
Pump--



Example

Surface substation--

Circuit Breaker--



Power line--

Battery Charger--

BC

Intake Air--

a) proposed b) existing

(blue) (blue)

Neutral Air--

a) proposed b) existing

(green) (green)

Return Air--

a) proposed b) existing

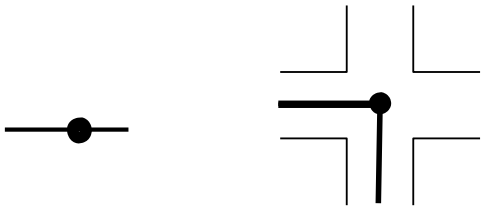
(red) (red)

Escapeways--

a) Primary b) Alternate

(blue) (green)

Belt Drive—



Example

Evaluation Point--

Spad--

Control Survey--

Water Valve--

Fire Valve--

Floor Elevations--

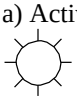
× 596.3

Water Borehole--

Power Borehole--

Core Hole--

Gas Well--

a) Active 

b) Abandoned 

c) Plugged for mine-thru 

Oil Well--

a) Active 

b) Abandoned 

c) Plugged for mine-thru 

RED: Unverified coordinates or spotted from map
BLACK: Physically located and tied to mine survey

MINE MAPS

1. Q. Who is required to furnish maps of coal mines?

   A. The operator

2. Q. What must be the scale of maps of coal mines?

   A. Not less than one hundred (100) feet, and not more than five (500) feet to the inch.

3. Q. How often must the map of the coal mine be brought up to date?

   A. Twice annually, on or before the 1st of March and the 1st of September.

4. Q. Who must certify the map of a coal mine to be correct?

   A. A certified engineer.

5. Q. To whom must a copy of the map of a coal mine be delivered semi-annually?

   A. To the district mine inspector.

6. Q. What map is required to be kept at the mine?

   A. A certified up-to-date map of the mine.

7. Q. How is ventilation to be shown on the map?

   A. By arrows.

8. Q. How may the effectiveness of the ventilating current be shown on the map?

   A. By showing the volume of air passing through the last crosscut of each entry.

9. Q. What is the penalty for making an incorrect map or a false statement in connection therewith?

   A. A fine of not less than five hundred (500) nor more than one thousand (1,000) dollars.

10. Q. What is required of a mine operator before coal is removed from within less than five hundred (500) feet of a gas or oil well, or before workings are extended beneath any tract of land on which oil or gas wells are drilled or proposed to be drilled?

    A. The operator should forward maps to the well operator and the MHST showing the mine workings and projected mine workings beneath any tract of land on which oil or gas wells have been drilled or proposed to be drilled and within five hundred (500) feet of such wells.

11. Q. After filing with a well operator and the MHST the required maps showing an intention to mine in the vicinity of an oil or gas well, how close to the well may the mine operator remove the coal?

A. Not nearer than two hundred (200) feet from the oil or gas well.

12. Q. When may the mine operator remove coal from within less than two hundred (200) feet from the oil or gas well?

A. When approval is obtained from the MHST.

13. Q. What procedures are necessary before a mine operator may obtain approval to mine from within less than two hundred (200) feet of an oil or gas well?

A. The operator should file an application and petition with MHST and the well operator, together with a map showing the size of the pillars to be left around the well and the proposed plan of mining within less than two hundred (200) feet of the well.

14. Q. How often must maps showing the progress of mine workings within two hundred (200) feet of oil and gas wells be extended?

A. Once every six (6) months.

15. Q. A mine map showing the location of pipelines, location of valves, and fire taps is required to be kept where?

A. At the mine office at all times.

Notes:

FIRE BOSS


DEEP MINE #4.
FIRE BOSS BOARD
DAY SHIFT
EVENING SHIFT
OWL SHIFT
IN
OUT
IN
OUT
IN
OUT

FIREBOSS

1. Q. Who is responsible for the employment of a mine examiner (fireboss) at each coal mine?

   A. Mine operator.

2. Q. What qualifies a person to be a mine examiner (fireboss)?

   A. A person that holds a certificate of competency for such position issued to him by MHST after passing an examination.

3. Q. What signal shall be prepared at the mine entrance by the mine examiner (fireboss) at the beginning of a shift or prior to the mine foreman entering the mine to make his examination?

   A. A danger signal with red color.

4. Q. When the mine is reported to be safe by the mine examiner (fireboss) what change shall be made to the danger signal?

   A. The danger signal shall be changed to indicate that the mine has been examined and is safe.

5. Q. What area of a mine shall the mine examiner (fireboss) examine?

   A. Designated definite underground area of the mine that the mine examiner has been assigned.

6. Q. What shall the mine examiner (fireboss) examine in the assigned area?

   A. All active working places in the assigned area and make tests with a multi-gas detector or other approved device for accumulations of methane and oxygen deficiency, examine seals and doors, examine, and test the roof, face, and ribs in the working places and on active roadways and travelways, approaches to abandoned workings and accessible falls in active sections.

7. Q. What evidence shall be left by the mine examiner (fireboss) that the required examination was performed?

   A. The mine examiner shall place their initials and date at or near the face of each place examined.

8. Q. If during the examination the mine examiner (fireboss) finds a condition which is considered dangerous to persons entering such areas, what action shall be taken.

   A. The examiner shall place a conspicuous danger sign at all entrances to such place or places.

9. Q. After completing the examination of the assigned area designated to the examiner, how shall the findings be reported?

A. The examiner shall report the results of the examination by communications or in person to a certified person trained as a certified miner, with at least two years of mining experience, designated by mine management to receive and record such report at a designated station.

10. Q. What record shall be kept by the mine examiner (fireboss) of the results of the examination?

A. The mine examiner (fireboss) shall record the results of the examination with ink or indelible pencil in a book prescribed by the Director of MHST at a place on the surface of the mine designated by mine management.

11. Q. In addition to the pre-shift examination, what else is required of all construction and rehabilitation work areas?

A. On shift examination made between third and fifth hour.

Notes:

V E N T I L A T I O N

VENTILATION

1. Q. Where shall all main fans be installed?

   A. On the surface.

2. Q. The main fan must be enclosed in what kind of housing?

   A. Fireproof.

3. Q. The fan or fans shall be kept in what kind of operation?

   A. Continuous operation.

4. Q. What action shall be taken in the event of an accident to the ventilation fan?

   A. The miners shall be ordered to withdraw from the face regions and other affected areas immediately and the power disconnected. §22a-2-3

5. Q. When the fan stops and ventilation is restored within fifteen (15) minutes, what must be done?

   A. The face regions and other places in the affected area shall be re-examined by a certified person.

6. Q. When shall all employees be removed from the mine when the fan stops?

   A. If the ventilation is not restored within fifteen (15) minutes.

7. Q. What shall be done before persons return to the mine after ventilation is restored?

   A. The mine shall be examined by a certified person. If ventilation is restored to the mine before miners reach the surface, the miners may return to the underground working areas only after an examination of the area is made by a certified person.

8. Q. How many openings are necessary to provide adequate ventilation?

   A. At least two (2).

9. Q. What is the maximum distance that mines may be developed underground before mechanically operated fans are required?

   A. Two hundred (200) feet.

10. Q. How shall mine ventilation be obtained?

    A. By the use of fans, mechanically operated.

11. Q. What are the two systems of ventilation?

A. Blowing and exhaust.

12. Q. What is the ventilating pressure?

A. Pressure which must be exerted upon an air current to overcome the mine resistance.

13. Q. How is the ventilating pressure measured?

A. With pressure-recording gages or water gages.

14. Q. How is the ventilating pressure produced by fans?

A. By the speed by which the fan is operating, varying with the characteristics of the fan.

15. Q. What affect do obstructions in airways have upon the quantity of air circulated, the fans speed remaining constant?

A. The quantity is decreased.

16. Q. What affect do short circuits have upon the quantity of air circulated, the fans speed remaining constant?

A. The quantity is increased.

17. Q. What affect does a decrease in mine resistance have upon the performance of a fan?

A. The fan is enabled to circulate and increased quantity of air with no increase in the ventilating pressure.

18. Q. What is the benefit of decreased mine resistance when it is not necessary to increase the quantity of air in circulation?

A. A saving in power can be affected by reduced fan speed.

19. Q. What is meant by natural ventilation?

A. Movements of air produced by differences in the weights of air columns or by differences in temperature.

20. Q. How is natural ventilation produced?

A. By the difference in weight of air due to the difference in temperature between outside air and mine air or by difference in pressures.

21. Q. Why is natural ventilation not reliable?

A. The direction may reverse with weather conditions, and when the outside temperature approximates the inside temperature, movement may cease.

22. Q. What is the most reliable means of producing ventilation in a mine?

A. A mechanically operated fan.

23. Q. With what instruments should all main fans be provided?

A. Pressure recording gages or water gages.

24. Q. What common typed of fans are used?

A. Centrifugal and axial flow fans.

25. Q. How must a mine fan installation be protected from an explosion?

A. By explosion doors, or a weak wall.

26. Q. What is the purpose of explosion doors?

A. To relieve the pressure of an explosion before it reaches the fan.

27. Q. How must fan buildings be constructed?

A. With incombustible materials, equipped with fireproof air ducts and provided with explosion doors or a weak wall.

28. Q. Where shall fans be located with respect to mine openings?

A. They should be offset not less than fifteen (15) feet from the nearest side of the mine opening and connected to the opening by means of air ducts.

29. Q. Why should fans not be located in a mine opening?

A. Because of the possibility of their destruction in the event of a mine explosion.

30. Q. Under what circumstances may the fan be placed in front of or over a mine opening?

A. When the opening is not in a direct line with possible forces coming out of the mine, and there is another opening having explosion doors or a weak wall in direct line of forces coming out of the mine.

31. Q. What electrical requirement is necessary for mine fans?

A. They must be operated from an independent power circuit.

32. Q. How should man doors at fans be installed?

A. In pairs to form an air lock.

33. Q. Why should main fans be reversible?

A. So that the air current can be reversed in case of fire or explosion, if deemed advisable.

34. Q. How are mine fans made reversible?

A. By an arrangement of air doors in fan housing or in the mine, or by changing the direction of rotation of disc fans.

35. Q. What is meant by the normal rated capacity of a fan?

A. It is the capacity specified by the manufacture at which best efficiency is obtained.

36. Q. Where multiple fans are used, are neutral areas permitted?

A. No.

37. Q. What quantity of air must be delivered to the intake of a pillar line?

A. Nine thousand (9,000) cubic feet of air per minute.

38. Q. What shall be made part of pillar recovery plans relative to ventilation?

A. A bleeder system shall be established to prevent accumulation of gas in such areas.

39. Q. How much air must be delivered to the intake of the pillar line if a bleeder return is closed as a result of roof falls or water during pillar recovery operations?

A. At least twenty thousand (20,000) cubic feet of air per minute.

40. Q. How should pillar lines be ventilated?

A. By keeping the ventilating current along the pillar line.

41. Q. Where are bleeders found?

A. Bleeders will be found around pillared areas.

42. Q. What are bleeders used for?

A. For the ventilation of gob areas.

43. Q. While tubing, line brattice, or other ventilation devices are being installed inby the machine operator, what must be done?

A. Production activities in the working faces shall cease.

44. Q. When a line brattice or other types of ventilating controls are damaged, in a working place, to the extent that face ventilation is inadequate, what action should be taken?

A. Repairs to the ventilating controls shall be made immediately.

45. Q. What is the principal requirement for permanent stoppings?

A. They should be airtight.

46. Q. How must stoppings be constructed to seal an abandoned area?

A. The sealing shall be done with incombustible material in a manner prescribed by the Director of MHST and one or more of the seals shall be fitted with a pipe and cap or valve to permit the sampling of gases and measuring of hydrostatic pressure behind the seals.

47. Q. When and where should brattice material stoppings be used?

A. Only temporarily, in next to the last open crosscut.

48. Q. What are stoppings?

A. Partitions erected across openings.

49. Q. What is the purpose of a stopping?

A. To prevent short-circuiting of the air and help provide adequate face ventilation.

50. Q. What materials are used to construct stoppings?

A. Incombustible materials.

51. Q. When should stoppings be completed?

A. They should be completed promptly, as required.

52. Q. What is line brattice?

A. It is a curtain erected from the last crosscut to the face.

53. Q. What kind of material shall be used to construct stoppings between intake and return airways not required for the passage of air and equipment?

A. Incombustible or a fire-resistant material.

54. Q. What is the purpose of a line brattice?

A. To conduct an air current to the working face.

55. Q. When brattice cloth is used, what precautions should be taken against fire?

A. The brattice should be flame resistant.

56. Q. How should the space behind line brattice be maintained?

A. Clean and open for the free flow of air.

57. Q. How is the ventilating current controlled?

A. By the use of stoppings, doors, overcasts, undercasts, regulators, check curtains, line brattice.

58. Q. What means shall be used to ensure ventilation where unusual quantities of gas or smoke may exist?

A. Line brattice or other approve methods of ventilation should be used.

59. Q. What means must be used to ensure ventilation at faces where crosscuts are driven in excess of eighty (80) feet apart?

A. Line brattice, fans and other approved methods of ventilation shall be used.

60. Q. What is an overcast or undercast?

A. It is an enclosed airway constructed to provide a means for one air current to cross another without mixing.

61. Q. What are the main requirements of an overcast?

A. To provide sufficient area for the air current and to permit a smooth uninterrupted flow of air.

62. Q. How shall overcasts be constructed and maintained?

A. Constructed of incombustible material, maintained in good condition.

63. Q. Why are overcasts generally preferred to undercasts?

A. Undercasts might be easily filled with debris or water and are therefore seldom used unless it is not practical to construct an overcast.

64. Q. How do overcasts aid haulage?

A. They eliminate the necessity for doors on the haulage road.

65. Q. How does overcasts aid ventilation?

A. They permit frequent splitting of the air allowing the air to pass only over one section or one portion of a mine.

66. Q. What are some of the common errors made in construction of overcasts?

A. Rough and abrupt interruptions to the ventilating current, and insufficient area.

67. Q. What is a regulator?

A. A variable partial obstruction in an airway.

68. Q. What is the purpose of a regulator?

A. To control the distribution of the air by regulating the resistance to flow in an air split.

69. Q. How is a regulator usually constructed?

A. It usually is a stopping provided with an opening having a sliding door.

70. Q. What is the effect of a closing regulator on the quantity of air entering a split?

A. The quantity is decreased.

71. Q. Who determines where regulators are placed?

A. The mine foreman.

72. Q. Why are regulators essential to the ventilation of a mine?

A. They proportion the air to meet the requirement of each individual split.

73. Q. Where are the regulators usually placed in a mine?

A. In the return headings of each split of air.

74. Q. What is an advantage of having a regulator in the return near the end of a split of air?

A. It is out of the way and does not interfere with haulage.

75. Q. What is the purpose of ventilating doors?

A. To direct the course of ventilation and permit traffic to pass.

76. Q. How should a door be hung?

A. So that it will close automatically and tightly.

77. Q. How far apart should the doors of an air lock be placed?

A. At sufficient distance to accommodate a full trip of cars.

78. Q. What provision should be made to prevent a short circuit of a main ventilating current controlled by doors?

A. Doors shall be hung in pairs to form air locks unless mechanically operated.

79. Q. Why are doors in a mine objectionable?

A. If damaged or left open they permit short-circuiting of the air; they permit leakage, and unless built of incombustible material they constitute a fire hazard.

80. Q. Should haulage equipment be permitted to stand in doors or curtains?

A. No, never.

81. Q. When are doors advisable?

A. Where it is impracticable to use overcasts.

82. Q. Is the use of automatic doors preferable to ordinary doors?

A. Yes, but they should be inspected regularly and kept in operating condition.

83. Q. What are the requirements relative to the construction of doors placed on main haulageways?

A. They should be built substantially and hung to close automatically.

84. Q. What precaution should a foreman take at the end of each shift to assure proper ventilation for the section?

A. See that the doors on the section are closed.

85. Q. In what direction should doors swing to close?

A. In the direction of the air current.

86. Q. What locations should be avoided when placing doors?

A. Doors should be avoided on main haulageways when possible.

87. Q. What facilities should be provided for the passage of persons through doors where ventilating pressure prevents easy opening?

A. Man doors.

88. Q. What is a check curtain?

A. It is a temporary curtain erected to deflect air.

89. Q. What is the purpose of a check curtain?

A. To deflect the air current from entries into working faces.

90. Q. Where should a curtain be used?

A. Only within the limits of an active working section where leakage is not detrimental.

91. Q. What is a run through check curtain?

A. A translucent curtain used to deflect air currents, while allowing passage of miners and mobile equipment without adversely affecting face ventilation.

92. Q. Who should be notified when position of brattice is changed?

A. Operators of mobile equipment.

93. Q. How should face ventilation controls be installed?

A. In the most efficient manner possible in order to provide the maximum ventilation.

94. Q. What shall be provided at or near the face of each entry or room before such places are abandoned?

A. A crosscut.

95. Q. What shall be done to all workings which are abandoned?

A. Sealed or ventilated.

96. Q. What shall be installed in one or more seals of every sealed area?

A. A pipe and cap or valve to permit the sampling of gases and measuring of hydrostatic pressure behind the seals.

97. Q. In the event of a fire or explosion in any mine, the ventilation fan shall not be intentionally started, stopped, speed increased or decreased, or the direction of the air current changed without whose approval?

A. General mine foreman. However, if he is not available, a representative of MHST.

98. Q. Who shall prohibit any person to work where the quantity or quality of air required is not maintained?

A. Operator.

99. Q. Before sealed areas are opened, who shall be notified?

A. The Director of MHST.

100. Q. Who is responsible for keeping a careful watch over the ventilating apparatus and airways?

A. The mine foreman.

101. Q. How shall each working unit newly developed in virgin coal be ventilated?

A. By a separate split of air.

102. Q. How can the ventilation of large, abandoned areas be avoided?

A. By sealing them.

103. Q. What should be done when conveyors are extended through stoppings?

A. A box check should be erected to prevent excessive air leakage.

104. Q. What is the purpose of mine ventilation?

A To provide sufficient pure air to the employees and to dilute, render harmless, and carry away the dangerous and noxious gases and dust.

105. Q. What is the minimum distance permitted between slope and drift openings?

A. Fifty (50) feet.

106. Q. What is the minimum distance permitted between shaft and slope openings?

A. One hundred (100) feet.

107. Q. What is the minimum distance between shaft openings?

A. Three hundred (300) feet.

108. Q. What maximum number of miners may be employed in a mine before ample ventilation is required?

A. In all mines where one or more miner's work.

109. Q. How long shall a mine be ventilated?

A. Continuously throughout its operating life.

110. Q. How is a mine ventilated?

A. By coursing the air through the intake airways to the working faces and returning it to the outside by return airways.

111. Q. What must be the minimum oxygen content of the air delivered to working places?

A. 19.5 percent (19.5%).

112. Q. What percentage of noxious or poisonous gases can be tolerated?

A. None.

113. Q. What is the maximum carbon dioxide content allowed in air delivered to working places?

A. 0.5 percent (0.5%) carbon dioxide.

114. Q. What are the main requirements of an intake opening?

A. That it be unobstructed, fireproof, and located away from possible sources of contamination to the air.

115. Q. What are the main requirements of airways?

A. That they are of sufficient area and kept free from obstructions.

116. Q. What is a common fault of the two-entry system?

A. Insufficient area and falls restrict the volume and increases the resistance, resulting in inefficiency.

117. Q. Through what portions of a mine must the air current not be permitted to pass before reaching working places?

A. Through abandon workings not regularly inspected or air which has been used to ventilate a pillared section.

118. Q. Why should idle dead-end places not be permitted?

A. Ventilation is uncertain, and gases may accumulate.

119. Q. Where is it prohibited to turn rooms?

A. In advance of the ventilating current.

120. Q. What is the maximum distance that straight places may be driven beyond the last open crosscut?

A. Two hundred (200) feet.

121. Q. How often must the air currents be measured in airways?

A. At least weekly.

122. Q. Should ventilation be shifted from idle sections to active sections on different shifts?

A. No.

123. Q. When should changes in ventilation be made?

A. When the mine is idle.

124. Q. What is the speed of a ventilating current called?

A. The velocity.

125. Q. Why should excessively high velocities in a mine be avoided?

A. High velocities increase the necessary ventilating pressure and power consumption, keep coal dust in suspension, and may cause discomfort to the workers.

126. Q. Why should extremely low velocities be avoided?

A. Low velocities will not properly sweep out gases.

127. Q. How may high velocities be avoided?

A. By the use of airways of adequate cross-sectional area and by splitting the air current.

128. Q. What must be overcome to pass a ventilating current through a mine?

A. Mine resistance.

129. Q. What is mine resistance?

A. The resistance of the surface, bends, and obstructions in the airways to the passage of air.

130. Q. How can the mine resistance be decreased without decreasing the volume of air or changing its course?

A. By enlarging and cleaning airways.

131. Q. How does the mine resistance vary in relation to the velocity?

A. The mine resistance varies directly as the square of the velocity.

132. Q. What affect do constricted airways have upon mine resistance?

A. Constricted airways increase resistance by offering a greater proportion of rubbing surface for the effective area and by requiring increased velocity for a given quantity of air.

133. Q. What affect do constricted airways have upon velocity when the volume of air remains constant?

A. The velocity is increased in inverse proportion to the area.

134. Q. What affect do constricted airways (reduced in area throughout in length) have upon velocity when the ventilating pressure remains constant?

A. The velocity of the main ventilating current is decreased.

135. Q. On what air current shall haulage be placed?

A. On the intake.

136. Q. How can the main haulage of a mine be placed on fresh air when the mine is ventilated by a blowing system?

A. By the use of air locks or by placing the main haulage on a separate split of air.

137. Q. What is the advantage of having the main haulage on the intake in the event of an explosion?

A. Entrance to the mine is more easily obtained.

138. Q. What is meant by splitting a ventilating current?

A. Dividing the main current into separate individual currents.

139. Q. What affect does splitting the air have upon mine resistance?

A. The mine resistance will be decreased.

140. Q. What is an air split?

A. A portion of the main ventilating current forming a continuous current throughout a definite part of the mine.

141. Q. What affect does a cold intake current of air have upon the dampness of a mine?

A. As the temperature of the air rises, moisture is absorbed, and the mine surfaces become dry.

142. Q. What affect does high humidity and high temperature have upon persons working?

A. The temperature of the body cannot be dissipated by the evaporation of perspiration and such conditions cause discomfort to the workers.

143. Q. How would the temperature of the return air differ from the intake during extreme hot or cold weather?

A. Temperatures of the return air are usually moderate.

144. Q. What is the main disadvantage of having the intake near the dumping point?

A. Dust from the dumping point is frequently carried into the mine.

145. Q. What must be done where coal is dumped near air intake openings?

A. Reasonable provisions must be made to prevent dust from entering the mine.

146. Q. What may be the disadvantage of having the coal shaft or slope on the intake during cold weather?

A. Freezing temperatures may interfere with operations.

147. Q. What may be the disadvantage of having workers in return air in a mine?

A. The return may contain an explosive mixture of gas.

148. Q. What is short circuiting of the air?

A. Permitting it to enter the return before reaching the faces.

149. Q. What is rigid foam?

A. Rigid foam is a stiff cellular material formed when two liquid chemical compounds are mixed in a specially designed spray gun and sprayed on a surface such as concrete, steel, wood, rock, or coal.

150. Q. What are some of the advantages of rigid foam?

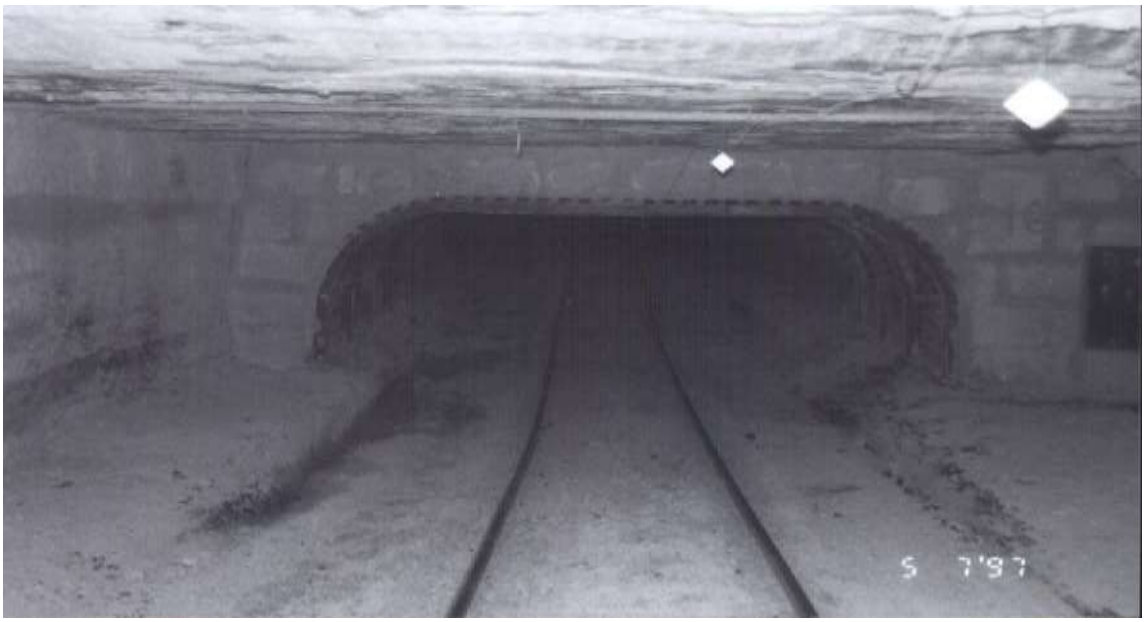
A. It is an excellent sealing material, it is strong enough to be able to be sprayed on brattice cloth or wire mesh, resists crushing, and is easy to apply.

151. Q. What affect does splitting the air current have upon an explosion?

A. Air splitting reduces possibility that an explosion will propagate from one section to another.

152. Q. What should be the minimum dimensions of man doors in permanent stoppings or overcasts?

A. Thirty (30) inches square or the height of the coal seam



153. Q. At what intervals shall man doors be installed between intake and return airways?

A. Six hundred (600) feet when the height of the coal is over forty-eight inches. Three hundred (300) feet when the height of the coal is under forty-eight inches.

154. Q. What must shuttle car operators do before passing through a check or door?

A. Must always sound an alarm.

155. Q. How close to checks and doors can mobile equipment be parked?

A. At least fifteen (15) feet away from check or door.

156. Q. What causes air to circulate through a mine?

A. The difference in pressure between the intake and return.

157. Q. How is the difference in pressure between the intake and the return created?

A. By difference in temperature, elevation or by mechanical means.

158. Q. What is meant by the rubbing surface?

A. The surface of an airway in contact with the air current.

159. Q. What shape of airway is most efficient for ventilation?

A. A circle.

160. Q. What is meant by the perimeter of an airway?

A. The distance as measured around its cross-sectional area.

161. Q. What is cross-sectional area of an airway?

A. The number of square feet enclosed within its perimeter.

162. Q. What factors determine the mine resistance?

A. The area, perimeter and length of airways, the velocity, and the coefficient of friction.

163. Q. How can the rubbing surface of an airway be calculated?

A. Multiply the length by the perimeter.

164. Q. What is used to isolate the intake air escapeway entry from other entries?

A. Permanent stoppings.

165. Q. How is the quantity of air in a ventilating current determined?

A. By multiplying the area of an airway by the velocity in feet per minute.

166. Q. How is the total mine pressure calculated?

A. By multiplying the unit pressure by the cross-sectional area of the airways.

167. Q. If an airway is twelve (12) feet wide and six (6) feet high, what is the area?

A. Seventy-two (72) square feet.

168. Q. If the area of an airway is sixty (60) square feet and the quantity of air is thirty thousand (30,000) cubic feet per minute, what is the velocity?

A. Five hundred (500) feet per minute.

169. Q. An airway fourteen (14) feet wide and four (4) feet high is passing twenty-five thousand (25,000) cubic feet of air per minute, what is the velocity?

A. 446.4 feet per minute.

170. Q. What is the quantity of air passing through an airway ten (10) feet wide and five (5) feet high, if the velocity is three hundred (300) feet per minute?

A. Fifteen thousand (15,000) cubic feet per minute.

171. Q. If an airway is eight (8) feet wide and four (4) feet high what is the perimeter?

A. Twenty-four (24) feet.

172. Q. What is the maximum number of persons permitted to work on a single current of air?

A. Eighty (80) persons with a permit.

173. Q. While miners are working to provide the necessary amount of air, what other persons are permitted to enter that part of the mine affected?

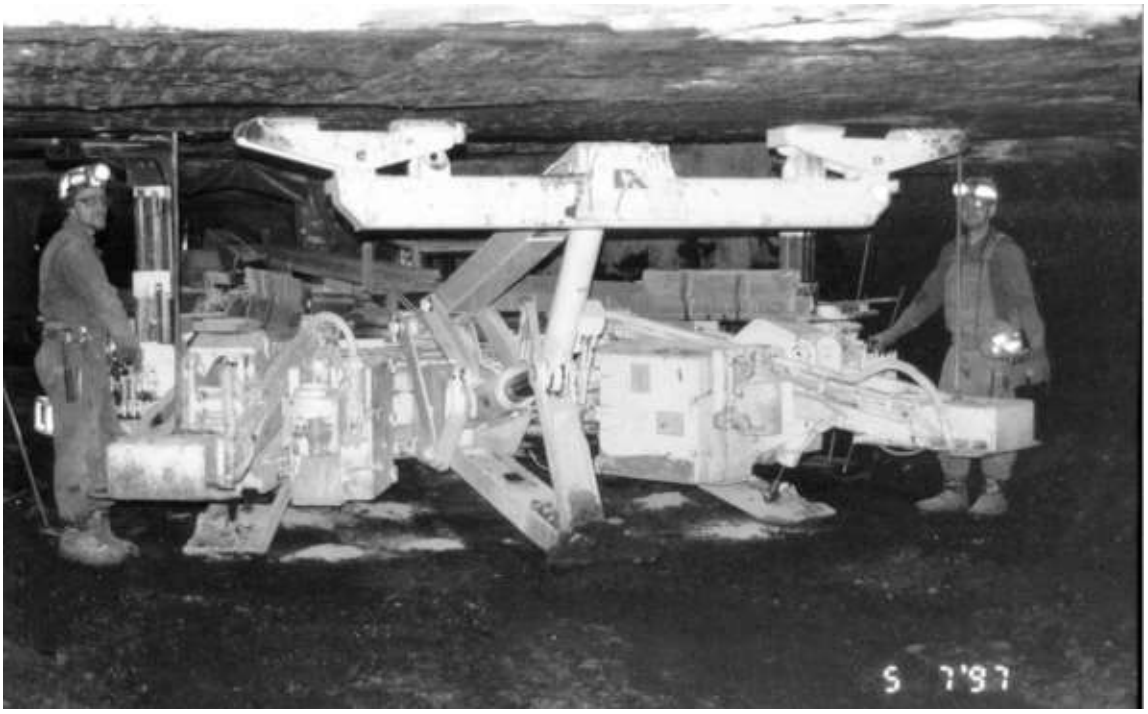
A. No person, except those actually employed in the necessary repair work.

174. Q. How may rectifiers be ventilated?

A. They may be ventilated on the intake air.

Notes:

ROOF CONTROL



COMMON ROOF BOLTS

CONVENTIONAL ROOF BOLTS -- A conventional roof bolt is a tension-type roof bolt. As the bolt is tightened, the shell expands against the wall of the hole. The installation torque is normally 120-to-200-foot pounds, as specified in manufacturers recommendations.

FULLY GROUTED RESIN RODS -- A fully grouted resin rod is a non-tension type roof bolt. A resin cartridge is inserted into a drilled hole. A rebar rod follows the resin into the hole. The bolt is then rotated, mixing the resin. When the resin hardens, anchorage is provided along the full length of the bolt.

TENSION REBAR -- A tension rebar bolt is normally installed with two or three feet of resin. The bolt is rotated a few seconds to mix the resin, then stopped and held a few seconds. After the resin hardens, the bolt is rotated a second time. A soft pin or dome nut will shear, and the bolt will tighten to the desired torque.

MECHANICAL ANCHOR-RESIN ASSIST -- A mechanical anchor-resin assist roof bolt has a mechanical anchor like the conventional bolt and uses one to two feet of resin to enhance the anchor zone of the bolt. Some mixing occurs as the resin flows by the mechanical anchor. The finishing mix occurs as the mechanical anchor is tightened.

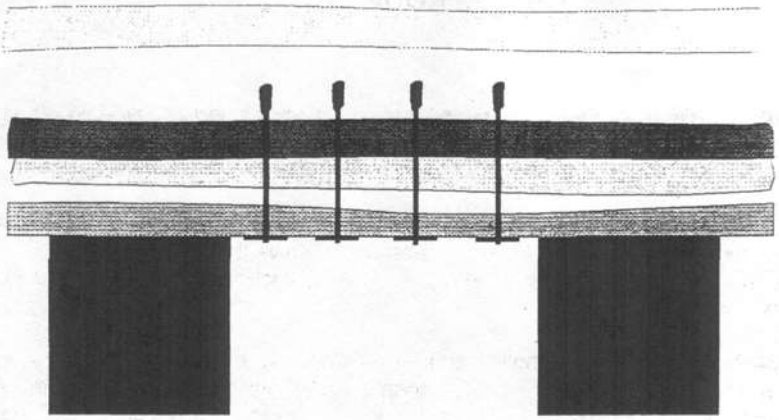
COMBINATION BOLT -- A combination bolt is made up from different length pieces, two to six feet, or more if necessary. These pieces are coupled together to obtain an adequate anchor in a wide range of depths into the roof. A mechanical anchor and one to two feet of resin are normally used to enhance the bolt anchor.

TRUSS BOLT -- Truss bolts are used to support some of the poorest roof conditions experienced in mining. The two rib bolts are installed at a 45-degree angle so that when the bolts are inserted at least two feet of the end of the bolt is over the coal pillar. A carrier truss is connected to the two rib bolts. The two center bolts are commonly 10 to 12 feet in length. Truss bolting and cable bolts, as long as 25 feet, are being experimented with in the tailgate entries of longwall mining.

TUNNEL LINERS OR ARCHES -- Tunnel liners or arches are used where adequate bolt anchorage cannot be obtained, or in areas of extreme pressure. Steel arches are fitted together on two to four feet spacing with steel rods. Steel plates are used to fill the openings between the arches. As loose roof rock and other materials fill the void areas between the arches, coal ribs and mine roof, the tunnel supports become more stable. In some instances, the materials are a cushion to falling roof. The tunnel supports are very strong and provide access to coal reserves that roof bolts could not.

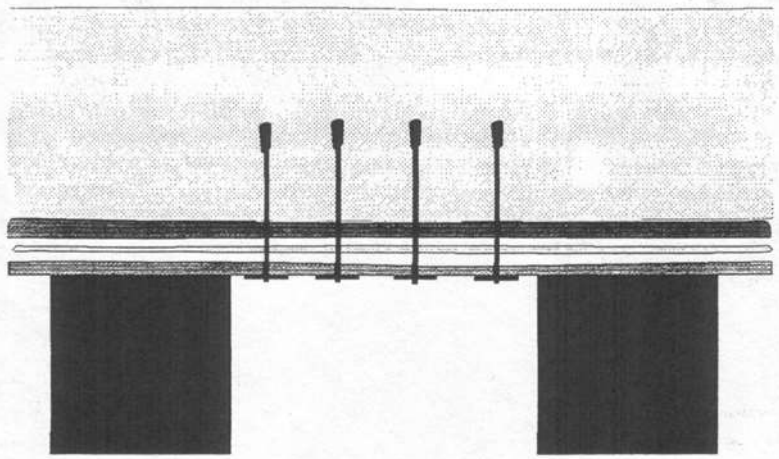
All roof bolts must be installed according to manufacturer's recommendations and in accordance with the approved roof control plan. Roof bolt technology today allows coal to be mined safely that only a few years ago would not have been mined

TWO PRINCIPLES OF ROOF BOLTING



BEAM BUILDING

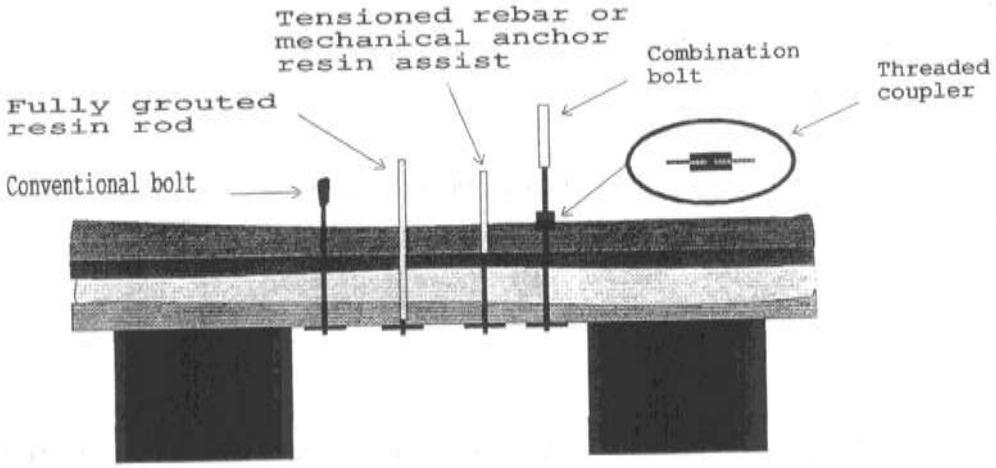
The roof bolts provide support by creating beams of the different strata. Bolts are used to bind these strata together much like the manufacture of plywood.

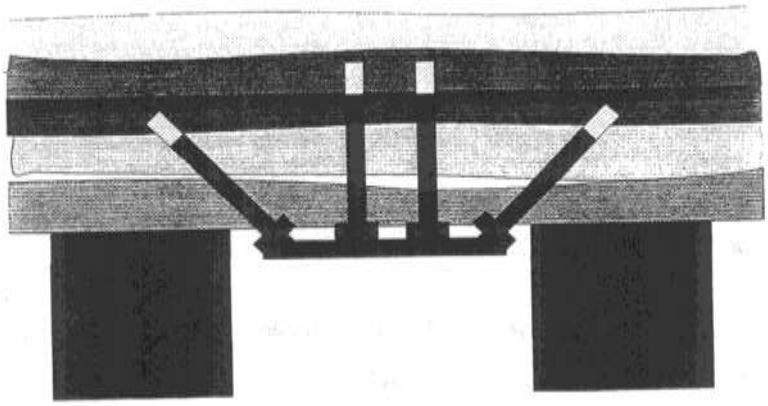


SUSPENSION

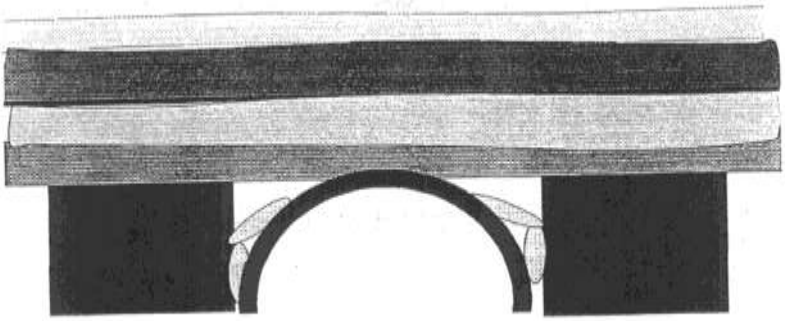
The roof bolts tie the lower layers of the roof to a stronger stratum located above. The lower layers are suspended from the upper stratum.

DIFFERENT TYPES OF ROOF SUPPORT





TRUSS BOLTING



TUNNEL LINERS OR ARCHES

ROOF CONTROL

1. Q. What is a major cause of fatalities in coal mines?

   A. Falls of roof, rib, and coal.

2. Q. Who is required to develop the roof control plan at a mine?

   A. The mine operator.

3. Q. Who approves the mine operator's roof control plan?

   A. The Director of MHST.

4. Q. Who shall be afforded the opportunity to review the roof control plan and submit comments and recommendations to the Director and operator concerning the development, modification, or revision of such plan?

   A. Representative of the miners.

5. Q. How often shall such approved roof control plans be reviewed?

   A. Periodically, at least every six (6) months.

6. Q. Who shall review each approved roof control plan at least every six (6) months?

   A. The Director of MHST.

7. Q. When are apprentice miners permitted to set temporary supports on a working section?

   A. When under the direct supervision of a certified miner.

8. Q. What shall be done before a miner is engaged in any activity involving the securing of roof or ribs during a shift?

   A. The immediate supervisor shall at the onset of any such shift, orally review those parts of the roof control plan relevant to the type of mining and roof control to be pursued by such miner.

9. Q. So as not to expose the miner to unusual danger from roof falls, what shall be the maximum width of roadways?

   A. Shall not exceed twenty (20) feet unless additional cross-sectional support is added.

10. Q. What shall each mine have relative to roof support?

A. A minimum roof control plan.

11. Q. How may falls of slate and roof be controlled?

A. By careful testing, inspection, and systematic support.

12. Q. What should each employee, or the official in charge, do before work is started?

A. They should thoroughly examine the roof and general conditions and see that the necessary roof support is provided to make the place safe.

13. Q. What shape does a weak and broken roof assume in an entry after all the loose material has fallen?

A. The form of an arch.

14. Q. How is the strength of the roof affected by moisture?

A. The roof is often weakened by moisture.

15. Q. What are the main requirements of good timbers?

A. That they are of proper length, straight grained, of sufficient cross-sectional area and with the ends sawed square.

16. Q. What is required of all active underground roadways, travelways, and working places?

A. The roof and ribs shall be supported or otherwise controlled adequately to protect persons from falls of roof or rib.

17. Q. How should dangerous roof conditions be handled?

A. They should be corrected immediately.

18. Q. Who may require substantially constructed canopies or cabs to be provided on electric face equipment to protect miners from roof falls or rib and face rolls?

A. The Director of MHST.

19. Q. When should broken, rotten, or inferior timbers be replaced?

A. Promptly.

20. Q. What is the operator required to provide at or near each working face and at other locations in a coal mine to adequately support the roof?

A. An ample supply of suitable materials of proper size in accordance with the approved roof control plan.

21. Q. What shall mine foremen do when they find a place in dangerous condition?

A. The mine foreman shall remain until the place is made safe or dangered off.

22. Q. When should a miner be prohibited from working in a working place?

A. Before it has been made safe.

23. Q. How should equipment operators protect themselves from falls of the roof?

A. Frequent examinations should be made, and safety posts should be set as needed.

24. Q. What should be done before new places are started?

A. Proper roof support shall be provided.

25. Q. What shall be done with loose, dangerous, or unusual overhanging ribs, brows, or roof?

A. They shall be removed, or carefully secured.

26. Q. How should timbers be placed with respect to the track?

A. So that proper clearance is maintained.

27. Q. What is a crossbar?

A. A beam set on legs to support the roof.

28. Q. When setting crossbars or taking down loose rock, what precaution should be taken?

A. Temporary supports should be placed to protect the worker.

29. Q. What kind of wood should cap pieces be made of?

A. Soft wood.

30. Q. What protection is a cap piece to a timber?

A. It takes the first weight by crushing, without affecting the strength of the timber.

31. Q. What are the advantages of using a cap block under a timber?

A. It affords greater protection for the timber and in the case of soft bottom it affords a greater bearing area.

32. Q. What method of timbering should be used when there are numerous fractures in the roof, or it is extremely weak?

A. Crossbars with supporting legs should be used.

33. Q. What are common errors made in setting timbers?

A. By setting on uneven surfaces, by having too small cap pieces, by not wedging them properly, by not setting them vertically and by using inadequate or crooked timber.

34. Q. How should a post be set in a pitched place?

A. With the top slightly up the pitch.

35. Q. How should a person removing a post be protected?

A. The person removing a post should be under well supported roof.

36. Q. What is the greatest danger from pillaring operations?

A. Frequent falls of roof and coal.

37. Q. How can the danger of roof falls in pillaring operations be lessened?

A. By relieving the weight of the roof from the pillars, by obtaining adequate falls by straight pillar lines, by proper and systematic timbering, and by careful inspection and supervision.

38. Q. What is the proper method of testing roof?

A. By sight, sound, and vibration when tapped with a solid instrument.

39. Q. What is the most dangerous roof?

A. One which conceals slips and kettle bottoms.

40. Q. What is a kettle bottom?

A. A large boulder with tapering edges, embedded loosely in the roof.

41. Q. What form of hand tool should be used in taking down slate?

A. A long slate bar.

42. Q. What is roof bolting?

A. A method of supporting the roof by tying the roof strata together.

43. Q. What material is used to tie the strata together?

A. Roof bolts and bearing plates.

44. Q. In roof bolting, what length of bolts should be used?

A. At least the minimum length specified in the roof control plan.

45. Q. In roof bolting, what diameter of bolts should be used?

A. Diameter specified in the roof control plan.

46. Q. In roof bolting, how shall bolts be anchored?

A. Anchored as specified in the roof control plan.

47. Q. In roof bolting, what size plates shall be used?

A. Size of plates specified in the roof control plan.

48. Q. In roof bolting, how far apart shall bolts be placed?

A. Not farther apart than specified in the roof control plan.

49. Q. What is torque?

A. The "twisting" force applied to the bolt.

50. Q. How tight should roof bolts be installed?

A. As specified by the roof control plan, usually from 125 to 175 foot- pounds.

51. Q. How can the torque of a roof bolt be determined?

A. By the use of a torque wrench.

52. Q. What is the tension of a roof bolt?

A. The amount of tightening force applied between the bearing plate and the anchor.

53. Q. How can the tension of a roof bolt be approximated?

A. By multiplying the torque reading by forty (40).

54. Q. What is torque "bleed off"?

A. The loss of torque after installation.

55. Q. What causes torque "bleed off"?

A. When the anchor is in soft rock such as shell, the high installation pressure causes the rock to yield and lets the bolt slip a small amount.

56. Q. What is automated temporary roof support or ATRS?

A. A mechanical device used to temporarily support the roof.

57. Q. When spot bolting is done on track haulage roads, shall machines be required to have ATRS?

A. No.

58. Q. When the roof bolting machine is being aligned, adjusted, or repositioned, who shall be permitted to be inby the operating controls of the roof bolting machine in a working face that is not completely supported?

A. No one.

59. Q. What shall roof bolting machines used in seams forty-eight (48) inches or higher be equipped with?

A. Mechanical means of holding the drill steel.

60. Q. Prior to the date first pillaring is to begin, which has not been previously performed, when shall the operator notify the district inspector?

A. Five working days.

61. Q. Are all roof control plans the same for all mines?

A. No.

62. Q. What is a test hole?

A. Test holes are holes drilled into the mine roof to determine roof conditions.

63. Q. What is the proper depth of test holes?

A. Test holes shall be drilled to a depth of at least twelve (12) inches above the anchorage point of the bolts being used.

64. Q. What is a normal depth cut when continuous mining machines are used?

A. A normal cut is measured from the further most point of the machine cutting drum to the machine operating controls, generally twenty (20) feet.

65. Q. What is required before extended depth cuts are mined?

A. Approval from the Director of MHST.

66. Q. What is the maximum roof bolt spacing?

A. Generally, four feet unless otherwise specified.

67. Q. What is the maximum distance temporary support is set from the location permanent support is being installed?

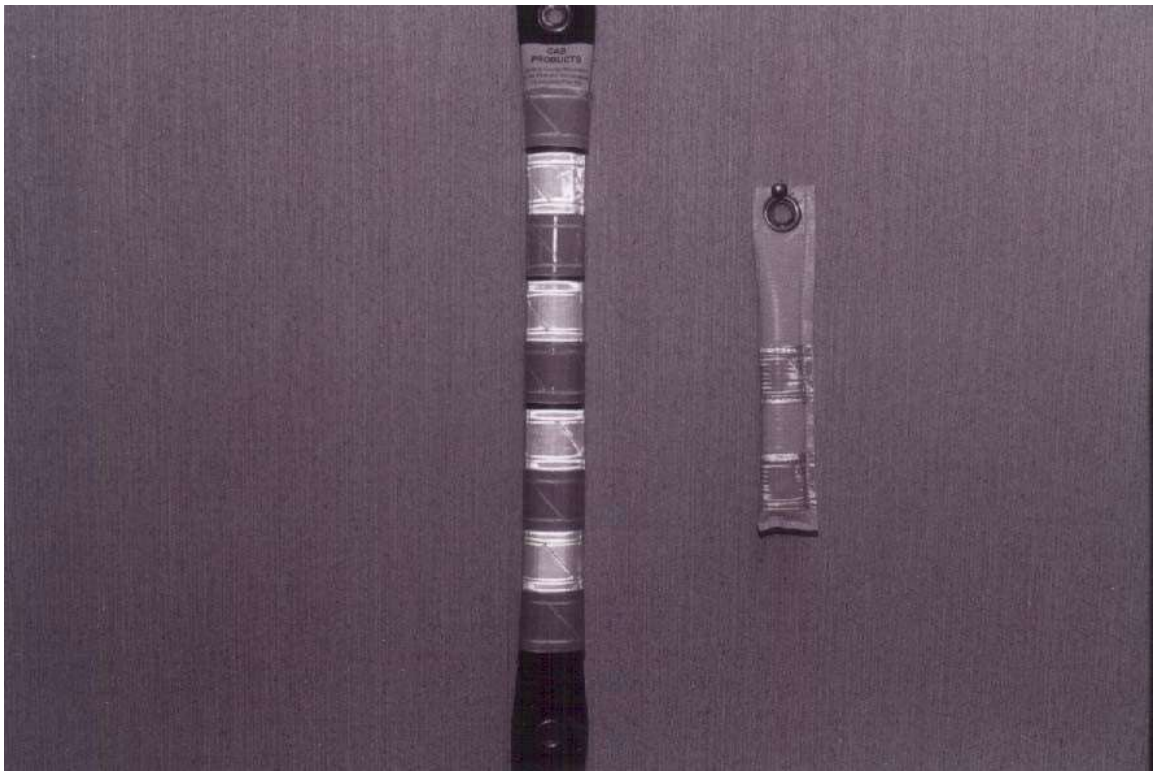
A. Twelve (12) inches.

68. Q. What is required at the entrance to any unsupported area?

A. A warning device or a physical barrier.

69. Q. What type of work can be performed inby permanent roof support?

A. Only the installation of temporary roof supports.



70. Q. What are sight lines?

A. A method to maintain the direction of mining in entries, rooms, crosscuts, and pillar splits.

71. Q. What is the minimum diameter of a round post and the minimum cross-sectional area of a split post?

A. Four (4) inches minimum diameter for a round post and thirteen (13) inches minimum cross-sectional area of a split post.

72. Q. What constitutes "fast feed" on the boom feed of roof bolting machines?

A. A feed rate greater than twelve (12) inches per second.

73. Q. When installing tensioned roof bolts how often is a torque check required?

A. The first roof bolt installed and one of every four thereafter.

74. Q. What protection is required for the roof bolt operator when installing resin grouted rods?

A. Effective eye protection.

75. Q. Can trailing cables be anchored on tensioned roof bolts used for roof support?

A. No.

76. Q. What is the minimum bearing surface of jacks used for roof support?

A. Thirty-six (36) square inches.

77. Q. What must be done in mines where pillar extraction (second mining) has not been previously performed prior to beginning such work?

A. The operator shall review plans concerning pillar extraction with all persons to be performing such work immediately prior to the start of such work and days prior to the date pillaring is to begin.

78. Q. What is required on all ATRS hydraulic jacks to prevent support failure in the event of a sudden loss of hydraulic pressure?

A. Check valves.

79. Q. What is the minimum dead weight supported by an approved ATRS system?

A. Eleven thousand two hundred and fifty (11,250) pounds as certified by a professional engineer.

80. Q. When a hazardous roof, face or rib condition is detected, when shall corrective action be taken?

A. Before any work or travel in the area.

81. Q. A proposed roof control plan or revision to a roof control plan shall not be implemented before what?

A. Approval of the Director of MHST.

82. Q. How shall resin grouted rods be installed?

A. In accordance with the manufacturer’s specifications.

83. Q. Who must be notified of unintentional roof falls at or above the anchorage point in active workings?

A. The Director of MHST or an authorized representative.

84. Q. During pillar extraction all non-essential personnel shall remain where?

A. Outby the last open crosscut of the place where coal is being extracted.

85. Q. Who has the primary responsibility to prevent injuries and deaths resulting from working under unsupported roof?

A. The mine operator.

86. Q. When second mining, how many roadways are allowed to the final pushout?

A. Only one, maximum sixteen (16) feet in width.

87. Q. A visual examination of what shall be made immediately before any work is started?

A. Roof, face, and ribs.

88. Q. What is the minimum accepted distance between the remote-control miner operator and the unsupported roof while in extended length cuts?

A. A minimum of two rows of roof bolts.

89. Q. How shall all openings of unsupported crosscuts on extended length cuts be supported prior to travel inby?

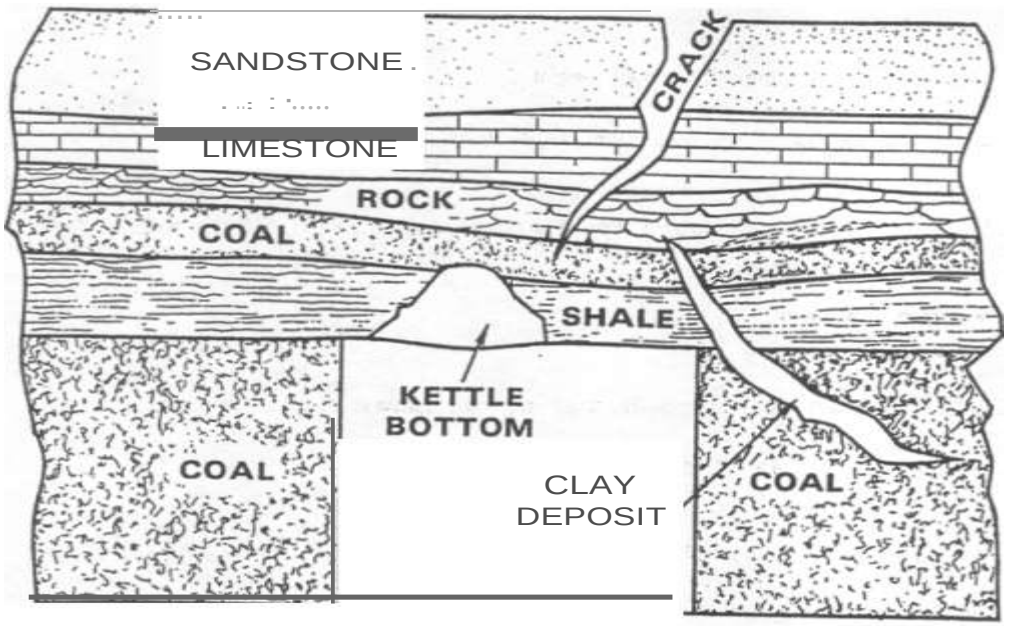
A. At least two rows of temporary supports on four feet centers.

90. Q. What shall be provided for the workers to determine when the maximum depth of an extended cut is obtained?

A. A conspicuous reference mark.

91. Q. When shall extended cut depths be reduced?

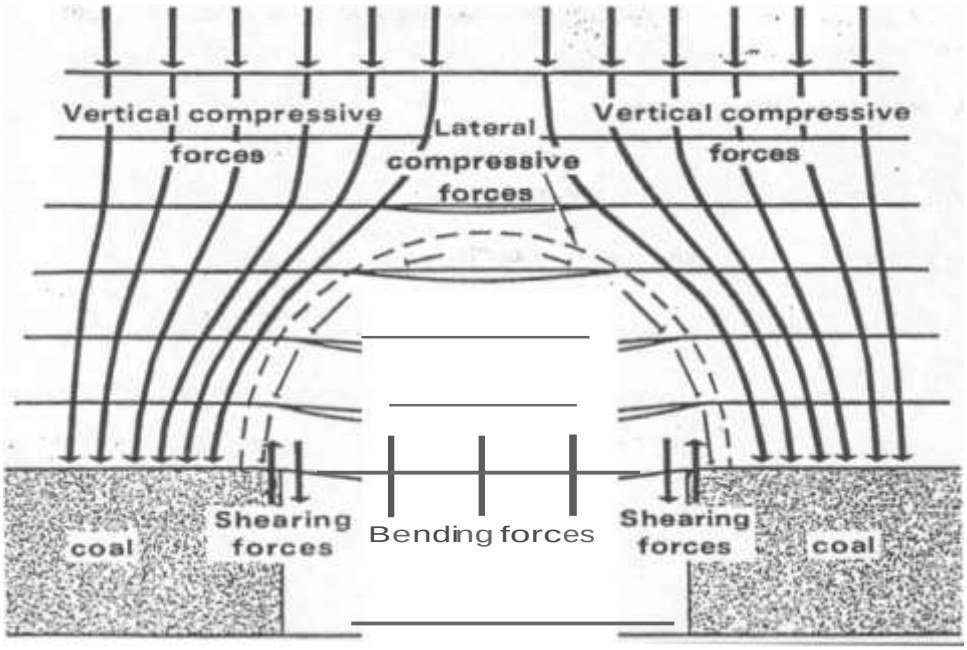
A. Where adverse roof conditions are encountered.



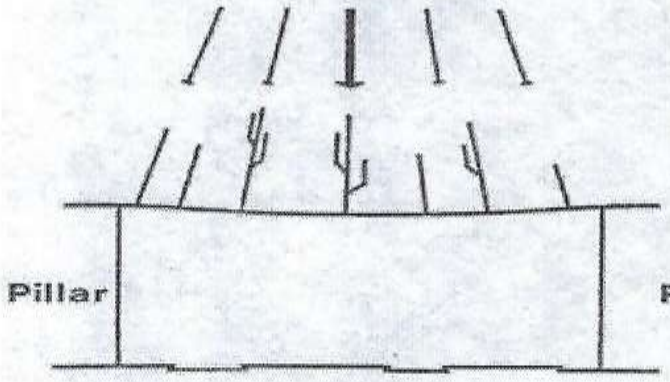
MINE STRATA WITH FAULTS AND INTRUSIONS

DISTRIBUTION OF FORCES

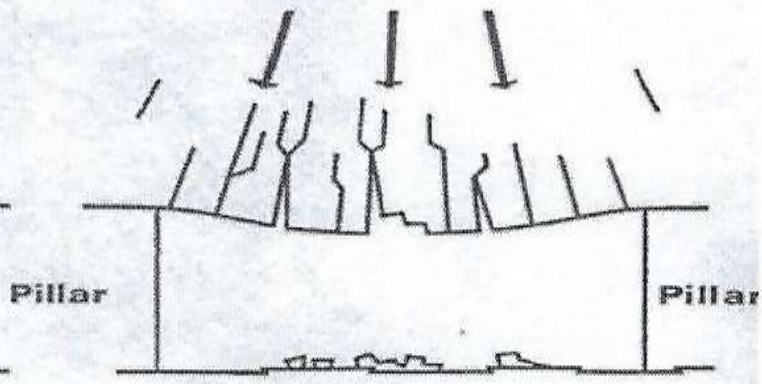
IN THE VICINITY OF A NARROW OPENING



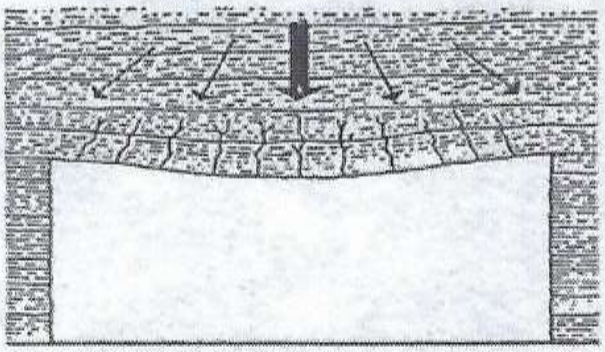
SEQUENCE OF A ROOF FALL



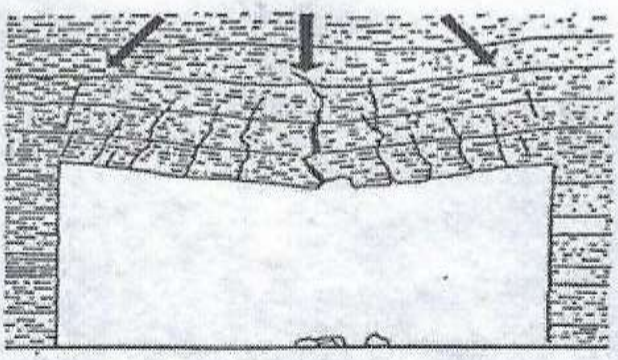
In the first stage, the roof begins to sag and tension cracks appear



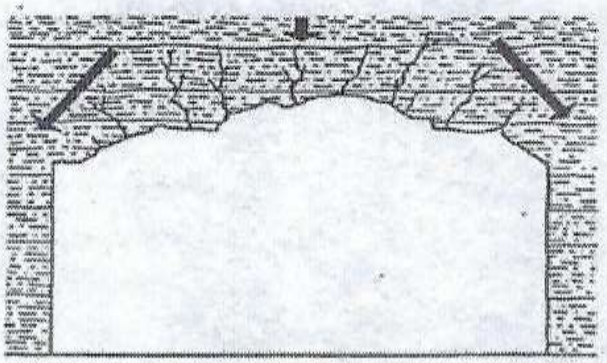
The center of the roof breaks, wedging itself, and the vertical load increases



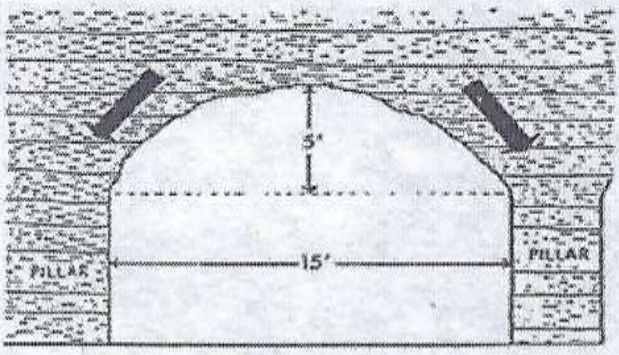
1. In early stage, roof begins to sag, then tension cracks begin to appear.



2. Roof center breaks, wedges itself. Vertical load greatly increases.



3. Vertical load is transferred to pillars as roof works its way into an arch.



4. Roof has fallen completely and forces are transmitted to pillars. Falling may take minutes, days or even months.

Notes:

TRANSPORTATION

TRANSPORTATION

1. Q. What is a major cause of fatalities in coal mines?

   A. Haulage.

2. Q. How shall mining equipment be transported or trammed?

   A. Only by qualified personnel under the direct supervision of a certified foreman.

3. Q. Who is permitted to be inby the equipment being moved in the same ventilating split that is passing over such equipment?

   A. No person.

4. Q. What shall be done, if necessary, so as to provide clearance and to avoid accidental contact with power lines when moving equipment?

   A. Equipment shall be insulated, and assemblies removed.

5. Q. What are some unsafe haulage practices?

   A. Making flying switches, permitting men to ride on pushed trips, throwing switches, and opening doors in front of moving trips, riding loaded cars, riding on the front bumper of cars, leaving unblocked cars on tracks, coupling cars in motion, and getting off or on trips in motion.

6. Q. What should be provided along haulage roads to permit persons to pass moving cars with safety?

   A. Sufficient clearance of at least 24 inches and shelter holes.

7. Q. What clearance shall be maintained along entries between the car and the rib, gob, or timber?

   A. Not less than 24 inches on the clearance side.

8. Q. Where shall the clearance side along a track be located relative to the trolley wire?

   A. On the side of the entry opposite the trolley wire.

9. Q. What minimum clearance shall be maintained on the trolley wire side between the car and the rib, gob, or timber?

   A. Not less than 12 inches.

10. Q. What shall be the minimum clearance on the designated clearance side along each track in sidetracks?

A. 24 inches.

11. Q. What shall be the clearance where supplies are loaded or unloaded?

A. Ample clearance shall be provided, however, never less than 24 inches.

12. Q. What provision should be made relative to leaving supplies along a haulage road?

A. All supplies should be unloaded in a breakthrough or other opening where the clearance will not be obstructed, and on the side opposite to the trolley wire unless the wire is adequately guarded.

13. Q. What protection shall be provided for persons along haulageways?

A. Shelter holes shall be provided and maintained.

14. Q. How shall shelter holes be maintained?

A. Clear of refuse and other obstructions.

15. Q. What shall be the maximum distance between shelter holes?

A. 105 feet.

16. Q. What is the minimum size required for shelter holes?

A. Five (5) feet in depth, four (4) feet in width, and as high as the traveling space.

17. Q. What protection from moving trips shall be provided on both sides of permanent doors?

A. Shelter holes.

18. Q. What protection from moving trips shall be provided at switch throws?

A. Shelter holes.

19. Q. When should shelter holes be used?

A. At all times when men encounter approaching trips.

20. Q. How are moving trips required to be lighted?

A. By a conspicuous light on both the front and rear.

21. Q. Who shall see that a conspicuous light is placed on the front and rear of trips?

A. The motorman and trip rider.

22. Q. Who shall provide the conspicuous light for the front and rear of every trip?

A. The mine foreman.

23. Q. Where shall the operator of a locomotive be while the locomotive is being operated?

A. In the deck.

24. Q. What precaution should be taken before the controller is engaged on the locomotive?

A. A motorman should be within the deck and all persons and equipment in the clear.

25. Q. How should the brakes on locomotives be maintained?

A. In proper operating condition.

26. Q. What material should be provided on each locomotive to increase traction?

A. Sand.

27. Q. How should the sand rigging on locomotives be maintained?

A. In proper operating condition.

28. Q. How should the decks of locomotives be protected from loose material in the track entry?

A. With shields.

29. Q. What is the duty of the motorman relative to the speed on haulage roads?

A. He should operate at reasonable speed and keep trips under full control at all times.

30. Q. What signaling devices shall be provided on locomotives and shuttle cars?

A. Sounding devices.

31. Q. What equipment is required on all locomotives and personnel carriers?

A. A lifting jack and handle.

32. Q. How should motormen operate trips when approaching and passing through doors and curtains?

A. At reduced speed and under full control, capable of immediate stop.

33. Q. What protection shall be provided for trips, locomotives and other mechanically operated equipment coming out onto tracks used by other equipment?

A. A system of signals or other devices shall be used.

34. Q. What shall be done to regulate and safeguard the movement of trips?

A. A proper system of signals shall be provided.

35. Q. Who shall be on duty in any coal mine where more than 350 tons of coal are produced on any shift in each 24-hour period?

A. A dispatcher shall be on duty when there are movements of track equipment underground, including time when there is no production of coal.

36. Q. What shall be the dispatcher's duty?

A. Direct traffic.

37. Q. What precaution should be taken in making up trips to haul rail, pipe, or long supplies?

A. One or more empty cars should be placed between the locomotive and the material car.

38. Q. In what manner shall trips not be operated on main haulageways?

A. By being pushed, except for switching.

39. Q. What precaution should be taken before the motorman leaves the locomotive?

A. Directional levers shall be in neutral, and brakes set.

40. Q. What is the duty of the motorman relative to spotting cars near a door or curtain?

A. No cars or other equipment should be spotted near or in doors or curtains.

41. Q. What is the duty of the motorman relative to unsafe places along the haulageway?

A. He should report such places to the mine foreman or supervisor immediately.

42. Q. What are the specific duties of motormen and brakemen relative to ventilating doors?

A. They should not damage, block, or permit ventilating doors to remain open.

43. Q. What precautions should be observed while cars are being delivered to the working section?

A. To see that all miners are in the clear.

44. Q. How shall a mantrip be operated?

A. Under full control at all times.

45. Q. At what speed shall a mantrip be operated?

A. At a safe speed not to exceed 12 miles per hour.

46. Q. Is back-poling prohibited?

A. Yes, however, back-poling is permitted with precaution to the nearest turning point not to exceed 80 feet or when going up extremely steep grades.

47. Q. Why is back-poling prohibited?

A. The pole may leave the wire and cause the pole to break, resulting in serious injury.

48. Q. When should mantrips not be operated on long steep grades?

A. When other trips which may get out of control are on the grade above them.

49. Q. Who shall supervise the operation of mantrips?

A. Foreman or other designated competent persons.

50. Q. In what manner should mantrip cars not be operated?

A. By being pushed.

51. Q. What type of cars shall not be used for mantrips?

A. Drop-bottom cars unless special safety precautions are taken.

52. Q. What are the duties of motormen and trip riders relative to persons riding on locomotives or loaded cars?

A. They shall not permit such riding.

53. Q. Who may ride on loaded cars or on the outside of a car?

A. No person.

54. Q. On which side shall miners not ride?

A. On the trolley wire side unless suitable covered man cars are used.

55. Q. Where shall miners not get on or off mantrip cars?

A. On the same side as the trolley except where protection and clearance are maintained.

56. Q. When is a trip rider or brakeman permitted to get off of a slow-moving trip?

A. A trip rider or brakeman may get on or off the rear end of a slowly moving trip or the stirrup of a slowly moving locomotive to throw a switch, align a derail or open or close a door.

57. Q. From what part of moving cars should men not get on or off?

A. From the front or between cars.

58. Q. When shall miners not get on or off mantrip cars?

A. When the cars are in motion.

59. Q. From what side should cars not be coupled?

A. From the wire side or the inside of a curve.

60. Q. How may mine cars be coupled safely?

A. By coupling when not in motion.

61. Q. How should clearance points at the end of sidetracks be designated?

A. By being marked.

62. Q. What is required on haulage roads between the end car of trips placed on sidetracks and moving traffic?

A. A clearance point shall be marked with an approved device.

63. Q. Where should cars, locomotives or other equipment be placed on sidetracks?

A. Inby the clearance points.

64. Q. What are the primary requirements of good mine track?

A. That it is of proper size, well tied and spiked, joints well bolted, properly laid, and kept clean and well drained.

65. Q. What hazards are associated with poorly maintained track?

A. Hazards connected with frequent derailments.

66. Q. What are the primary causes of haulage accidents?

A. Improperly maintained track, insufficient clearance, and unsafe practices.

67. Q. What should be the condition of track at working sections before cars are placed?

A. The track should be in safe condition.

68. Q. In what condition should haulageways and travelways be maintained?

A. Clean and properly maintained.

69. Q. Where shall switch throws be located?

A. On the side opposite the trolley wire where possible.

70. Q. What kind of switch throws is safest?

A. Automatic.

71. Q. How should switches be kept aligned?

A. With the main line track.

72. Q. What safety precautions shall be observed where track is on a steep grade?

A. Derails should be installed.

73. Q. What devices should be provided to prevent the rail car from moving?

A. Stopblocks, chains or clevises.

74. Q. When a trip is uncoupled from a locomotive on a grade, what precautions would be taken?

A. That brakes are set, and the cars are properly secured.

75. Q. What is meant by track gauge?

A. The distance between the rails, measured from ball to ball.

76. Q. When trackmen are working on haulageways, what notice shall be given haulage crews?

A. Notice to haulage crews to maintain traffic under a slow and safe operating speed at the point of construction or repair.

77. Q. If a dispatcher's station is provided at a new mine or relocated at a mine already in operation, where shall it be located?

A. On the surface.

78. Q. What is the purpose of installing stopblocks or derails?

A. To protect persons from danger of runaway haulage equipment.

79. Q. If a pusher locomotive is not used on a trip, what is required?

A. The locomotive operator shall have an assistant to assist him in his duties.

80. Q. What communication is required on self-propelled track equipment?

A. All self-propelled track equipment shall be equipped with two-way communications.

81. Q. Whose duty is it to inspect a locomotive prior to putting it into operation?

A. The motorman.

82. Q. What shall a motorman do if during an inspection of a locomotive he finds a defect?

A. Report such defect to the proper supervisor.

83. Q. If a locomotive is not coupled to the trip ahead, what distance shall be maintained between the locomotive and the trip?

A. At least three hundred (300) feet.

84. Q. Are tools, small machine parts, and supplies permitted to be transported in mantrips?

A. Yes, however, a mantrip shall be operated independently of any loaded trip of coal or other heavy material.

85. Q. What shall be provided at locations of abrupt or sudden changes in overhead clearance along haulage roads?

A. Warning lights or reflectors.

86. Q. What must be done on all self-propelled section haulage equipment prior to the operator's leaving the normal operating position?

A. Set the park brake.

87. Q. What shall all track haulage cars which are regularly connected and disconnected be equipped with?

A. Couplers.

88. Q. How shall roadways on section haulage equipment travels be maintained?

A. In a safe condition and free of hazards.

89. Q. Prior to section haulage equipment being operated, who shall examine the roadway to be traveled?

A. The equipment operator.

90. Q. What is required on all mobile equipment prior to placing it in service?

A. A pre-shift examination.

91. Q. All self-propelled track haulage equipment shall be equipped with what?

A. An emergency stop switch or other device to deenergize the equipment.

92. Q. What shall be provided where miners load or unload from conveyor belts?

A. Adequate clearance of at least 36 inches, proper illumination at all loading and unloading stations that is observable to all persons, and suitable communications.

93. Q. How should travelways be kept along conveyor belt lines?

A. A clear travel way at least 24 inches wide shall be provided on both sides of all belt conveyors.

94. Q. What is the maximum speed of belts when miners are being transported?

A. 250 feet per minute when minimum overhead clearance is 18 inches. 300 feet per minute when minimum overhead clearance is 24 inches.

95. Q. When must miners not ride on belts?

A. When supplies are being transported.

96. Q. How far apart must miners be spaced when riding belts?

A. At least six (6) feet apart.

97. Q. What is the minimum roof clearance when miners ride belts?

A. At least eighteen (18) inches from the top of roller.

98. Q. When the height of the coal seam permits, what shall the clearance be when miners ride belts?

A. Not less than twenty-four (24) inches.

99. Q. Who shall supervise the loading and unloading of belts used for mantrips?

A. Assistant mine foreman or person designated by the mine foreman.

100. Q. What type of material are belt conveyors required to be made of?

A. Flame-resistant.

101. Q. On belt conveyors that do not transport miners, at what intervals are stop and start controls required to be installed?

A. Not to exceed 1000 feet.

102. Q. What shall be provided where miners are required to cross moving belts?

A. Suitable crossing facilities.

103. Q. When are belt conveyors required to be inspected?

A. Following the last production shift each week, before holidays, vacation periods, and each production shift.

104. Q. What records of belt inspections are required to be kept?

A. Records of daily inspections.

105. Q. What shall all belt conveyors be inspected for daily?

A. Frozen rollers, rock falls and fires.

106. Q. What fire protection shall be provided at each main and secondary conveyor belt drive?

A. Deluge-type water sprays, water sprinklers, dry chemical sprinkler system, or foam generators.

107. Q. What shall be provided on all underground conveyor belts?

A. Slippage and sequence switches.

108. Q. What shall be provided at points where supplies are regularly loaded or unloaded from belt conveyors?

A. Telephone or other suitable communications.

109. Q. If a conveyor belt is used to transport miners, what must be done after supplies are transported on such conveyor belt prior to the transportation of miners?

A. Examined for unsafe conditions.

110. Q. On conveyor belts used for transporting miners, what is required to stop such belt at any location?

A. Readily accessible positive-acting stop controls.

111. Q. What is required when an onshift examination of the belt conveyor and belt conveyor entry has not been made during the preceding shift?

A. An examination of the belt conveyor and belt conveyor entry prior to starting of the belt.

112. Q. What is required when men are loading or unloading a belt conveyor used for man- trips?

A. Belt conveyor shall be stopped.

113. Q. What shall not accumulate along underground belt conveyors?

A. Fine, dry coal and coal dust.

114. Q. What is required by the operator where stockpiles are provided with draw-off feeders?

A. A plan submitted and approved by the Director of MHST.

115. Q. Where transportation of personnel is exclusively by rail, how shall the track be maintained?

A. To within 1,500 feet of the nearest working face, except that when any section is fully developed and being prepared for retreating, then the track shall be maintained to within 1,500 feet of that retreat mining section if a rubber-tired vehicle is readily available: Provided, that in any case where such track is maintained to within a distance of more than 500 feet and not more than 1,500 feet of the nearest working face, a self-propelled, rubber-tired vehicle capable of transporting an injured worker shall be readily available.

EQUIPMENT SAFETY CHECK LIST

For

UNDERGROUND EQUIPMENT

SELF PROPELLED SECTION EQUIPMENT PRE-OPERATIONAL CHECK LIST

1. **STOP/START CONTROL**
2. **PANIC BAR**
3. **TRAM CONTROLS**
4. **STEERING**
5. **SERVICE BRAKES**
6. **AUTOMATIC EMERGENCY BRAKES**
7. **LIGHTS**
8. **WARNING DEVICES**
9. **CANOPIES WHERE REQUIRED**
10. **ATRS SYSTEM AND BOOM CONTROL ON ROOF BOLTING MACHINES**

REPORT SAFETY DEFECTS AND/OR UNSAFE CONDITIONS TO YOUR SUPERVISOR

EQUIPMENT SAFETY CHECK LIST

EQUIPMENT SAFETY CHECK LIST
Note: (Fill out this sheet before starting shift)

Job _____ Date _____

Equipment Type and Number _____

Shift _____ Hours Worked _____

No. of Loads _____

	Defective	Proper
Excessive oil or hydraulic leaks	_____	_____
Back Alarm	_____	_____
Brakes, Foot	_____	_____
Brakes, Parking	_____	_____
Fire Extinguisher	_____	_____
Lights	_____	_____
Horn (Electric)	_____	_____
Windshield Wipers	_____	_____
Glass, Windshield	_____	_____
Glass, Door	_____	_____
Cab-rails	_____	_____
Steps	_____	_____
Steps	_____	_____
Safety Guards	_____	_____
Mirrors	_____	_____
Horn (Air)	_____	_____
Seat Belt	_____	_____
Other:	_____	_____
Tires	_____	_____
Steering	_____	_____
Coolant	_____	_____

Remarks: (Visual Inspection of Machine for any other Mechanical or Safety Defects) _____

_____

Defect Repaired: _____

Signature: Equipment Operator _____

Immediate Supervisor _____

Notes:

DIESEL EQUIPMENT IN UNDERGROUND MINES

Getman Corp. Tow Tractor

DIESEL EQUIPMENT IN UNDERGROUND MINES

1. Q. What is any substance emitted to the mine atmosphere from the exhaust port of the combustion chamber of a diesel engine called?

   A. “Exhaust emission”

2. Q. A diesel engine with an intake system, exhaust system, and a safety shutdown system installed that meets the specific requirements for MSHA approval for use in underground coalmines is called what?

   A. Diesel power package.

3. Q. What is a “Diesel fuel transportation unit”?

   A. A self-propelled or portable wheeled vehicle used to transport a diesel fuel tank.

4. Q. An internal combustion engine using the basic cycle where combustion results from the spraying of fuel into air heated by compression is called what?

   A. Diesel engine.

5. Q. Can a skid-mounted fuel tank be used for transportation of diesel fuel?

   A. No, the tank must be provided with wheels or be self-propelled.

6. Q. A metal container intended for storage, transport or dispensing of diesel fuel, with a nominal capacity of five gallons is called what?

   A. Safety can.

7. Q. Must a safety can used for the transport of diesel fuel be listed or approved by a nationally recognized independent testing laboratory?

   A. Yes.

8. Q. What color is an approved safety can used for transporting diesel fuel?

   A. Yellow.

9. Q. An area of a mine provided for the short-term storage of diesel fuel in a fuel transportation unit, which moves as mining progresses is called what?

   A. “Temporary underground diesel fuel storage area”

10. Q. What is a facility designed and constructed to remain at one location for the storage or dispensing of diesel fuel, which does not move as mining progresses called?

A. “Permanent underground diesel fuel storage facility”

11. Q. Are fixed or permanent diesel fuel storage tanks permitted underground?

A. Fixed underground diesel fuel storage tanks are prohibited.

12. Q. All diesel-powered equipment shall be_____while in operation with the engine running in underground mines.

A. Attended.

13. Q. What does the term “attending diesel equipment” mean?

A. “Attended” shall mean a diesel equipment operator is within sight or sound of the diesel-powered equipment.

14. Q. What is the average concentration of diesel particular matter emissions that is allowed under West Virginia law?

A. 0.12 mg over m to the third power.

15. Q. All significant external surfaces on diesel equipment shall not exceed what surface temperature?

A. 302 degrees Fahrenheit.

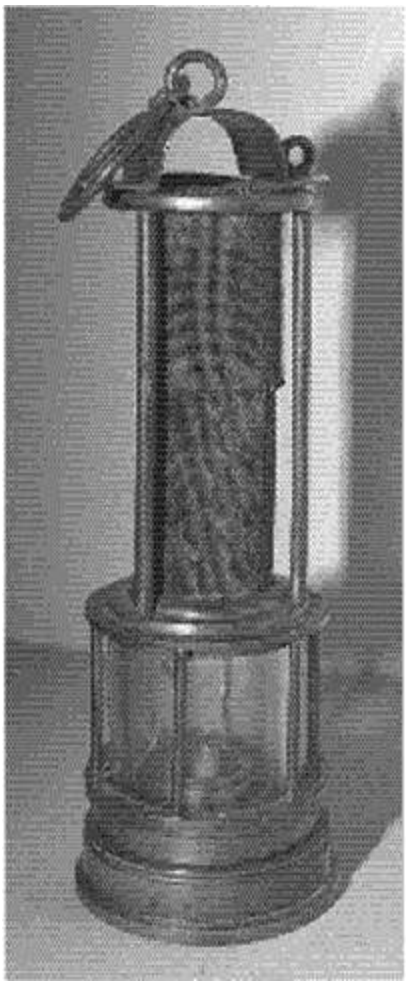
16. Q. What’s the minimum quantity of ventilation required where multiple units are operated on the same split of air?

A. At least 100% of MSHA’s Part 7 approved plate quantities for each unit operating in that split of air.

17. Q. What is the ambient concentration of exhaust gases that are allowed in the mine atmosphere under WV Diesel Law?

A. Carbon Monoxide (CO) ---- not to exceed 35 parts per million ceiling.
Nitric Oxide (NO) --- not to exceed 25 parts per million ceiling.
Nitrogen Dioxide (NO2) – not to exceed 3 parts per million ceiling.

MINE GASES



MINE GASES

Many of the following gases are found in mixtures in mine environments. The mixtures have been given rather graphic names.

Firedamp - A combustible gas, chiefly methane, occurring naturally in coal mines and forming explosive mixtures with air.

Blackdamp - A mine atmosphere deficient in oxygen incapable of supporting life. Blackdamp is heavier than air and lays along the floor.

Afterdamp - The mixture of gases which remain in a mine after a mine fire or an explosion which may contain irrespirable gases.

Whitedamp - An atmosphere containing carbon monoxide which is extremely toxic even in low concentration.

Stinkdamp- An atmosphere containing hydrogen sulfide, which has an odor and taste of rotten eggs.

MINE GASES OXYGEN

Oxygen (02) which is needed to support life also supports the chemical reactions that produce fires and explosions. Oxygen is colorless, odorless, tasteless, and non-toxic at ordinary concentrations and pressures.

Different amounts of oxygen are needed to perform hard work or merely to stay alive. The minimum requirement for an inactive person to maintain consciousness is oxygen content corresponding to 300 to 800 cubic inches of fresh air per minute. A person exercising moderately requires about 3,000 cubic inches of fresh air per minute. Hard work may double the amount of air required for moderate work. The ratio of maximum to minimum requirement is about 20 to 1.

People breathe most easily and work well when the air contains about 21 percent oxygen. At 17 percent oxygen, people breathe a little faster and deeper.

The specific gravity of oxygen is 1.105. Oxygen consists of approximately 1/5 of the atmosphere.

1. Q. What element in air is essential for life?

   A. Oxygen.

2. Q. What is oxygen?

   A. It is a tasteless, odorless, and colorless gas which supports life and combustion.

3. Q. How does the body receive oxygen?

   A. Through breathing air, the oxygen is taken up by the hemoglobin of the blood and carried to all parts of the body.

4. Q. What chemical changes does oxygen undergo in the support of life?

   A. The oxygen combines with the carbon contained by waste products in the body and forms carbon dioxide (CO_2).

5. Q. What is the specific gravity of oxygen?

   A. 1.105.

6. Q. What supports the chemical reaction that produces fires and explosions?

   A. Oxygen.

7. Q. What percent oxygen can a person most easily work in?

   A Twenty-one (21) percent.

8. Q. At what percent oxygen will a person begin to breathe faster and deeper?

   A. Seventeen (17) percent.

9. Q. The earth's atmosphere consists of what percent oxygen?

   A. Approximately twenty-one (21) percent.

MINE GASES NITROGEN

Nitrogen (N2) is the largest component of fresh air. Nitrogen is the chief component, by volume, of the atmosphere of the earth. People are accustomed to inhaling or intaking the normal amount contained in fresh air. Coal may absorb some atmospheric nitrogen. Nitrogen is added in other forms during mining operations. Nitrogen and its compounds may be emitted from strata in certain metal mines. Nitrogen is odorless, colorless, and tasteless and has no effect on the human body. Its compounds are dangerous. As with other gases, too high a nitrogen concentration can dilute the air sufficiently to reduce the oxygen percentage below the safety level.

Nitrogen accumulations may be added to other gases, such as carbon dioxide, to form blackdamp. This can produce an oxygen deficient atmosphere. Nitrogen is approximately 4/5 of the atmosphere.

1. Q. What is nitrogen?

   A. It is a tasteless, odorless, and colorless gas which will neither support life nor combustion.

2. Q. Is nitrogen combustible?

   A. No.

3. Q. What effect does nitrogen have towards propagating an explosion?

   A. None.

4. Q. What is the specific gravity of nitrogen?

   A. 967.

5. Q. What effect does nitrogen have upon life?

   A. It has no effect, except when it depletes oxygen to the extent that there is a deficiency of oxygen.

6. Q. Does nitrogen have an ignition temperature?

   A. No, nitrogen will not ignite.

7. Q. The earth’s atmosphere consists of what percent nitrogen?

   A. Approximately seventy-eight (78) percent.

MINE GASES CARBON DIOXIDE

Carbon dioxide (CO_2) is formed by the oxidation and combustion of organic compounds. It is exhaled by the lungs. It is colorless, and odorless. When inhaled in high concentrations, it has an acid taste. Since CO_2 is heavier than air, it lays along the floor in low places and abandoned workings. It is normally present in mine air.

The proportion of carbon dioxide in mine air is increased by the breathing of people, by oxidation of coals, decay of timber, fires, explosions, and blasting. Carbon dioxide has been found radiating from rock strata in the underground workings of metal mines. It is a constituent of blackdamp and traces of it at the 0.03 concentration are present in normal air.

As little as 0.5 percent carbon dioxide in the mine air will cause people to breathe deeper and faster than in pure air. In 5 percent CO_2, a person breathes about three times as fast as normal. Concentrations of 10 percent cannot be tolerated for more than a few minutes.

The specific gravity of carbon dioxide is 1.529.

1. Q. What is carbon dioxide (CO_2)?

   A. Carbon dioxide is a colorless and odorless gas formed by the chemical combination of carbon and oxygen.

2. Q. How is carbon dioxide formed in a mine?

   A. By combustion, by breathing of miners, by decay of vegetable and animal matter, by the oxidation of coal by chemical action of acid water or carbonates.

3. Q. What is a product of complete combustion?

   A. Carbon dioxide.

4. Q. What is the specific gravity of carbon dioxide?

   A. 1.529.

5. Q. Is carbon dioxide combustible?

   A. No.

6. Q. Where might concentrated accumulations of carbon dioxide ordinarily be found?

   A. Near the floor, in inadequately ventilated places.

7. Q. What effect does carbon dioxide have upon life?

   A. Lung ventilation is increased as carbon dioxide increases. When five percent (5%) of carbon dioxide is present lung ventilation has increased three hundred percent (300%) and breathing is laborious and continued exposure is injurious.

8. Q. How is carbon dioxide detected?

   A. Usually by a chemical analysis.

9. Q. What percent of carbon dioxide is given off by the body during exhalation?

   A. Approximately 2.6 to 6.6 percent.

MINE GASES METHANE

Methane (CH4), also known as marsh gas, is one of the chief constituents of fire damp. It is colorless, odorless, tasteless, non-toxic, and highly flammable. It is found in coal mines, occasionally in metal and non-metal mines and in tunneling operations. It may be liberated in a steady flow or in a sudden burst.

In coal mines, methane may be emitted from the cleats or cracks of the coal, from “blowers” or “feeders”, or from overlying or underlying strata. It is often released in large amounts from the coal when irregularities, such as clay veins, “horsebacks”, or faults occur.

Once liberated from the strata, methane tends to accumulate near the mine roof in high places where it mixes progressively with air currents and eventually may be found uniformly distributed in a cross section of airflow. Once mixed with fresh air, it will no longer separate into layers or form pockets of still gas.

Methane has no specific physiological effect upon people, but enough may accumulate in mine workings to dilute oxygen of the air below the respirable level. Deaths from asphyxiation have resulted from people unknowingly entering high concentrations of methane.

The specific gravity of methane is 0.555. The lowest ignition temperature of methane is 1200 degrees Fahrenheit, and the explosive range if five (5) to fifteen (15) percent.

1. Q. What is methane (CH4)?

   A. A colorless, odorless, and tasteless combustible gas.

2. Q. What is the source of methane in coal mines?

   A. It is liberated from coal and adjoining strata.

3. Q. Where is methane found?

   A. In almost all coal mines.

4. Q. What is the composition of methane?

   A. Carbon and hydrogen (CH4).

5. Q. What is the specific gravity of methane?

   A. 0.555.

6. Q. Where is methane usually found in mines?

   A. Along the roof, to the rises, in the vicinity of working faces, in dead ends and above falls.

7. Q. Why is methane not explosive by itself?

   A. Oxygen is required to support combustion.

8. Q. What is firedamp?

   A. An explosive mixture of methane and air.

9. Q. What is the range of explosibility for methane?

   A. Between five percent (5%) and fifteen percent (15%).

10. Q. Why can there be no explosion when the percentage of methane is greater than fifteen percent (15%)?

    A. Because the amount of oxygen present is insufficient for rapid combustion to occur.

11. Q. What is the percentage of methane required for maximum explosive violence?

    A. Ten percent (10%).

12. Q. What is the percentage of oxygen below which no explosion of a methane air mixture can occur?

    A. Twelve percent (12%).

13. Q. What effect does an atmosphere with reduced oxygen content have upon the explosibility of methane?

    A. A greater percentage of methane is necessary to start an explosion in an atmosphere which contains less than the normal percentage of oxygen.

14. Q. What effect does the presence of methane have upon the explosibility of coal dust?

    A. The coal dust is more easily ignited, and the force of the explosion is greater.

15. Q. What effect does coal dust in the air have upon the explosibility of methane?

    A. The lower explosive limit is decreased.

16. Q. How can methane be detected?

    A. By a multi-gas detector, by the use of methane detectors and testers and by chemical analysis.

17. Q. What dangerous gas is most likely to be encountered above a pillar fall?

A. Methane.

18. Q. If a split of air of twenty thousand (20,000) cubic feet per minute contains three percent (3%) methane how many cubic feet per minute would be required to reduce the methane content to one percent (1%)?

A. Sixty thousand (60,000) cubic feet.
Solution: 20,000 X 3% ÷ 1% =
$\frac{20{,}000 \times 3}{1}$ = 60,000 cubic feet

19. Q. What is the instrument most often used in detecting methane?

A. An approved methane detector.

20. Q. What is meant by the diffusion of gases?

A. Their mixing with each other.

21. Q. How does the diffusion rate of gases vary?

A. Light gases diffuse more rapidly than heavy gases.

22. Q. Will diffused gases separate from a mixture because of their differences in weight?

A. No, they will not separate or stratify once they have been diffused or mixed.

23. Q. Which is easier to remove, a body of methane or carbon dioxide?

A. Methane would be the easiest to remove because it is lighter than carbon dioxide and diffuses more readily.

24. Q. What gas is odorless, tasteless, non-toxic, colorless, and explosive in the concentration of 5% - 15%?

A. Methane.

25. Q. Where is methane normally found?

A. Since the specific gravity of methane is .555 which indicates that it is lighter than air, it is normally found in high places.

MINE GASES CARBON MONOXIDE

Carbon monoxide (CO) forms by the incomplete combustion of solids, liquids or gases that contain carbon. Although it is sometimes called “whitedamp” carbon monoxide is colorless, tasteless, and odorless. It is toxic even in low concentrations.

Carbon monoxide is produced during mine fires by the explosion of gas and coal dust and in blasting or in the burning of explosives.

Air which contains 12.5 to 75 percent carbon monoxide will explode if ignited.

The most important characteristic of carbon monoxide is its poisonous action in low concentrations. The human lungs absorb CO in preference to oxygen. If suddenly exposed to a high concentration a person may collapse before experiencing any warning symptoms. If not removed to safe air immediately they will die. Prolonged exposure even to non-lethal concentrations produces a continual feeling of tiredness, headache, nausea, increased heart rate and mental dullness. The generally recognized maximum allowable CO concentration for an 8-hour period is 0.005 percent or 50 ppm. A concentration of 0.4 percent or 4,000 ppm will cause death in less than 1 hour.

The specific gravity of carbon monoxide is 0.967.

The lowest ignition temperature of carbon monoxide is 1190 degrees Fahrenheit.

1. Q. What is carbon monoxide (CO)?

   A. It is a colorless, odorless, tasteless, combustible, and poisonous gas.

2. Q. How can carbon monoxide be detected?

   A. By multi-gas carbon monoxide detectors and by chemical analysis.

3. Q. What is the source of carbon monoxide?

   A. It is the product of incomplete combustion (combustion with insufficient oxygen).

4. Q. When is carbon monoxide most likely to be found in mines?

   A. When there is a mine fire or after an explosion.

5. Q. What is afterdamp?

   A. The atmosphere following an explosion containing carbon dioxide, carbon monoxide, decreased oxygen, nitrogen, hydrogen, and smoke.

6. Q. What kind of engines produce carbon monoxide?

   A. Internal combustion engines.

7. Q. What is the principal poisonous gas produced by explosives?

   A. Carbon monoxide.

8. Q. What effect does carbon monoxide have on life?

   A. It is extremely poisonous.

9. Q. How does carbon monoxide cause injury to life?

   A. By combining with the hemoglobin of the blood and excluding oxygen.

10. Q. What percentage of carbon monoxide will produce symptoms in several hours?

    A. Two hundredths of one percent (.02%) or 200 ppm.

11. Q. What percentage of carbon monoxide will produce discomfort in two or three hours?

    A. Four hundredths of one percent (.04%) or 400 ppm.

12. Q. What percentage of carbon monoxide will produce a tendency to stagger in one and one-half (1-1/2) hours?

    A. Eight to twelve hundredths of one percent (.08% - 0.12%) or 800 to 1,200 ppm.

13. Q. What percentage of carbon monoxide will produce symptoms of unconsciousness in thirty (30) minutes?

    A. Twenty to thirty hundredths of percent (.20% - .30%) or 2,000 to 3,000 ppm.

14. Q. How much greater affinity does hemoglobin have for carbon monoxide than for oxygen?

    A. About three hundred (300) times.

15. Q. Why are small quantities of carbon monoxide injurious?

    A. Because it is not easily discarded and accumulates in the blood.

16. Q. What is the explosive range of carbon monoxide?

    A. Between twelve and five-tenth percent (12.5%) to seventy-five percent (75%)

MINE GASES HYDROGEN

Hydrogen (H2) is a colorless, odorless, tasteless, and highly flammable gas. Hydrogen is produced during mine fires, explosions and by charging batteries. Air which contains 4.1 to 74 percent hydrogen will explode if ignited. The lowest ignition temperature of hydrogen is 935 degrees Fahrenheit.

The specific gravity of hydrogen is 0.07.

Hydrogen is detected only be chemical analysis.

1. Q. What is hydrogen (H2)?

   A. It is a colorless, odorless, and tasteless gas.

2. Q. How is hydrogen formed in a mine?

   A. It is formed by mine fires, explosions and by charging batteries.

3. Q. Is hydrogen explosive?

   A. Yes, over a wide range.

4. Q. What is the specific gravity of hydrogen?

   A It is the lightest of all gases. Specific gravity 0.07

5. Q. What is the explosive range of hydrogen?

   A. From four and one-tenth percent (4.1%) to seventy-four percent (74%).

6. Q. What is the ignition temperature of hydrogen?

   A. 935 degrees Fahrenheit.

7. Q. How is hydrogen detected?

   A. By chemical analysis.

MINE GASES HYDROGEN SULFIDE

Hydrogen sulfide, H2S, usually forms by decomposition of sulfur compounds. It is colorless and has the odor and taste of rotten eggs and may also be called “stinkdamp”. It is poisonous in small concentration.

Hydrogen sulfide is liberated by burning explosives containing sulfur, black blasting powder or dynamite.

Hydrogen sulfide occurs in large amounts in the natural gas and oil from certain fields and in gypsum mines. Occasionally, it has been found emitting from gas blowers or feeders in coal mines. It is frequently soluble and is thus carried into mine workings by water.

Enough H2S can occur in coal mines under normal conditions to cause severe eye irritation. Concentrations from 4.3 to 45 percent in the air will explode when ignited. The generally recognized maximum allowable concentration of hydrogen sulfide in the air of working places is 0.002 percent by volume during an 8-hour exposure. H2S acts mainly as an eye irritant. Concentrations from 0.005 to 0.07 percent becomes dangerous after a 1/2-hour exposure.

Higher concentrations produce acute systemic poisoning which may act upon the nervous system and cause breathing to stop abruptly, resulting in death. Hydrogen sulfide is considered more than twice as poisonous as carbon monoxide.

The specific gravity of hydrogen sulfide is 1.191.

The lowest ignition temperature of hydrogen sulfide is 655 degrees Fahrenheit.

1. Q. What is hydrogen sulfide?

   A It is a poisonous, combustible, colorless gas having a taste and odor like rotten eggs.

2. Q. What mine gas can be detected by its odor?

   A. Hydrogen sulfide.

3. Q. What is the origin of hydrogen sulfide?

   A. It is liberated by burning explosives containing sulfur such as black powder or dynamite.

4. Q. How can hydrogen sulfide be detected other than by sense of smell?

   A. By a hydrogen sulfide detector, chemical analysis, or multi-gas detector.

5. Q. What is the specific gravity of hydrogen sulfide?

   A. 1.191.

6. Q. What is the range of explosibility of hydrogen sulfide?

A. Four and three-tenths (4.3%) to forty-six percent (46%).

7. Q. Is hydrogen sulfide poisonous?

A. Yes, it is extremely poisonous even in small amounts.

8. Q. What is the most violent explosive point of hydrogen sulfide?

A. Fourteen percent (14%).

9. Q. What is the temperature of ignition of hydrogen sulfide?

A. 655 degrees Fahrenheit.

10. Q. What percent of hydrogen sulfide will become dangerous after a 1/2 hour?

A. .005 to .07.

11. Q. What is the immediate effect of hydrogen sulfide on a person?

A. It is extremely irritating to the eyes.

MINE GASES SULFUR DIOXIDE

Sulfur dioxide is a heavy pungent toxic gas that is easily condensed to a colorless liquid. Sulfur dioxide is used in making sulfuric acid, in bleaching, as a preservative and as a refrigerant.

Sulfur dioxide is a major air pollutant in industrial areas. Sulfur dioxide is a colorless, suffocating, irritating, poisonous gas that is intolerable to breathe.

Sulfur dioxide is liberated by burning coal containing pyrites and the firing of black powder.

The specific gravity of sulfur dioxide is 2.263.

1. Q. What is sulfur dioxide (SO2)?

   A. A colorless, suffocating, irritating, and poisonous gas.

2. Q. How is sulfur dioxide formed in a mine?

   A. By burning coal containing pyrites or by the firing of black powder.

3. Q. What is the specific gravity of sulfur dioxide?

   A. 2.263.

4. Q. What is the particular danger of sulfur dioxide?

   A. It is extremely poisonous even in small amounts.

5. Q. How is sulfur dioxide detected?

   A. By chemical analysis.

6. Q. What is the first effect on a person exposed to sulfur dioxide?

   A. It is extremely irritating and suffocating and is intolerable to breathe.

7. Q. Is sulfur dioxide combustible?

   A. No, it is incombustible.

MINE GASES NITROGEN DIOXIDE

Nitrogen dioxide (NO_2) forms by the burning of high explosives and exhaust emissions of diesel-powered equipment. Nitrogen dioxide has an odor of burning explosives and is tasteless.

Nitrogen dioxide is detected with a multi-gas detector. It is poisonous but will not explode.

The specific gravity of nitrogen dioxide is 1.589.

1. Q. What is nitrogen dioxide (NO_2)?

   A. It is an extremely poisonous gas frequently formed by the burning of high explosives and exhaust emissions of diesel-powered equipment.

2. Q. What is the specific gravity of nitrogen dioxide?

   A. 1.589.

3. Q. Is nitrogen dioxide combustible?

   A. No, it is incombustible.

4. Q. What percentage of nitrogen dioxide will be fatal?

   A. Extremely low concentrations, probably about one hundredth of one percent (0.01%).

5. Q. How may traces of nitrogen dioxide be detected?

   A. By chemical analysis or multi-gas detector.

6. Q. What are the first effects of nitrogen dioxide on a person?

   A. It is extremely irritating to the nostrils and the eyes.

7. Q. What is the particular danger of nitrogen dioxide?

   A. Relatively small quantities may cause death even after apparent recovery.

MINE GASES OXIDES OF NITROGEN

Oxides of nitrogen are formed in mines by burning, by afterburning and under certain conditions by detonation of high explosives. They occur in the exhaust of diesel and gasoline engines. They are formed by the reaction of atmospheric oxygen and nitrogen in the air around electric arcs and sparks and by the burning of nitrated materials.

The most common toxic oxides of nitrogen are nitric oxide (NO) and nitrogen dioxide (NO_2 or N_2O_4) depending upon the temperature. Nitric oxide does not exist in significant amounts in the air, since in the presence of moisture and oxygen it is further oxidized to dioxide.

When air samples are analyzed for oxides of nitrogen, the results usually are reported in terms of nitrogen dioxide (NO_2), since this designation gives proper evaluation of the toxic properties of the atmosphere.

OXYGEN DEFICIENCY

Oxygen Present	Effect
21%	Breathing easiest
17%	Breathing faster and deeper
15%	Dizziness, buzzing noise, rapid pulse, headache, blurred vision
9%	May faint or become unconscious
6%	Movement convulsive, breathing stops, shortly after heart stops

Physiological Effects of Carbon Monoxide

Concentration of CO, Percent	Allowable Length of Exposure
0.01	Allowable for exposure of several hours
0.04 to 0.08	Can be inhaled for 1 hour without appreciable effect
0.06 to 0.07	Just noticeable effects after 1 hour exposure
0.10 to 0.12	Unpleasant, but probably not dangerous after 1 hour exposure
0.15 to 0.20	Dangerous for exposure of 1 hour
0.4 or more	Death in less than 1 hour

PROPERTIES of MINE GASES

GAS	Symbol	Specific Gravity	Density (lb/ft3)	TVL*** (ppm)	Hazard
Air		1	0.075		
Nitrogen	N_2	0.967	0.073		Simple asphyxiate
Oxygen	O_2	1.105	0.083		(At elevated pressures)
Carbon dioxide	CO_2	1.529	0.115	5000	Affects respiration
Methane	CH_4	0.554	0.042		Flammable and a simple asphyxiate
Carbon monoxide	CO	0.967	0.073	50	Very toxic
Nitric Oxide	NO	1.036	0.078	25	Very toxic
Nitrogen dioxide	NO_2	1.589	0.119	5***	Very toxic
Sulfur dioxide	SO_2	2.264	0.17	5	Very toxic
Hydrogen sulfide	H_2S	1.191	0.089	10	Very toxic
Hydrogen	H_2	0.0695	0.0052		Hydrogen

* Ratio of density of gas to that of air at sea level and 70°F.

** Determined at sea level and 70°F

*** Threshold Limit Valve; average (time weighted) concentration for a daily 7- or 8-hour workday that will not produce an adverse effect in most workers

**** Ceiling valve (maximum allowable concentration)

PHYSIOLOGICAL EFFECTS OF CARBON MONOXIDE (CO)

Concentration of CO PPM	Allowable Length of Exposure
100	Allowable for exposure of several hours
400 to 500	Can be inhaled for 1 hour without appreciable affect
600 to 700	Just noticeable effects after 1 hour exposure
1000 to 1200	Unpleasant, but probably not dangerous after 1 hour exposure
1500 to 2000	Dangerous for exposure of 1 hour
4000 or greater	Death in less than 1 hour

Asphyxiates are gases which cause suffocation or choking.

Solubility is the ability of a gas to be dissolved in water.

Notes:

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78 Trapped in Mine by Blasts and Fire

Smoke billowing from the Llewellyn portal of Mountaineer Coal Co. yesterday after explosion trapped at least 70.

21 Safe in West Virginia —Flames Halt Rescue Efforts Until Today

By BEN A. FRANKLIN
Special to The New York Times

FARMINGTON, W. Va., Nov. 20 — A series of explosions sparked fierce fires deep below the earth in a soft coal mine early today, trapping 78 of 99 miners who were at work.

Efforts to reach the men, who were trapped 600 feet below ground, were put off late today until at least tomorrow morning as fire and smoke and the danger of further blasts barred waiting rescue teams from the mine portals.

Twenty-one miners of 99 on last night's midnight-to-8 A.M. shift were known to be safe. There has been no contact with any of those still missing.

An explosion at 5:40 A.M. today shattered the miners' lamp house, where precise records are kept of men going below ground.

It was not until tonight that officials of the Consolidation Coal Company of Pittsburgh, which owns the huge Farmington No. 9 mine at nearby James Fork, could give an accurate estimate of the number still missing.

The mine is operated by the

Continued on Page 34, Column 4

FARMINGTON
WEST VIRGINIA
NOV. 1968

FIRES AND EXPLOSIONS

1. Q. What are the principal causes of mine fires?

   A. Open lights, smoking, electric sparks, heating of electrical equipment, ignition of gas, blasting, and spontaneous combustion.

2. Q. What hazard may be created by wooden structures inside a mine?

   A. The hazard of fires.

3. Q. What methods have been used to control or extinguish mine fires?

   A. (a) Chemicals, rock dust, or sand.
   (b) Enclosing affected area with tight seals.
   (c) Flooding affected areas.
   (d) Foam.

4. Q. How may rock dust be used effectively to extinguish a mine fire?

   A. By applying a thick layer of rock dust to the fire.

5. Q. Under what conditions may rock dust be used to extinguish a mine fire?

   A. When the fire can be approached near enough so that rock dust can be directed upon the burning material.

6. Q. What advantage does rock dust have over the use of water in extinguishing a mine fire?

   A. Rock dust can be carried by the air current and deposited upon the fire; it eliminates the formation of steam and water gas; the use of rock dust also protects the roof from disintegration caused by steam and water.

7. Q. What is the most effective means of applying rock dust to a mine fire?

   A. By the use of a high-pressure rock dusting machine.

8. Q. What is the safest and most effective means of controlling a serious mine fire?

   A. By sealing.

9. Q. When should a mine fire be sealed?

   A. Whenever it is not reasonably safe to employ direct methods of fighting the fire.

10. Q. When is it advisable to fight a mine fire by flooding?

A. Only when it is otherwise inaccessible and local conditions are favorable.

11. Q. Why is it not advisable to fight a mine fire by flooding?

A. (a) Heavy damages to mine and equipment.
(b) Expense of dewatering.
(c) Impossibility of ascertaining if fire is extinguished. (d) Period of non-productivity.
(e) Possibility of generating explosive and dangerous gases by insufficient amount of water on the fire area.

12. Q. What is the object of sealing a mine fire?

A. To cut off the supply of oxygen.

13. Q. What are the principal hazards in sealing mine fires?

A. Explosive and asphyxiating gases.

14. Q. What changes occur to the atmosphere sealed within a fire area?

A. Carbon dioxide and carbon monoxide are increased, oxygen is depleted, and explosive gases may accumulate.

15. Q. What is the first thing to do upon discovery of a mine fire?

A. Withdraw all miners from the mine, except those engaged in fighting the fire.

16. Q. Under what circumstances may methane accumulate in the presence of fire without the danger of an explosion?

A. When the rate of liberation is not sufficient to produce an explosive mixture before the oxygen has been reduced to twelve percent (12%).

17. Q. What is the principal danger while mine fires are being sealed?

A. The danger of gas explosion.

18. Q. How may the danger of an explosion be minimized while sealing a fire area?

A. By sealing sufficiently far away to prevent explosive mixtures from forming before the fire seals can be completed.

19. Q. What kind of fire seals should be erected first?

A. Temporary seals.

20. Q. Why should temporary seals be erected first to seal a mine fire?

A. Quickness of erection lessens the exposure of the miners to the danger of an explosion.

21. Q. During what period after a fire seal has been erected is there danger of an explosion?

A. While the oxygen content remains above twelve percent (12%).

22. Q. What are the essential requirements of permanent fire seals?

A. They should be as airtight as possible.

23. Q. How may permanent fire seals be made relatively airtight?

A. By “hitching” them into the floor, roof and ribs and coating the seals.

24. Q. Of what material should permanent fire seals be constructed?

A. They should be substantially constructed of incombustible material.

25. Q. What facilities should be provided in permanent fire seals?

A. Pipes should be provided through which air samples may be collected and excessive internal pressures can be bled.

26. Q. By what means can the condition of the fire in a sealed area be indicated?

A. By analysis of air samples collected from behind the seals.

27. Q. How can excessive internal pressures be relieved from a sealed area without permitting air to enter?

A. By bleeding off through a water trap.

28. Q. What would continued high oxygen content in a sealed fire area indicate?

A. That there is a leakage of air into the sealed area.

29. Q. What would a fluctuating high carbon monoxide concentration in a sealed fire area indicate?

A. That there is a leakage of air into the sealed area, keeping the fire active.

30. Q. How would an air analysis indicate that the fire was extinguished?

A. By low oxygen content and the absence of carbon monoxide.

31. Q. What are the two most dangerous gases encountered in mine fires?

A. Carbon monoxide and methane.

32. Q. How does the action of a mine fire cause explosive gases to be formed?

A. By distillation of combustible gases from the coal and surrounding carbonaceous shales and by chemical reaction between carbon of the coal, oxygen of air and coal, and hydrogen from water at the higher temperature.

33. Q. How may the danger of an explosion following a mine fire be minimized?

A. By sealing a large area enclosing the fire.

34. Q. What is the primary consideration in fighting mine fires?

A. To provide for the safety of the miners engaged in the work.

35. Q. What is the danger of reversing the air current in the event of a mine fire?

A. Flammable gases formed by the fire may become explosive when drawn across the fire.

36. Q. In what way may the possibility of mine fires be lessened?

A. By the use of closed lights, permissible explosives, approved electrical installations, sealing of abandoned areas, and careful supervision.

37. Q. What combustible and dangerous gas may be formed by the application of water to a mine fire?

A. Water gas (carbon monoxide and hydrogen).

38. Q. How may gob fires in abandoned areas be avoided?

A. By sealing to exclude oxygen.

39. Q. In the event of a mine fire located on the return of an extremely gassy section, what precaution should be taken?

A. The air should be short-circuited to prevent the gas from being carried across the fire area.

40. Q. In the event of a mine fire discovered on the intake, what should be done to protect the miners on the ventilation current inby from smoke and dangerous gasses?

A. By sealing to exclude oxygen.

41. Q. In the event of a mine fire, how should the fire be approached?

A. Cautiously from the intake side by a competent person.

42. Q. What precautions should be taken to protect those engaged in attempting to extinguish a mine fire?

A. The fire-fighting crew should be protected with fresh air.

43. Q. In the event of a mine fire, should the fan be stopped?

A. Only when so decided by persons in charge who are experienced in rescue and recovery operations.

44. Q. How long a period is arbitrarily set, after temporary seals are erected, before rescue teams are permitted to return to the seals for investigation?

A. Seventy-two (72) hours or longer.

45. Q. What should be done to determine when a sealed fire area should be opened?

A. Samples of air should be taken from the sealed area and chemically analyzed. Opening should not be attempted for at least one hundred (100) days.

46. Q. What does the presence of carbon monoxide in a sealed fire area indicate?

A. It indicates an active or recently active fire.

47. Q. What should be totally absent from the air samples before an attempt is made to unseal a mine fire?

A. Carbon monoxide

48. Q. What deficiency of oxygen in a methane-air mixture renders an explosion impossible?

A. When the oxygen is reduced to twelve percent (12%)

49. Q. Why is it not advisable to unseal a fire shortly after the carbon monoxide has disappeared and the oxygen content is reduced to about one percent (1%)?

A. Sufficient time should be allowed for the area to cool to minimize the danger of rekindling, one hundred (100) days minimum.

50. Q. To what percent should oxygen be reduced before it is advisable to attempt to open a fire seal?

A. One percent (1%) or lower.

51. Q. Why is it necessary to have a low oxygen content before a fire seal is opened?

A. Dilution with pure air is likely to form an explosive mixture; a low percentage of oxygen will lessen the danger.

52. Q How should ventilation be restored to a fire area?

A. Gradually and systematically unless conditions make this method hazardous.

53. Q. Why should the ventilation be restored to the fire area gradually and systematically after unsealing?

A. To be assured that all places are cleared of gas before miners enter and to prevent explosive mixtures from forming by an increase of oxygen.

54. Q. What preparatory work is necessary, prior to unsealing a mine fire?

A. Preparation should be made for the fire gases to pass directly to the main return and all entries outby the seals should be heavily rock dusted.

55. Q. Why should careful consideration be given to the problem of unsealing a fire area?

A. The dangerous character of the gases makes the operation extremely hazardous.

56. Q. What is the major consideration in determining when a fire seal should be broken?

A. The composition of the fire gases as found by chemical analysis and their correct interpretation.

57. Q. What is the comparative effect upon oxygen between a raging fire and a smoldering fire?

A. The oxygen will be reduced faster in the presence of a raging fire.

58. Q. How will an oily shale roof and a high volatile coal affect conditions otherwise favorable to reopening a fire seal?

A. Heat will be retained longer, and the danger of rekindling will be increased.

59. Q. What effect does barometric pressure have upon a sealed fire area?

A. Variations of pressure will result in air leakage around the fire seals in the direction of the lower pressure.

60. Q. When should air locks be used to recover a fire area?

A. When the sealed area is extensive, and it is uncertain whether or not the fire has been extinguished.

61. Q. How may bodies be recovered from a sealed fire area before the fire has been extinguished?

A. By advancing into the area by means of air locks.

62. Q. What is the procedure in using air locks to recover a sealed fire area?

A. Apparatus crews advance short distances inside of air locks and after erecting new seals with provisions for air locks, ventilation is re-established to the new base and this procedure is repeated.

63. Q. What is the procedure when a sealed fire area is recovered by direct ventilation?

A. Crews wearing self-contained oxygen breathing apparatus break the seal on the intake side, behind a previously constructed air lock, and after exploring the affected area, the return seal is broken and the area reventilated.

64. Q. Where should electricity not be permitted in a mine during the unsealing of a fire area?

A. The affected area.

65. Q. What are the principal causes of mine explosions?

A. Ignition of gas or coal dust, or both, by electric arcs, blown-out shots, and smoking.

66. Q. What is the most prevalent source from which mine explosions are started?

A. Accumulation of explosive mixtures of methane.

67. Q. What is the principal cause of accumulations of explosive mixtures of methane?

A. Interrupted ventilation.

68. Q. What is the most common cause of interrupted ventilation?

A. Short-circuiting of the ventilating current, for example, by leaving doors open, tearing line curtain down, and knocking out stoppings.

69. Q. What is the principal cause of ignition of explosive mixtures?

A. Electric arcs.

70. Q. How can mine explosions be prevented?

A. Adequate ventilation, use of rock dust, the safe use of electricity, and close supervision and frequent examinations for methane.

71. Q. What can be done to prevent a possible explosion from being propagated by coal dust?

A. By removing excessive coal dust and rock dusting.

72. Q. What is the first thing to be done on the surface of a mine in the event of an explosion?

A. See that the ventilation fan is operating properly.

73. Q. What is the most important duty of the electrician in the event of an explosion?

A. Pull and lock out all electrical switches leading into the mine.

74. Q. With ventilating apparatus working properly, what precaution should be taken to protect the lives of possible survivors?

A. Endeavor to ascertain their names and probable location.

75. Q. What should be the duty of police guards in the event of a mine explosion?

A. Barricade an area around the entrance and admit no one except authorized persons.

76. Q. What should be the duty of the mining engineer in the event of a mine explosion?

A. To furnish an up-to-date map of the mine showing the regular coursing of air, and keep it posted to show progress of recovery.

77. Q. What agency shall be notified immediately in the event of a mine explosion?

A. The Director of MHST and the district mine inspector.

78. Q. How many persons should be placed in charge of recovery work in the event of a mine explosion?

A. One (1) only.

79. Q. Who should be in charge of crews performing recovery work after a mine explosion?

A. Persons with experience and special training in recovery operations.

80. Q. What number of apparatus crews should be employed underground in recovery work after a mine explosion?

A. At least two (2).

81. Q. What precautions should be taken before persons are permitted to enter a mine following an explosion, assuming that fans are operating properly?

A. All persons should be properly checked and searched and only authorized persons should carry multi-gas detectors or other approved devices.

82. Q. What type of workers should be on each shift in recovery work following a mine explosion?

A. Trained oxygen breathing apparatus crews, and fresh air labor crews to build stoppings, carry material and stretchers.

83 Q. What qualifications should be possessed by persons on oxygen breathing apparatus crews?

A. They should be well trained, physically fit, and competent.

84. Q. What equipment shall rescue teams wear?

A. Mine rescue teams shall wear self-contained oxygen breathing apparatus.

85. Q. What types of gas detectors shall be provided to rescue teams?

A. Permissible methane, oxygen and carbon monoxide detectors or other approved devices.

86. Q. What material should be provided for recovery work?

A. Brattice cloth, boards, blocks, cement, and non-sparking hand tools.

87. Q. What ventilation instrument should be provided for recovery work?

A. Anemometer.

88. Q. What first-aid equipment should be provided for recovery work?

A. First-aid supplies, stretchers, blankets and EMT kits.

89. Q. What fire-fighting equipment should be provided for recovery work?

A. Fire extinguishers of proper type and rock dust.

90. Q. In recovery work, at what point underground is it advisable to have a first-aid station?

A. At the fresh-air base.

91. Q. Before proceeding into a mine after an explosion, what examination should be made?

A. Examine return airways for smoke or indications of fire.

92. Q. What particular danger is present if ventilation is restored following an explosion before an exploration is made?

A. Dormant fires may be revived, and an explosion may follow.

93. Q. What are the chief factors that determine the location and establishment of a fresh-air base in mine recovery work?

A. The fresh-air base must be in fresh air, free from possible contamination by poisonous and explosive gases, secure against roof falls, and readily accessible for rescue and recovery operations.

94. Q. What breathing apparatus may be used for exploration beyond fresh air?

A. Self-contained oxygen breathing apparatus.

95. Q. Where is it essential that self-contained oxygen breathing apparatus be used?

A. In irrespirable atmospheres.

96. Q. What percentages of methane in a methane-air mixture, when burned or exploded, will produce relatively large amounts of carbon dioxide?

A. The percentages between the lower explosive limit and the maximum explosive point; five percent (5%) to ten percent (10%).

97. Q. What percentages of methane in a methane-air mixture, when burned or exploded, will produce relatively large amounts of carbon monoxide?

A. The percentages between the maximum explosive point and the upper explosive limit; ten percent (10%) to fifteen percent (15%).

98. Q. What is the procedure of a mine rescue team engaged in exploration?

A. They should carefully examine all parts of the area assigned, marking directional arrows back to the fresh-air base, and end of travel, with chalk, by date and name of the team.

99. Q. How far apart should the members of a mine rescue team travel?

A. About seven (7) feet.

100. Q. How should mine rescue teams keep in contact with each other and the fresh-air base?

A. With a lifeline or communication system.

101. Q. What is the maximum distance a mine rescue team should explore under favorable conditions when lives are at stake?

A. One thousand (1,000) feet one way.

102. Q. What is the length of a standard mine rescue lifeline?

A. One thousand (1,000) feet.

103. Q. What is the recommended life-line signal to stop if traveling or “all right” if at rest?

A. One (1) pull.

104. Q. What is the recommended life-line signal for “advance”?

A. Two (2) pulls.

105. Q. What is the recommended life-line signal for “retreat”?

A. Three (3) pulls.

106. Q. What is the recommended life-line signal for “distress”?

A. Four (4) pulls.

107. Q. How should the lifeline be carried at all times?

A. Taut between all members and base.

108. Q. Is it advisable to explore ahead of fresh air in dense smoke?

A. Only to save lives or in an emergency.

109. Q. Under what conditions of travel is it inadvisable to explore ahead of fresh air?

A. In an explosive atmosphere.

110. Q. Under what condition of temperature is it inadvisable to explore beyond fresh air?

A. When temperature is high.

111. Q. What conditions of the self-contained oxygen breathing apparatus would make it inadvisable to explore beyond fresh air?

A. When the apparatus is inadequately charged or in an unsafe condition.

112. Q. When is it advisable to explore beyond fresh air when only one apparatus crew is in the mine?

A. When only extremely short trips are necessary, and then only to save life or do extremely important work necessary to recovery operations.

113. Q. In the course of recovery work, if men are discovered alive but not physically fit to travel on their own strength, how should they be treated?

A. They should be given first-aid treatment at the fresh-air base and permitted to partially recuperate before being accompanied outside.

114. Q. Why should persons be kept at the fresh-air base after rescue until partially recuperated?

A. Because of the severe physical reaction caused by the outside atmosphere.

115. Q. When re-establishing ventilation for recovery operations after an explosion, what type of stoppings should be used?

A. Wood, brattice cloth, boards, and plaster.

116. Q. What should be done when fires are found during recovery explorations?

A. Every effort should be made to extinguish them, if possible. If fire is inaccessible, it should be sealed at once.

117. Q. Why is it advisable to have telephones at the fresh-air base?

A. To expedite the transmission of messages and instructions.

118. Q. Why should maps of the mine be available for the persons in charge of recovery?

A. So that rescue and recovery work can be systematically planned and executed.

119. Q. Where should the shifts be changed when recovery work is in progress?

A. At the fresh-air base.

120. Q. What precautions should be taken when persons are coming off shift from recovery operations?

A. Persons should be checked out of the mine.

121. Q. When ventilation is being restored, what precautions should be taken at open dead ends and other open areas encountered?

A. They should be swept free from dangerous gases or temporarily sealed.

122. Q. What is the most harmful gas in afterdamp?

A. Carbon monoxide.

123. Q. What is a barricade?

A. A stopping erected to prevent gases from an explosion reaching an unaffected portion of the mine where men may remain safely until rescued.

124. Q. Have barricades been successful in preserving life following mine fires and explosions?

A. Yes.

125. Q. How may barricades be constructed?

A. From any suitable material at hand such as gob, stopping material, ties taken from track, brattice cloth or used lumber.

126. Q. In the event of an explosion and escape is cut off by afterdamp in all escapeways, what is the safest thing to do?

A. Short circuit the ventilation from the section and erect a barricade.

127. Q. What can be done to prevent the gases of an explosion from reaching the point where a barricade is erected?

A. By short-circuiting the air at least fifty (50) feet outby the place and erecting a temporary curtain.

128. Q. How large an area should be enclosed within a barricade?

A. As large as possible.

129. Q. While within a barricade how should a person conduct himself?

A. He should remain quiet, occasionally moving about to mix the air.

130. Q. How can compressed air, if available, be of assistance within a barricade?

A. It can be used to replenish the air.

131. Q. How much air does the average person require per hour within a barricaded area when at rest?

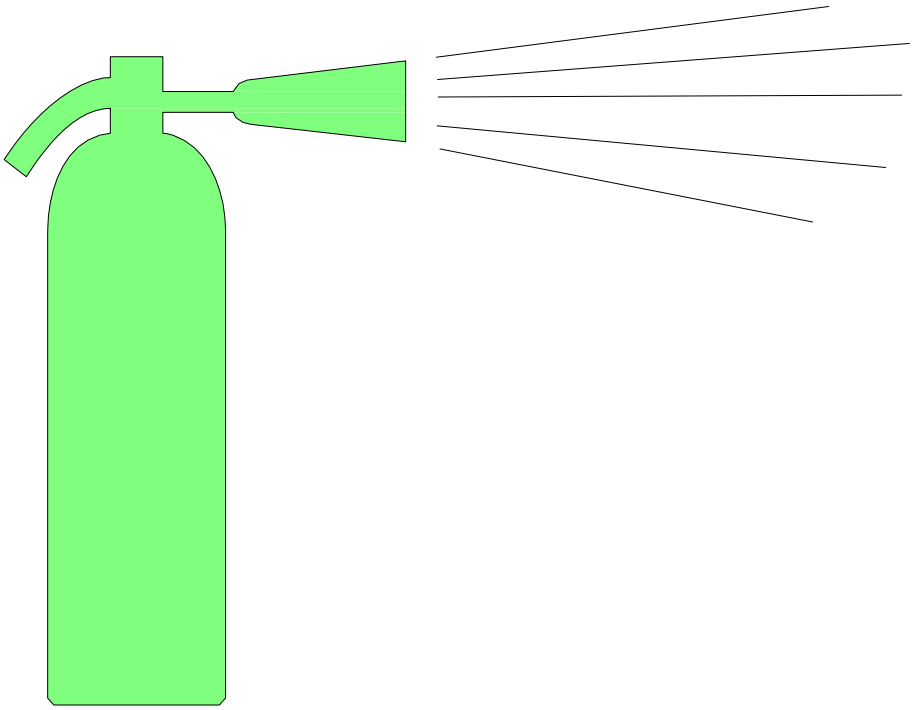
A. About one (1) cubic yard per hour.

132. Q. When gases begin to enter a barricade, what can be done?

A. If the place is large enough additional barricades can be built inby the first ones erected, or the crevices can be plugged.

Notes:

FIRE PROTECTION



FIRE PROTECTION

1. Q. How often shall fire drills be held for employees?

   A. At least every six (6) months.

2. Q. What shall be shown on the map of the mine and kept available at the mine office at all times?

   A. The location of pipelines, valves, and fire taps.

3. Q. At what surface installations shall suitable fire protection be provided?

   A. Fans, shops, tipples, substations, compressor stations, hoist rooms and all floors of preparation plants.

4. Q. What shall waterlines be capable of delivering?

   A. Fifty (50) gallons of water at a nozzle pressure of fifty (50) pounds per square inch.

5. Q. What shall be the capacity of a portable water car?

   A. At least one thousand (1,000) gallons.

6. Q. What shall be the capacity of a portable chemical car?

   A. Enough chemicals to provide a fire extinguishing capacity equivalent to that of a portable water car.

7. Q. What is necessary for the effective operation of a foam generating machine?

   A. It shall have facilities and equipment for supplying the machine with thirty (30) gallons of water per minute at thirty (30) pounds per square inch for a period of thirty (30) minutes.

8. Q. What is required of all new portable fire extinguishers?

   A. They shall be of the multi-purpose dry chemical type, having a 2A 10BC or higher rating.

9. Q. What shall be the bursting pressure of a fire hose?

   A. Four (4) times higher than the static water line pressure at the mine location.

10. Q. How far shall water lines be extended?

    A. To each section loading point and equipped with enough fire hose to reach each working face.

11. Q. What shall be provided at each working section of coal mines producing three hundred (300) tons or more per shift?

A. Two (2) portable fire extinguishers and two hundred forty (240) pounds of rock dust.

12. Q. Where shall waterlines be located in relation to belt conveyors?

A. Waterlines shall be installed parallel to the entire length of the belt conveyor.

13. Q. Where shall outlets with valves be located for waterlines along belt conveyors?

A. At three hundred (300) feet intervals along the belt conveyor and at tailpieces.

14. Q. In mines producing three hundred (300) tons of coal or more per shift, where shall waterlines be installed relative to haulage tracks.

A. Parallel to all haulage tracks using mechanized equipment in the track or adjacent entry.

15. Q. Where shall outlets with valves be located for waterlines along haulageways?

A. At intervals of not more than five hundred (500) feet.

16. Q. What may be used in lieu of waterlines along haulageways?

A. Two (2) portable water cars, readily available.

17. Q. What shall each locomotive, track or off track self-propelled mantrip car or personnel carrier be equipped with?

A. One (1) portable fire extinguisher.

18. Q. What shall be provided at each permanent electrical installation?

A. Two (2) portable fire extinguisher.

19. Q. What shall be provided at temporary electrical installations?

A. One (1) portable fire extinguisher and two hundred and forty (240) pounds of rock dust.

20. Q. What shall be provided at each permanent underground oil storage station?

A. Two (2) portable fire extinguishers and two hundred and forty (240) pounds of rock dust.

21. Q. At each working section where twenty-five (25) gallons or more of oil are stored, how many fire extinguishers are required?

A. One (1) portable fire extinguisher.

22. Q. What fire protection is required at locations where cutting, welding, or soldering with arc or flame is being done?

A. One (1) portable fire extinguisher or two hundred and forty (240) pounds of rock dust.

23. Q. What fire protection is required at each wooden door through which power lines pass?

A. One (1) portable fire extinguisher or two hundred forty (240) pounds of rock dust.

24. Q. What should all employees know relative to fire extinguishers?

A. They should know how to use them properly.

25. Q. What is required at strategic locations along each belt conveyor?

A. At least five hundred (500) feet of fire hose.

Notes:

INSTRUMENTS and APPARATUS

MINE RESCUE APPARATUS

1. Q. What is a Drager BG-4 mine rescue apparatus?

   A. An approved self-contained compressed oxygen breathing apparatus used in mine rescue operations.

2. Q. How long will a mine rescue apparatus provide oxygen for the wearer?

   A. Four hours at a moderately heavy work rate.

3. Q. Who is permitted to wear a mine rescue apparatus in mine rescue operations?

   A. Only people physically fit and certified in mine rescue equipment.

4. Q. How shall mine rescue apparatus and equipment be maintained?

   A. In a manner that will insure readiness for immediate use.

5. Q. What is a SCSR?

   A. An approved self-contained self-rescuer.

6. Q. What is the purpose of the SCSR?

A. To provide the wearer oxygen in the event of a mine emergency.

7. Q. When should the SCSR be used?

A. Immediately at the first indication of a fire or an explosion.

8. Q. How long will the SCSR provide oxygen for the wearer in an emergency situation?

A. One hour minimum.

9. Q. How may the service life of the SCSR be extended?

A. By remaining calm and resting quietly.

10. Q. What must be done if there is a puncture in the case or damage at the seal area of the SCSR?

A. The unit must be removed from service immediately.

11. Q. How can it be determined that the SCSR is functional?

A. By checking daily the gauge or indicator and overall conditions.

12. Q. What is the shelf life of the SCSR?

A. That which is recommended by the manufacturer.

13. Q. What effect does moisture have on the SCSR in storage?

A. Moisture has no effect on storage or operation of the unit in that it is sealed.

14. Q. What is the time frame for donning and activating the SCSR unit?

A. Approximately thirty seconds.

15. Q. Where shall the self-rescuer be located in respect to the miner?

A. Within immediate reach at all times and in compliance with the cache´ storage plan. Immediate reach is a distance of no more than three (3) feet from the individual.

16. Q. Who is required to provide training to the miner in the use of the SCSR?

A. The mine operator.

17. Q. How often shall underground employees be trained in the use of the SCSR?

A. Quarterly.

18. Q. What is the general principal of the SCSR?

A. Oxygen is supplied to the wearer and exhaled carbon dioxide is absorbed.

19. Q. How does one breathe wearing the SCSR?

A. Inhalation and exhalation through the mouthpiece.

20. Q. Where is it essential to use the SCSR?

A. In an oxygen depleted atmosphere.

21. Q. May the SCSR be used to fight mine fires?

A. No, the SCSR is to be used for escape only.

22. Q. Why are goggles provided with the SCSR?

A. To provide eye protection from smoke and other harmful gases.

23. Q. What determines the storage and/or shelf life of the SCSR?

A. The manufacturers' recommendations as specified.

ANEMOMETER

The anemometer generally used in coal mining consists of a metal ring within which is set a rotating propeller or blade. The air current striking the inclined blades rotates the vane, the number of revolutions being recorded on the face of the dial by means of a series of gears. The instrument is so calibrated that each revolution of the vane corresponds to one lineal foot of air travel. The instrument is used to measure the velocity of the air currents in mine entries as expressed in feet per minute.

When taking a reading, an area is found where the air has a straight course and will not be deflected unequally to either side, and where the area of the entry can be measured.

1. Q. What is an anemometer?

   A. An instrument resembling a small disk fan, used to measure lineal feet of air travel.

2. Q. How are air velocities determined by an anemometer?

   A. By the lineal feet of air travel as recorded on the dials.

3. Q. What period of time is usually taken for measuring air velocities?

   A. For one minute.

4. Q. How is an anemometer used to obtain velocities in mines?

   A. It is held in an air current for a given period of time to determine lineal feet of air passing each minute.

5. Q. What is the quantity of air moving through an airway five (5) feet high and twelve (12) feet wide and the anemometer reading is five hundred (500) FPM?

   A. Thirty thousand (30,000) CFM, 5 X 12 X 500 = 30,000 CFM.

6. Q. What is meant by CFM?

   A. Cubic feet per minute.

7. Q. What should be done prior to taking an air velocity reading?

   A. All dials should be reset to zero.

8. Q. How is the cross-sectional area of an entry determined?

   A. Entry height multiplied by entry width.

9. Q. What is the cross-sectional area of an entry 6 1/2 feet high and 20 feet wide?

   A. 130 square feet (6.5 x 20 = 130 sq. ft.).

SMOKE TUBES

1. Q. What is used to show the direction and velocity of slow-moving air?

   A. Smoke Tube.

2. Q. When using a smoke tube what distance is normally measured?

   A. 10 feet.

3. Q. When taking an air reading with a smoke tube how many quadrants be used?

   A. Four.

PITOT TUBE

4. Q. What is a Pitot Tube?

   A. An instrument for determining high velocity airflows.

BAROMETER

A barometer is an instrument used to measure the pressure of the atmosphere. A careful study of changes in pressure often forecast a dangerous gaseous condition in the mine as shown by a rapid fall of the barometer reading. Regular barometer readings are important in respect to their indicating the expansive effect on the mine air, which always accompanies a sudden fall of the barometer reading. As a result, the air and gasses confined in large, abandoned areas are forced out into the active workings, causing a potentially explosive condition.

1. Q. What is a barometer?

   A. An instrument used to measure the pressure of the atmosphere.

2. Q. What are the two common types of barometers?

   A. The mercurial and the aneroid barometer.

3. Q. What common varying conditions of mine air are determined by measuring devices?

   A. Temperature, pressure, velocity, and humidity.

4. Q. What is the principal by which a mercurial barometer works?

   A. Atmospheric pressure is determined by the height to which a mercury column is raised in a vacuum.

5. Q. How does the aneroid barometer operate?

   A. Outside pressure changes are shown on a dial which is graduated in inches and tenths.

6. Q. What is atmospheric pressure?

   A. The pressure exerted by the column of air above a given point.

7. Q. What is the normal pressure of air on the earths' surface at sea level?

   A. About 14.7 pounds per square inch.

8. Q. What is the barometer reading for normal air pressure at sea level?

   A. Thirty (30) inches.

9. Q. How does elevation affect the reading of a barometer?

   A. The reading varies with the weight of the atmosphere. As we ascend, the reading becomes less, as we descend, the reading becomes greater.

10. Q. What factors change the reading of a barometer?

    A. Changes in atmospheric pressure due to temperature, humidity, and elevation.

11. Q. What value is a barometer relative to mine ventilation?

    A. A falling barometer warns of decreased air pressure.

GAS TESTING INSTRUMENTS

CSE Digital Model 102 and 102LD

1. Q. What is the first check performed on the CSE 102 methane detector?

   A. A visual inspection to assure cleanliness and no missing or damaged parts.

2. Q. How is the battery-voltage test performed on the CSE 102 detector?

   A. Press both buttons and assure battery voltage reads between 3.5 and 4.0 volts.

3. Q. How is the electrical-zero test performed on the CSE 102 detector?

   A. Press the test button only and assure electrical zero reads between 0.0 and 0.1.

4. Q. How is a malfunction indicated by the CSE 102 detector?

   A. A malfunction is indicated by a yellow light while making the battery-voltage test.

5. Q. How is a high concentration of methane indicated on the CSE 102 detector?

   A. A red light will appear when there is a high concentration of methane.

6. Q. What button is depressed when taking a methane test on the CSE 102 detector?

   A. The test button only.

7. Q. What does the display consist of on a CSE 102 detector?

   A. It consists of a gas indicator, a malfunction indicator, and a two-digit readout.

8. Q. What checks should be made before using the CSE 102 methane detector?

   A. Visual inspection, battery-voltage test, and electrical-zero test.

9. Q. How is a methane test performed with a CSE 102?

   A. By depressing the test button only and reading the display, whole numbers are on the left, and tenths are on the right of the display.

10. Q. How long should the CSE 102 be allowed to cool between gas tests?

    A. The CSE 102 should be allowed to cool for at least one (1) minute between gas tests.

DRAGER X-am 5000

1. Visual examination prior to use.

2. A Fresh Air Calibration must be conducted each day prior to using. To conduct the fresh air calibration: Page 23

   - Switch on the instrument.
   - Press the (+) key (3) three times, the symbol for fresh air calibration (✻) appears.
   - Press the (OK) key to start the fresh air calibration function. The measured values flash.
     When the measured values have stabilized:
   - Press the (OK) key to perform the calibration.
     The display containing the current gas concentration changes with the display (OK).
   - Press the (OK) key to exit the calibration function or wait approximately 5 seconds.

   If a fault has occurred during the fresh air calibration:
   The fault message (X) appears and a - - is displayed for the respective sensor instead of the measured value. Page 24

   - In this case, repeat the fresh air calibration. If necessary, have the sensor replaced by qualified personnel.

3. A periodic short flashing indicates the operating capacity of the instrument. If there is no operating signal, correct operation cannot be guaranteed. Page 17 (3)

4. To turn the instrument on, hold down the OK key for approximately 3 seconds until the 3-2-1- shown on the display is elapsed. Page 18

5. The gas detector is ready to measure when the measured values no longer flash, and the red LED's are no longer illuminated. Page 19

6. To turn the instrument turned off, press and hold the OK and + keys at the same time until the countdown 3-2-1- shown on the display elapsed. Page 19

7. What are the normal (factory) settings for alarms? Handout

CH4	1.0%	1.5%	O2	19.5%	23.5%	CO 35 ppm	50 ppm
NO2	2.5 ppm	5.0 ppm	NO	15.0 ppm	25.0 ppm		

8. The peak icon shows the highest levels of gas recorded by the device since turn-on or since peak readings were reset.

9. Dirt and deposits can be removed from the instrument by washing it with cold water. A sponge can be used for wiping necessary. Carefully dry the instrument with a cloth.

10. Abrasive cleaning tools (brushes, etc.) cleaning agents and cleaning solutions can destroy the dust and water filters.

11. Do not use compressed air to clean the sensor holes.

12. Do not press on the face of the sensors as this may damage them and cause erroneous readings.

13. A combustible gas reading of “ Γ Γ” indicates the atmosphere is above 5.00% methane.

INDUSTRIAL SCIENTIFIC MX-4

1. Visual examination prior to use.
2. Bump test before each days use. If the device fails the bump test, preform a calibration before using.
3. Perform a bump test more frequently if the device is subjected to physical shock or high levels of contaminates.
4. The bump test quickly confirms that the gas sensors are functioning.
5. A combustible gas reading of “Or” indicates the atmosphere is above 5.00% methane.
6. The “√” check mark indicator shows that there is a monitor or sensor fault.
7. The “!” exclamation mark indicator shows that there is a monitor or sensor fault.
8. The “■)))” alarm indicator shows an alarm causing condition.
9. Each battery indicator segment represents approximately 33% of total capacity.
10. The low battery warning is a flashing empty battery icon.
11. The “^\” peak icon shows the highest levels of gas recorded by the device since peak reading were reset.
12. When necessary, wipe the outside of the Ventis MX-4 with a soft, clean cloth.
13. NEVER use solvents or cleaning solutions of any type.
14. Make sure the sensor diffusion membrane, inside and out, is free of debris; wipe gently with a cloth or brush that is soft, clean, and dry.

ALTAIR

1. Visual examination prior to use
2. Before each days use, check the function of the device.
3. Bump test before each days use. If the device fails the bump test, perform a calibration before using.
4. Perform a bump test more frequently if the device is subject to physical shock or high levels of contaminates.
5. The bump test quickly confirms that the gas sensors are functioning.
6. A combustible gas reading of “XXX” indicates the atmosphere is above 5.00% methane.
7. The green LED flashes once every 15 seconds to notify the user the device is on and operating.
8. The red LEDs are visual indicators of an alarm condition or error in the device.
9. The yellow LED is a visual indication of a device fault condition.
10. Each battery indicator segment represents about 25% of total capacity.
11. A Low Battery Warning indicates that a nominal 30 minutes of operation remain before the battery id depleted.
12. The peak icon shows the highest levels of gas recorded by the device sine turn-on or since peak readings were reset.
13. The “MIN Page” shows the lowest level of oxygen recorded since tur-on or since the MIN reading was reset.
14. After 30 seconds of inactivity, the full Motion Alert alarm is triggered.
15. Clean the exterior of the device regularly using only a damp cloth.
16. Do not use cleaning agents as many contain silicones which will damage the combustible sensor.
17. Do not use compressed air to clean the sensor holes.
18. Do not press on the face of the sensors as this may damage them and cause erroneous readings.

LTX 310 ELECTRONIC DETECTOR

1. Q. What three (3) gases are detected by the LTX 310 Electronic Detector?

   A. Methane (CH4), carbon monoxide (CO), and oxygen (O2).

2. Q. What is the low alarm level activation setting for oxygen on the LTX 310 detector?

   A. Nineteen and one-half percent (19.5%).

3. Q. What is the alarm level activation setting for carbon monoxide on the LTX 310 detector?

   A. Fifty (50) ppm carbon monoxide.

4. Q. What does ppm stand for?

   A. Parts per million.

5. Q. What is the alarm level activation setting for methane on the LTX 310 detector?

   A. One percent (1%) methane.

6. Q. What is the calibration level for oxygen?

   A. Twenty and nine-tenths percent (20.9%) oxygen.

7. Q. When must the oxygen level be calibrated on the LTX 310 detector?

   A. Daily.

8. Q. The LTX 310 detector has what two (2) types of alarms?

   A. Visual and audible.

9. Q. How often must the LTX 310 detector be calibrated according to West Virginia state law?

   A. Every thirty (30) days.

10. Q. What type of methane detector calibration record should be maintained by the operator?

    A. A written record.

ITX MULTI-GAS MONITOR

1. Q. How do you turn on the ITX multi-gas monitor?

   A. Press and hold the "On/Off" mode until the instrument emits a short beep and the ITX Welcome screen appears.

2. Q. How can you check the last calibration date on the ITX multi-gas monitor?

   A. Press "On/Off" mode until "Instrument Calibration Due" appears.

3. Q. What needs to be done after any incident where the combustible gas content has caused the instrument to latch in the over-range alarm condition?

   A. Verify the calibration of the combustible gas sensor.

4. Q. How do silicone compound vapors or other known contaminants affect the combustible gas sensor?

   A. It will cause readings of combustible gas to be lower than the actual gas concentration.

5. Q. How may sudden changes in the atmospheric pressure affect the instrument?

   A. It may cause temporary fluctuations in the oxygen reading.

6. Q. Where are the instruments tested for intrinsic safety?

   A. In explosive gas / air mixtures only (21% oxygen).

7. Q. The “Peak” reading displayed represents what?

   A. The highest toxic and explosive gas concentration, and the lowest oxygen concentration measured since the peak reading was last cleared from the memory.

8. Q. How long should the ITX function with a fully charged battery pack?

   A. Up to 19 hours; and up to 10 hours when using the ISP sampling pump of continuous operation.

9. Q. The ITX sensors are designed to be changed and replaced by whom?

   A. The user in the field, without the need for factory service personnel.

10. Q. What should you use when necessary to clean the ITX detector?

    A. Wipe the outside with a soft, clean cloth. Do not use any types of solvent or cleaning solutions.

MSA SOLARIS MULTIGAS DETECTOR

1. Q. What check must be made prior to each days' use?

   A. Check calibration before each days' use and adjust if necessary.

2. Q. How often must the Solaris be calibrated?

   A. At least every 30 days or more often if needed.

3. Q. When the low battery alarm sounds, how much operational time remains?

   A. Fifteen (15) minutes, depending on ambient temperatures.

4. Q. What happens when the batteries can no longer operate the instrument?

   A. The instrument goes into battery shut down mode.

5. Q. What must be done before charging if instrument is either very hot or very cold?

   A. Allow instrument to stabilize for one hour at room temperature before attempting to charge.

6. Q. In what type of atmosphere must the zero calibration be made?

   A. Instrument must be in fresh air to perform the zero calibration.

7. Q. When the unit is subjected to physical shock, what must be done?

   A. Recheck calibration.

8. Q. How can you determine how much charge is in the battery when instrument is in use?

   A. Battery life indicator, as battery charge dissipates, segments of the battery icon in the upper portion of the screen goes blank until only the outline of the icon remains.

9. Q. If the instrument detects that an enabled sensor is not properly installed, what happens?

   A. The Solaris multi-gas detector will enter the sensor missing alarm and the "**sensor**" and "**missing**" words will flash on the display.

10. Q. What is the purpose of the peak reading?

    A. To show the highest level of gas recorded since turning on, or peak readings were reset.

Notes:

ADD: 1 + 1 = 2

SUBTRACT: 2 – 1 = 1

MULTIPLY: 2 X 2 = 4

DIVIDE: 4 ÷ 2 = 2

MATHEMATICS

1. Q. What is 50 plus 25? (50 + 25 = ___)

   A. 75

2. Q. What is 50 minus 25? (50 - 25 = __)

   A. 25

3. Q. What is 25 multiplied by 4? (25 x 4 = ____)

   A. 100

4. Q. What is 100 divided by 4? (100 ÷ 4 = ____)

   A. 25

5. Q. What is the square footage of a ten (10) by ten (10) feet area?

   A. 100 Square feet.

6. Q. What is the cubic feet of a ten (10) feet x ten (10) feet x ten (10) feet cube?

   A. 1,000 cubic feet.

7. Q. What is one (1) cubic yard?

   A. Twenty - seven (27) cubic feet.

8. Q. What is the weight of solid coal?

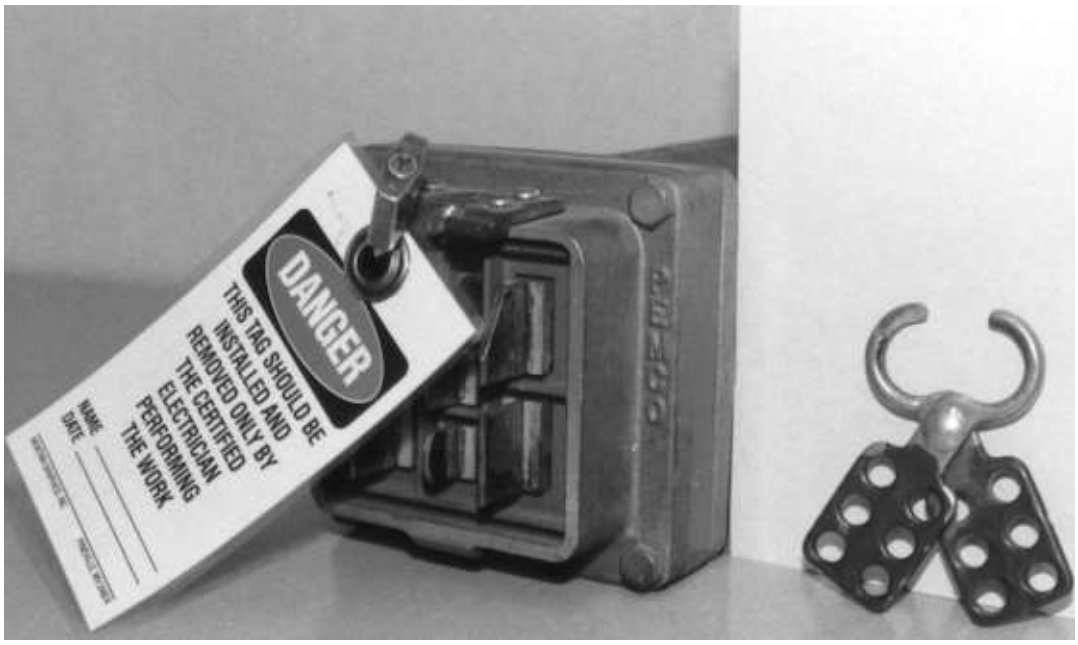
   A. Eighty (80) pounds cubic foot.

9. Q. What is the weight of loose coal?

   A. Sixty-five (65) pounds cubic foot.

Notes:

G E N E R A L S A F E T Y



GENERAL SAFETY

1. Q. Why were the mining laws enacted?

   A. To ensure the safety of persons employed within or at the mines.

2. Q. How shall the direction to escapeways be marked?

   A. By signs, conspicuously placed throughout the mine.

3. Q. How often shall entrances to old works be traveled and examined?

   A. At least once every week.

4. Q. How often shall airways be traveled and examined?

   A. At least once every week.

5. Q. What instruments shall be carried by a certified foreman exploring abandoned workings?

   A. A multi-gas detector or another approved device.

6. Q. What shall be done at entrances to dangerous places in a mine?

   A. Entrances to dangerous places shall be dangered off.

7. Q. What shall be done when dangers are reported?

   A. Such dangers should be removed promptly.

8. Q. In case it is impracticable to remove a danger, what shall be done?

   A. Every person whose safety is threatened shall be notified.

9. Q. What shall be available at all times for the proper maintenance of the mine?

   A. Necessary supplies.

10. Q. To whom shall entry into a mine, idle or working, be limited?

    A. To those authorized.

11. Q. When two outlets are not available and work is in progress to provide a second outlet, how many miners may be permitted to be employed at one time in the mine?

A. Not more than twenty (20).

12. Q. What kind of beverages shall not be taken into a mine?

A. Intoxicating.

13. Q. What shall be done when excavations are driven toward and in dangerous proximity to an abandoned mine suspected of containing gas or dangerous quantities of water?

A. Boreholes should be kept not less than twenty (20) feet in advance of the face and where necessary on the sides.

14. Q. How far from the abandoned areas shall the boreholes be started?

A. When within fifty (50) feet of abandoned workings in such mine as shown by surveys made and certified by a competent engineer or surveyor, or within two hundred (200) feet of any other abandoned workings or such mine, which cannot be inspected.

15. Q. Why are safety rules necessary for the guidance of mine employees?

A. To establish standard mine safety practices.

16. Q. How does the enforcement of safety rules prevent accidents?

A. By preventing persons from performing acts which are known to be hazardous.

17. Q. Why should employees assist in offering suggestions relative to safety rules?

A. Habits of observation are developed, and hazards are more readily recognized.

18. Q. What benefits can be secured from safety meetings?

A. They offer a medium for the exchange of ideas and experiences and provide means for more safety education.

19. Q. Why should safety rules be enforced?

A. Proper discipline is essential for the safe operation of a mine.

20. Q. What method shall be adopted and maintained to advise employees of the rules and regulations of the mine?

A. They shall be printed in the English language and posted in a conspicuous place about the mine.

21. Q. What is the minimum legal age of employment in or around the mines?

A. Eighteen (18) years.

22. Q. What is the duty of the mine foreman relative to new employees?

A. To instruct each person of the particular danger incident to his work and furnish a copy of mining laws and company rules.

53. Q. What record is required of miners entering and leaving mines?

A. A system of checking miners in and out of mines.

24. Q. Why should all injuries, even those of a trivial nature, be reported?

A. Serious consequences from infection may result from even trivial injuries.

25. Q. How shall the scene of a fatal accident be left?

A. Unchanged until an investigation is made by MHST.

26. Q. What shall be worn as head and foot protection?

A. Approved safety hats and safety-toed shoes.

27. Q. What protection shall be provided for the eyes when grinding, cutting, welding, or striking where particles may fly?

A. Adequate eye protection.

28. Q. What is the principal hazard connected with grinding or pouring hot metal?

A. Serious injury may occur to the eyes.

29. Q. What protection should be provided for miners exposed to drowning at river loading points?

A. Life jackets or other approved devices.

30. Q. What is the danger of loose clothing?

A. It may become caught in moving machinery.

31. Q. What safety device should be worn by miners working in or near the top of shafts or other deep excavations?

A. Safety belts.

32. Q. What is the duty of equipment operators and helpers relative to others in the vicinity while the equipment is in operation?

A. They shall not permit other persons to remain near the equipment.

33. Q. When shall the cutting machine not be moved?

A. When the cutter chain is in motion.

34. Q. What protective devices should be provided for cutting machine chains?

A. Mechanical locking devices or electrical inter-locks.

35. Q. Why should refuse or other material be prohibited from accumulating along a passageway?

A. Obstructions or lack of clearance may result in injury.

36. Q. In what condition should mines be kept?

A. Clean and properly maintained.

37. Q. How should illuminating and signal lights be maintained?

A. In proper operating condition.

38. Q. Why should those persons not familiar with a piece of equipment be prohibited from operating such equipment?

A. Unfamiliarity may result in injury.

39. Q. What protective devices should be used on gears, belts, and revolving parts of machinery?

A. Properly installed guards.

40. Q. What precaution should be observed when reassembling a machine with dangerous contacts or moving parts?

A. All guards or safety devices shall be replaced.

41. Q. What precaution shall be taken before starting machinery?

A. Signals should be given, and the operator shall be in the proper position.

42. Q. What precaution should be taken with machinery and equipment raised for repairs?

A. They should be securely blocked.

43. Q. Why are repairs, adjustments or oiling of moving machinery prohibited?

A. Limbs or clothing may become entangled.

44. Q. What should not be permitted to accumulate on machinery?

A. Oil and grease.

45. Q. What precaution should be taken when pipe is heated?

A. To see that it is open throughout its length as any obstruction may trap water which may burst the pipe when heated.

46. Q. How should wire ropes be maintained?

A. Free from worn and broken strands and well lubricated.

47. Q. What danger exists when the employee is equipped with defective or improper tools?

A. Flying particles or uncontrolled action may cause serious injury.

48. Q. Who should be responsible for the condition of hand tools?

A. The user.

49. Q. What materials should not be permitted to accumulate in structures in or about mines?

A. Oil, grease, and debris.

50. Q. What protective devices shall be provided for repair pits in floors or ground?

A. Guards or covers.

51. Q. What protective devices shall be provided for stairways, landings, and elevated platforms?

A. Handrailing’s and toe boards where necessary.

52. Q. From what materials shall steps, landings and platforms be kept free?

A. Refuse and ice.

53. Q. How shall steps, landings and platforms be maintained?

A. In good repair.

54. Q. How shall oil and grease be carried and kept in a mine?

A. In closed containers.

55. Q. What shall be prohibited from places where oil and grease are kept?

A. Open lights, smoking and electricity.

56. Q. What shall be done before welders or torches are used in a mine?

A. A certified person examines for methane.

57. Q. Where shall welders and torches not be used?

A. Where danger of ignition of methane, oil, grease, or coal dust is present.

58. Q. What examination shall be made before a machine is taken inby the last open crosscut to the working face?

A. Methane gas examination.

59. Q. At what percentage of gas is equipment prohibited to operate in?

A. One percent (1%).

60. Q. How often shall gas test examinations be made in face areas where equipment is operating?

A. At least every 20 minutes.

61. Q. What shall be provided in a working place for gas test examinations?

A. Multi-gas detector or other approved devices.

62. Q. When methane gas of one (1) percent is found in a working place where mining equipment is being operated, what shall be done immediately?

A. Stop the machine and cut off the electrical current.

63. Q. Who shall maintain face equipment in safe operating condition?

A. The mine operator.

64. Q. Who shall promptly report defects in face equipment?

A. Equipment operators.

65. Q. When shall respirators be worn?

A. When a person is exposed to dust, fumes, and mist.

66. Q. What device is required on battery powered equipment to indicate such batteries need charging?

A. Under-voltage indicator.

67. Q. How shall all flammable liquids be stored.

A. In approved containers or other safe dispensers.

68. Q. What type of gloves shall not be worn around equipment?

A. Gloves with gauntleted cuffs.

69. Q. What shall persons be searched for prior to entering a mine?

A. Smoker's articles.

70. Q. When shall miners not load or unload from a mantrip?

A. Prior to such mantrip vehicle stopping.

71. Q. Who shall be in charge of a mantrip?

A. Certified person or another competent person designated by a mine foreman.

72. Q. Who is required to give instructions to apprentice miners in the hazard's incidental to their work assignments?

A. Mine foreman and assistant mine foreman.

73. Q. Who may supervise an apprentice miner?

A.
- A mine foreman or assistant mine foreman may have three (3) apprentice miners working with him/her on a section producing coal.
- In an area where coal is not being produced or is outby the working section, a mine foreman or assistant mine foreman may have five (5) apprentice miners under his/her supervision.
- Any miner holding a certificate of competency and qualifications (black hat) may have two (2) apprentice miners working with said miner.

74. Q. Who is responsible to instruct each new employee in the particular danger incident to their work?

A. Mine foreman or assistant mine foreman.

75. Q. Who is required to furnish new employees a copy of the West Virginia Mining Laws?

A. Mine foreman or assistant mine foreman.

76. Q. Who is responsible to ensure that apprentice miners are effectively supervised with regard to safety practices and to instruct apprentices in safe mining practices?

A. Mine operator.

77. Q. Who is responsible for the safety of an apprentice miner?

A. Mine foreman or assistant mine foreman.

78. Q. During the first 120 days of employment, where shall the apprentice miner work?

A. Within sight and sound of the mine foreman, assistant mine foreman or an experienced miner.

79. Q. Prior to a person being employed at a coal mine, what is the person required to possess?

A. An apprentice miner's card or miner's certificate.

80. Q. What is required when a multi-gas detector or other approved methane detector is taken underground?

A. Care shall be taken to ensure that such detector or other device is in a permissible condition and such detector or device is tested before each shift.

81. Q. What persons are permitted to be on a working section by themselves?

A. Mine Foreman-Fire Boss, assistant mine foreman-fire boss and pumper.

82. Q. When a required examination is being performed by a certified mine foreman-fire boss or assistant mine foreman-fire boss, what evidence should be left to reveal such examination was made?

A. Their initials, time, and the date at or near each place they examine.

83. Q. When may a disabled vehicle be pushed from the operator's deck end?

A. At no time.

84. Q. Who shall direct and see that all dangerous places and the entrance or entrances to worked out and abandoned places in all mines are properly dangered off across the openings?

A. Mine foreman.

85. Q. Who is required to give prompt attention to the removal of all dangers in a coal mine?

A. Mine foreman.

86. Q. Who is required to read carefully and countersign, with ink or indelible pencil, all reports entered in the record book of the fire boss?

A. Mine foreman.

87. Q. How often shall each coal mine employee be required to take refresher first-aid training?

A. Not less than five (5) hours of training within twenty-four (24) months of employment.

88. Q. Should the employees be paid regular wages, or overtime pay if applicable, for all periods of first-aid training?

A. Yes.

89. Q. Where shall each operator of a coal mine maintain a supply of first-aid equipment?

A. 1) At mine dispatcher's office.
2) Close proximity to each mine entrance.
3) At the bottom of each regularly traveled slope or shaft, if more than one thousand (1,000) feet from the surface.
4) On each working section, not more than five hundred (500) feet from working faces.

90. Q. What personal safety equipment must be worn by an underground miner when working in seam heights of 48 inches and greater?

A. Metatarsal boots.

91. Q. What is a Comprehensive Mine Safety Program?

A. A mine specific set of rules and regulations governing the safety and training of all mine employees.

92. Q. Who is responsible for the development of a Comprehensive Safety Program?

A. The operator.

93. Q. When a mine has been temporarily closed, the operator shall notify the Director within how many calendars day after resuming active mining operations, to retain the existing Comprehensive Safety Program?

A. 30 days.

94. Q. Who will approve or reject a Comprehensive Safety Program?

A. Director of MHST.

95. Q. Who shall conduct the annual review of the Comprehensive Safety Program?

A. The operator.

96. Q. Who will review the annual report of the Comprehensive Safety Program?

A. Director of MHST.

97. Q. Regarding the initial submittal of the Comprehensive Safety Program, who shall be afforded an opportunity to review and submit comments to the Director of MHST?

A. Each employee of the mine.

98. Q. Where shall a copy of the Comprehensive Safety Program be posted?

A. On the mine bulletin board.

99. Q. How often shall an evaluation of the Comprehensive Safety Program be made?

A. Annually.

100. Q. What shall be practiced in all areas of underground coal mines, and in and around mine buildings and yards?

A. Good housekeeping.

101. Q. When can underground equipment powered by internal combustion engines be used?

A. When permission is granted by the Director of MHST.

102. Q. What is an accident?

A. Any mine explosion, ignition, fire, inundation, injury, or death of any person.

103. Q. What is an imminent danger?

A. The existence of any condition or practice in a coal mine which could reasonably be expected to cause death or serious physical harm before such condition or practice can be abated

104. Q. What distance shall two-way communication facilities be located on the surface from the mine portal?

A. Within five hundred (500) feet.

105. Q. What shall the incoming communication signal activate on the working section?

A. An audible or visual alarm on the mine phone.

106. Q. When shall repairs be started to the mine communication system in the event of a failure?

A. Immediately.

107. Q. What safety device is required on all continuous miners, loading machine booms and head lift cylinders?

A. Load-locking valves.

108. Q. What is the purpose of a panic bar?

A. To quickly de-energize the equipment in the event of an emergency.

109. Q. What record is required for oxygen and gas tanks in the mines?

A. The date tanks or cylinders are taken into the mine, and the date the tanks are removed from the mine.

110. Q. Welding and cutting may be done in mines, provided:

A. That all equipment and gauges are maintained in safe condition and not abused.

111. Q. What precautions are required by persons performing welding and cutting?

A. Adequate eye protection shall be used, and precautions shall be taken to prevent other persons from exposure that might be harmful to their eyes.

112. Q. What type of tool is required to be provided to the person authorized to use oxygen and acetylene equipment?

A. A suitable wrench designed for compressed tanks.

113. Q. When are the hoses and gauges required to be disconnected from the oxygen and acetylene tanks?

A. When not in use and when being transported.

114. Q. What shall be done with empty oxygen and acetylene tanks?

A. They shall be marked empty and shall be removed from the mine promptly in safe containers provided for transportation.

Notes:

Emergency Shelters, Communication and Tracking and SCSR Requirements

Emergency Shelters, Communication and Tracking and SCSR Requirements

1. Q. What does “Emergency Shelter/Chamber” mean?

   A. An enclosed space made from man-made materials whose function is to protect the occupants from hazardous gases and provide breathable air in the event escape is not possible.

2. Q. What is the maximum distance the emergency shelter/chamber can be located from the face?

   A. 1,000 feet

3. Q. What does the term emergency communication mean?

   A. The transmission and reception of voice, data, and/or information regarding an unexpected event requiring immediate action.

4. Q. What does “wireless” mean?

   A. Allowing individual communications by a miner through a mine communication and tracking/locating system without a physical connection.

5. Q. What does the term “tracking/location” mean?

   A. Knowing the physical location of miners at the moment of an accident and as escape progresses if the tracking/location system being used is still functional.

6. Q. What does “tracking/location device” mean?

   A. An integrated mine communication system for the purpose of providing the physical location of a miner during an emergency.

7. Q. How many minutes of breathable air should the SCSR provide the wearer?

   A. At least 60 minutes.

8. Q. How often are inspection of SCSR’s required to be reported?

   A. Quarterly.

9. Q. How shall each SCSR storage cache be housed?

   A. In a container constructed to protect from normal operational damage, made of material that is non-combustible, easy to open during emergency escape and noted on the escapeway.

10. Q. How far from the nearest working face in each section and construction/rehabilitation site shall one SCSR cache storage be placed at a readily available location?

    A. Within 500 feet.

11. Q. Can distance of greater than 500 feet from the face be exceeded?

    A. Yes, not to exceed 1,000 feet with approval of the Director.

12. Q. What other articles are required in storage caches located 500 feet from the working face?

    A. Escape kit containing a hammer, tagline, a supply of chemical light sticks, and escapeway map.

13. Q. Are other caches storages required?

    A. Yes, at intervals that a miner may traverse in no more than 30 minutes traveling at a normal pace.

14. Q. How long after a serious or fatal accident at any coal mine or machinery connected therewith does the operator or mine foreman in charge of the mine give immediate notification?

    A. 15 minutes.

15. Q. Intrinsically safe battery powered strobe lights approved by the Director shall be affixed to what?

    A. Storage caches of SCSRs.

16. Q. What reflective signs are required at each cache storage box?

A. Self-Rescuer.

17. Q. What is required in the primary escape way?

A. Lifeline.

18. Q. What shall lifeline cords be attached to?

A. SCSR cache storage.

19. Q. Who shall a copy of the mine emergency shelter plan be provided to?

A. Mine rescue teams providing coverage to the mine.

20. Q. Who shall record weekly inspections of emergency shelter/chambers and its' contents and record in a weekly ventilation examination book?

A. Mine foreman or mine examiner.

21. Q. When shall the current location of an emergency shelter/chamber and the latest inspection be reviewed?

A. During weekly safety meetings.

22. Q. What is required on emergency shelter cambers to indicate unauthorized access?

A. Tamper proof tag.

23. Q. When shall the emergency communication and tracking system be monitored?

A. At all times in which one or more miners are underground.

24. Q. How many air courses must have 2-way communications?

A. 2 separate air courses, one of which must be in the intake air course.

25. Q. Who shall monitor the communication center?

A. It shall be staffed by miners holding a valid underground miner's certificate who is trained and knowledgeable of the installed communication/tracking systems, monitoring and warning devices, travelways, and mine layout.

26. Q. How shall lifeline cords be constructed?

A. They shall be constructed of flame-resistant material, with reflective material every 25 feet, and directional indicators signifying route of escape not exceeding 100 feet, which shall be located in a manner for miners to use effectively to escape.

27. Q. Purpose communication/tracking system shall include the ability for:

A. Knowing the location of all miners immediately prior to an event by tracking/locating device in the escapeways, normal work assignments, or notification of the communication center.

28. Q. What does the term “SCSR Storage Cache” mean?

A. Means a non-combustible container constructed to withstand normal mine conditions, protect a number of SCSRs, and allow easy access for inspection of SCSRs and easy access for miners who are escaping.

29. Q. What does the term “self-contained self-rescuer” mean?

A. Self-contained self-rescuer means a type of closed-circuit self-contained breathing apparatus, or its equivalent, approved by MSHA for the purpose of isolating a miner from hazardous gases and provide breathable air to aid an escape.

30. Q. Who shall a purposed detailed mine communication/tracking plan be submitted to?

A. The Director of MHST.

Notes:

BARRICADING

BARRICADING

1. Q. What are the four (4) circumstances that you would encounter that would make barricading the last resort?

   A. 1. Escape route is caved airtight
   2. Extreme heat between you and the escape facility
   3. Irrespirable atmosphere leading to escape facility and no SCSR's available,
   4. Disabling injury.

2. Q. What must a curtain type barricade be?

   A. Airtight.

3. Q. What are the ways to make a barricade airtight?

   A. 1. Nail spades no less than 6 inches apart up both ribs and along the roof.
   2. Fill the gaps in the curtain with rock dust bags, clothes, versa form, and etc.
   3. Pile loose coal, posts, and etc. along the bottom of the curtain along the mine floor.
   4. Build a second curtain if possible12 inches inby the first.

4. Q. Before the final sealing of the barricade is complete, what information should be written on the outby side of the barricade curtain?

   A. 1. The date.
   2. The time of day
   3. The number of miners behind the barricade.

5. Q. Prior to going behind the barricade, a sign with information stating the number of miners trapped and the location of the barricade should be placed where?

   A. On the tailpiece of the section, facing up toward the mine roof. (When drilling exploration holes into a section, searching for miners, the first location is the tailpiece.

6. Q. How would you estimate how much time you have before the atmosphere behind the barricade becomes irrespirable?

   A. Total cubic area in yards (L x H x W) divided by the number of miners equals survival time
   $\frac{L\ x\ H\ x\ W\ (yds)}{\#\ of\ miners}$ = Survival Time
   One person consumes 1 cubic yard of air per hour

7. Q. What is the survival time of:
   Length = 90 feet
   Width = 15 feet
   Height – 9 feet
   5 miners

   A. Length = 90 feet = 30 yds
   Width = 15 feet = 5 yds
   Height = 9 feet = 3 yds
   5 miners = 460/5 = 90 hours

8. Q. What items should be taken with you behind the barricade?

A.
1. Communication Line
2. Food and water
3. SCSR's
4. Oxygen tanks
5. Rock dust
6. First
7. Pounding tool – Hammer, crib block, etc.
8. Ventilation curtain

9. Q. How many shots should be heard before pounding on the mine roof to indicate your location to people on the surface?

A. Three shots. (Three shots can be heard several thousand feet deep, one every five seconds).

10. Q. After hearing the three shots, how many times should you strike the mine roof and how many minutes should you rest?

A. Strike the roof 10 times and rest for 15 minutes.

11. Q. Repeat this procedure until you hear how many shots, which indicates you have been located?

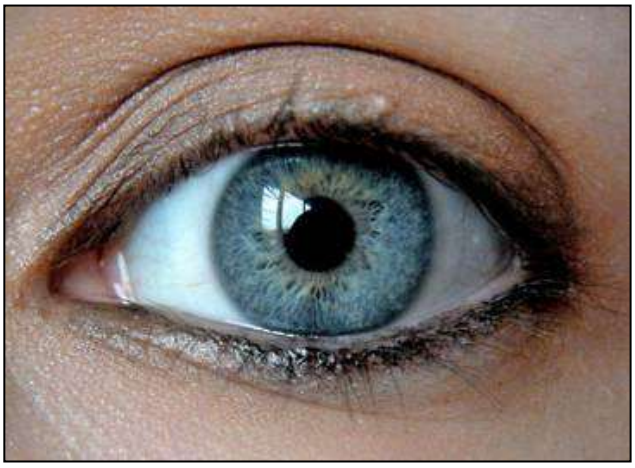
A. 5 shots.

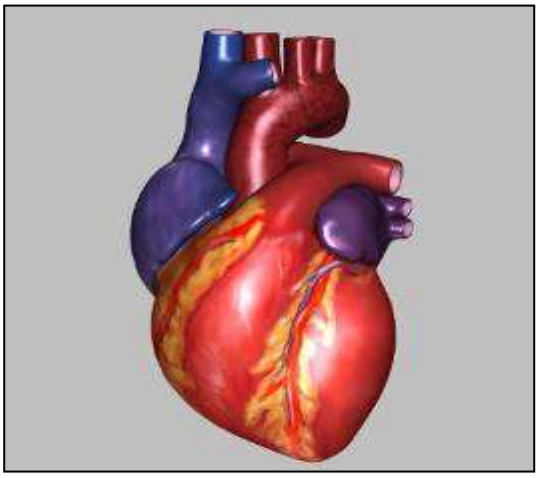
Notes:

GUARDING CONVEYOR BELTS

Conveyor Belts Move Faster Than You!

- What can happen in one second?
  - A human eye can only blink twice in one second.
  - At rest the human heart beats once per second.





GUARDING BELT CONVEYORS

Consider the following:

- A typical conveyor belt travels in the range of 300 feet per minute.
- This means the belt is moving at 5 feet per second.
- This is one revolution of an 18’ pulley.

That conveyor belt moving at 300 feet per minute of 5 feet per second will draw.

- Your tool
- Your loose clothing
- Your hand
- Your arm

5 feet into the pinch point before you can react.

Guarding Mounting Distances & Proper Mesh Sizing

Things to Consider When Building a Guard or Guarding an Area

Ergonomics

- A well-designed guard should not weigh more than 50 pounds
- It should not require more than one person to remove or install it.

Simplicity

- Guards should fit into place easily with minimal thought or effort.

Fastening System

Consider what type of fastening system will work best for the application.

Wedge Clamp

- Wedge clamp is never removed so your guard always has a place to go back onto.

Fully Opened Position

Partially Opened Position

Closed Position

Wedge Clamp

- When a tool is required to remove the guard.
- Cable tie requires a tool to remove it. (Side cutters)

Maintenance

- Do not design a guard that requires constant maintenance.

Recognition

- Is the Guard recognizable as a “Guard”?
- Paint your guards a color with will stand out from your equipment.
- Standardized a color which means “Danger”.
- Safety Yellow is a common color.

Inspection

- Can guarded components be inspected without removing the guard?

Create a Hazard

- Does the design, material, and construction of the guard create a hazard?
- Free of:
    - Burrs
    - Sharp Edges
    - Pinch Points

Standardization

- It is easier to install new guarding if you are using a common standard
- Also, it is easier to educate new and existing workers on safeguarding practices.

Common Areas Requiring Guarding

Tail Pulley

Tail Pulley

Receiving Hopper/Skirt Boards

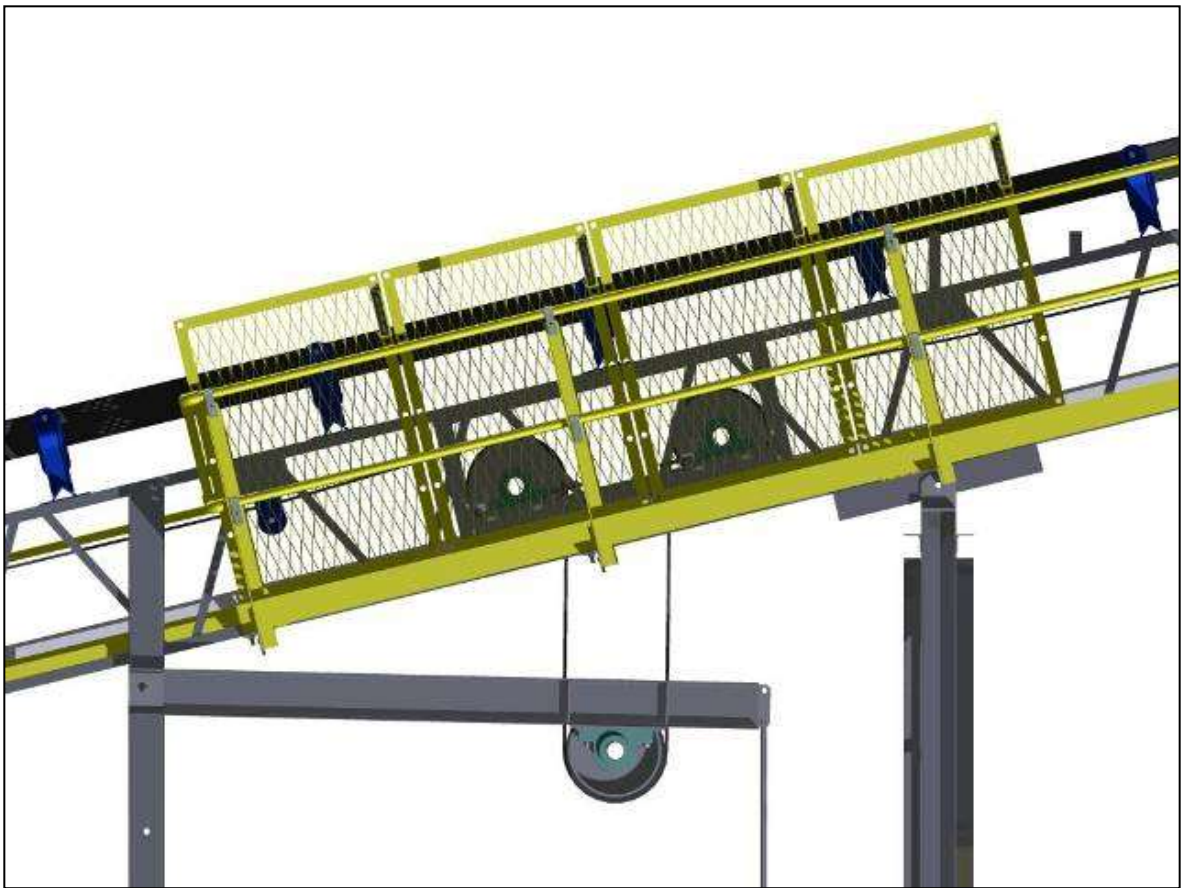
Receiving Hopper/Skirt Boards

Receiving Hopper/Skirt Boards

Receiving Hopper/Skirt Boards

Gravity Take Up Pulleys

Gravity Take Up Pulleys



Gravity Take Up Counterweight Enclosures

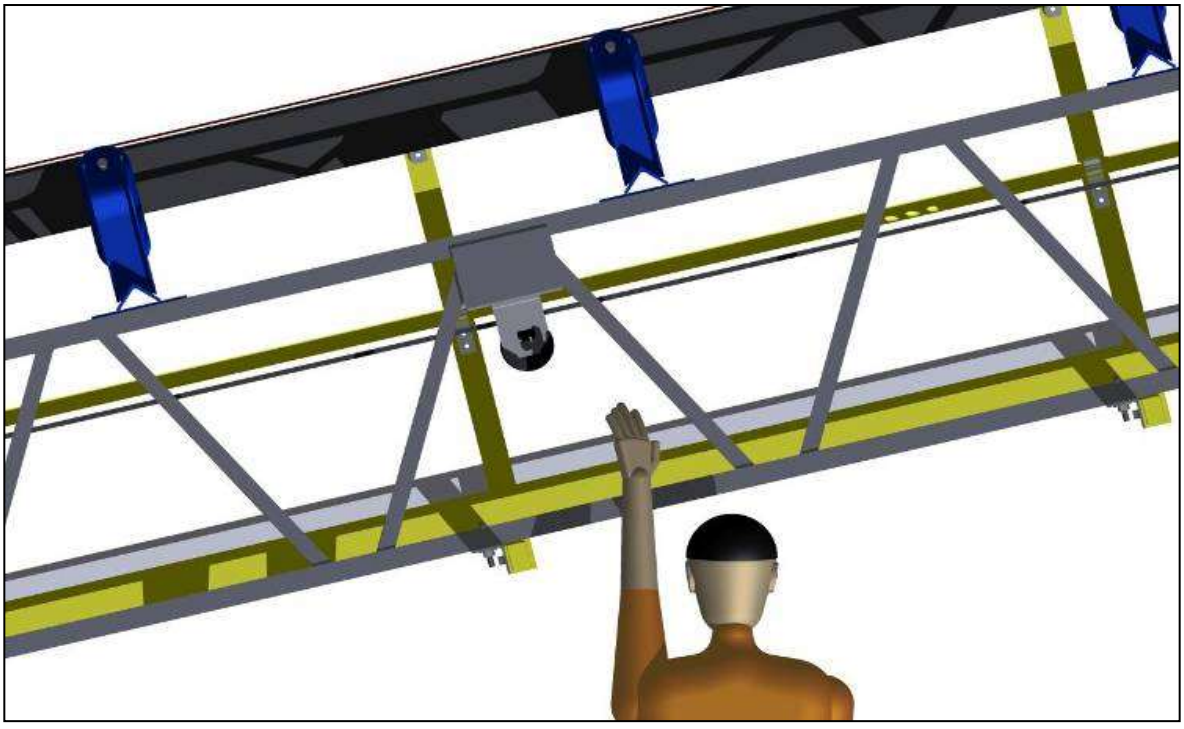
Gravity Take Up Counterweight Enclosures

Head Pulleys/Drive Pulleys/Snub Pulley

Return Rollers – within 7 feet from the ground or walking and working surfaces.

- Example – If a return roller is 6 feet above a walkway, and the area is 50 feet above the ground, it needs to be guarded.

Return Rollers – within 7 feet from the ground or walking and working surfaces.



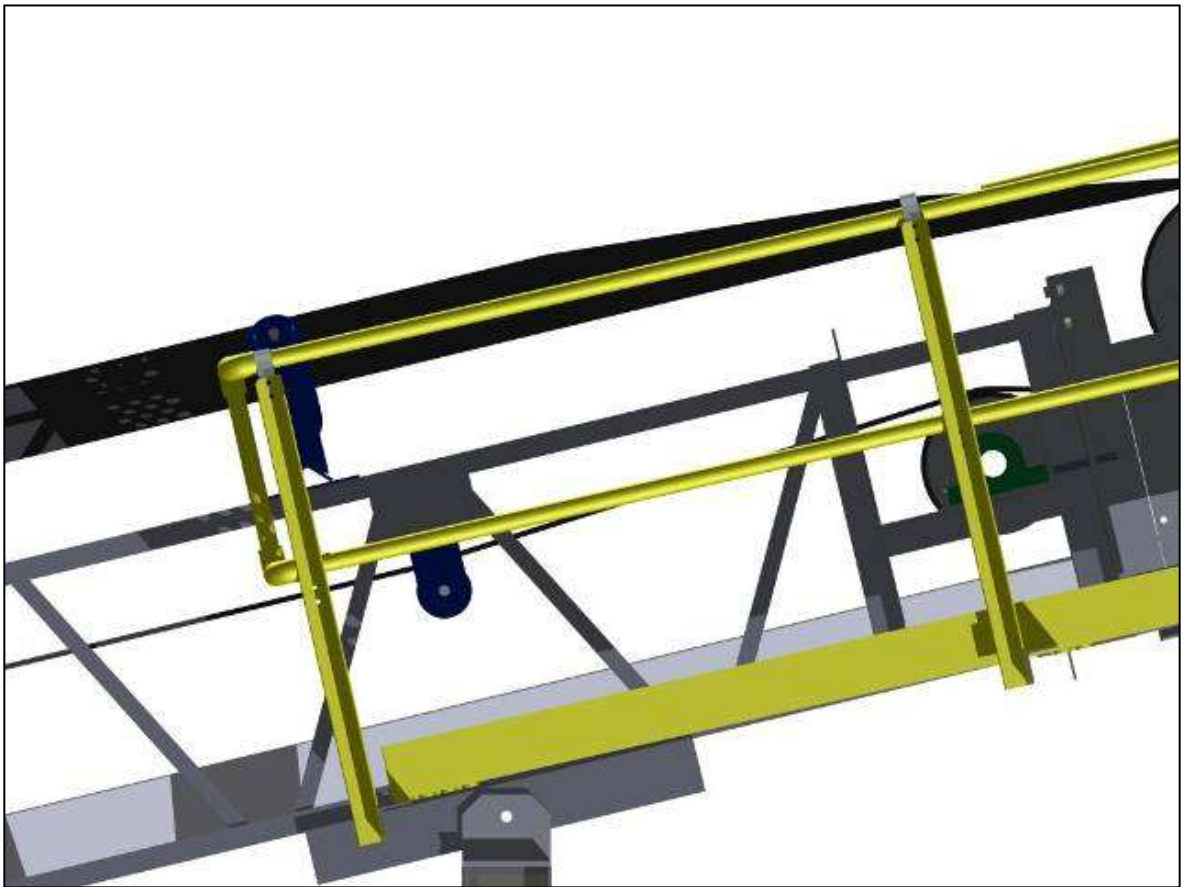
Return Rollers – within 7 feet from the ground or walking and working surfaces.

Return Rollers – above 7 feet from the ground.

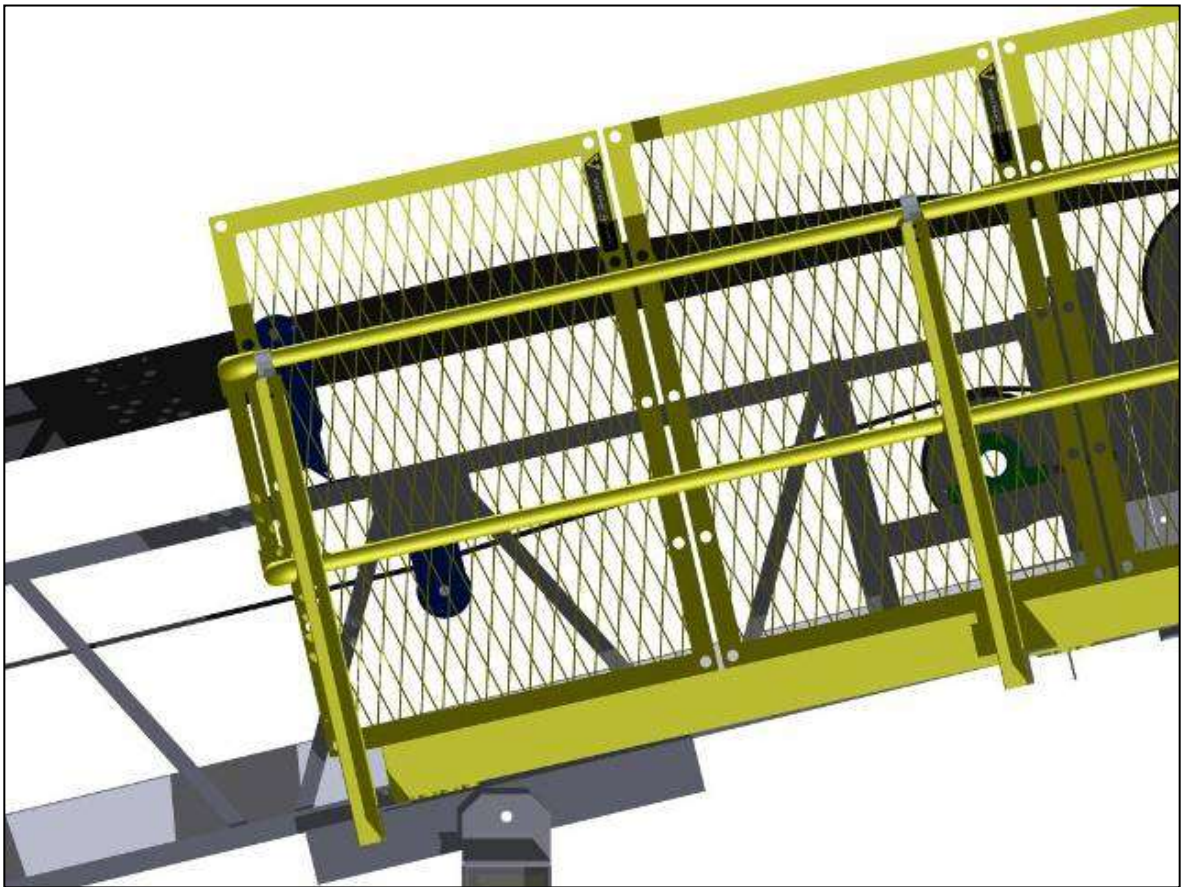
Return Rollers – above 8 feet from the ground.

Return Rollers – above 7 feet from the ground.

Return Rollers – on walkways.



Return Rollers – on walkways.



Uprights or Obstructions which could trap.

Uprights or Obstructions which could trap.

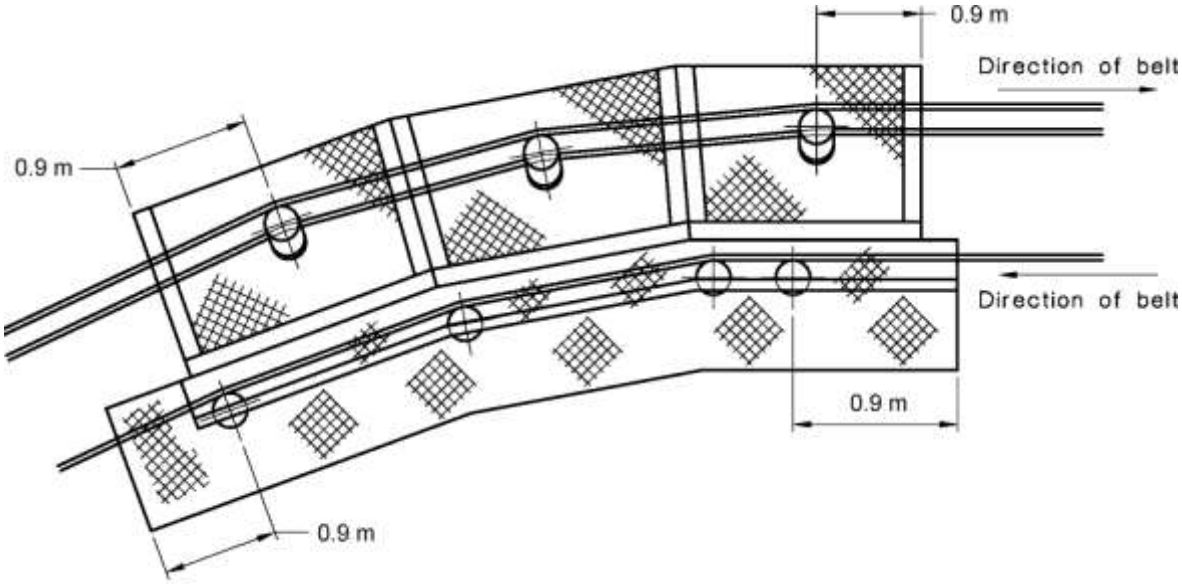
V-Belts

V-Belts

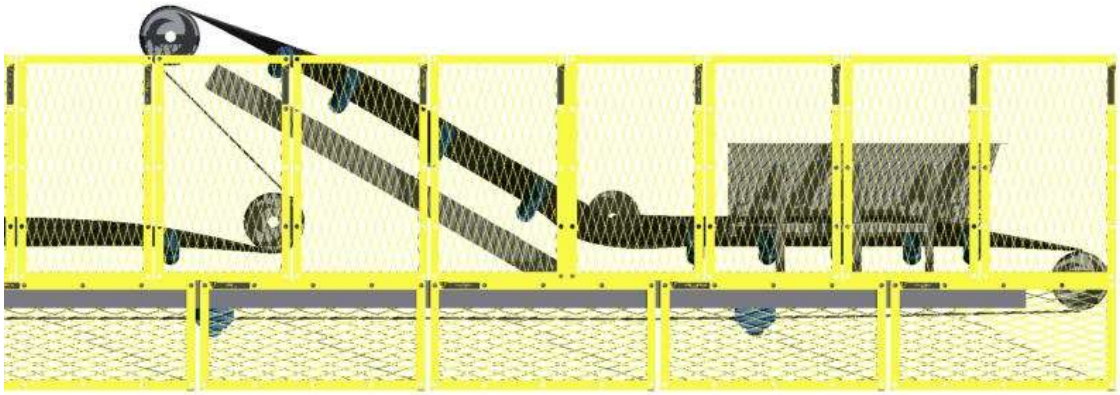
V-Belts

Other Circumstances to Consider

Conveyor Bends



Tripper Conveyors



Radial Drivers on Portable Stacks

Radial Drivers on Portable Stacks

Self-Closing Gate

- Used on top of ladder exists so person doesn't back or walk into the ladder opening
- Gate can also be used at the bottom of stairs to limit access.

Self-Closing Gate

Self-Closing Gate

Self-Closing Gate

Training

- Training should involve instruction and hands-on training.
- Specific training is a crucial part of any effective guarding system.

Three Questions to Ask Your Workers:

1. How do the guards provide protection for the specific pinch point?
2. How and under what circumstances can guards be safely removed and when must the guards be replaced?
3. What do you do if a guard is damaged or missing?

Conclusion

1. Keep it simple
4. Standardize your guarding.
2. Properly train your workers.

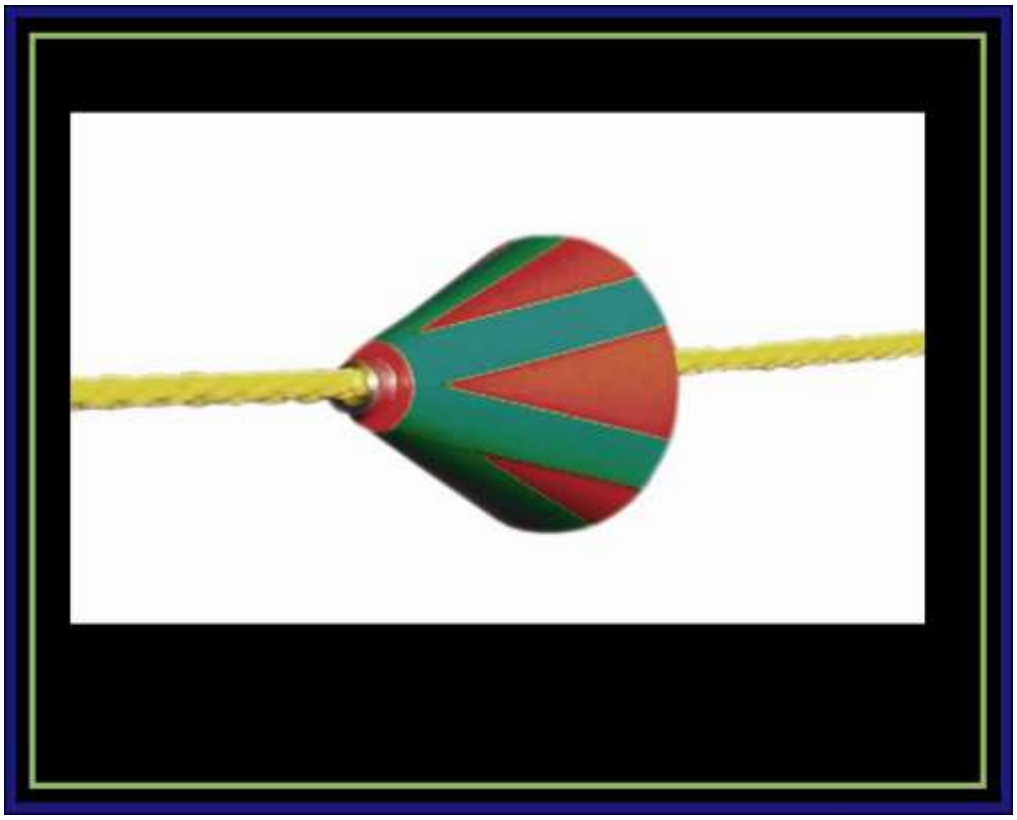
Notes:

LIFELINE

GOAL

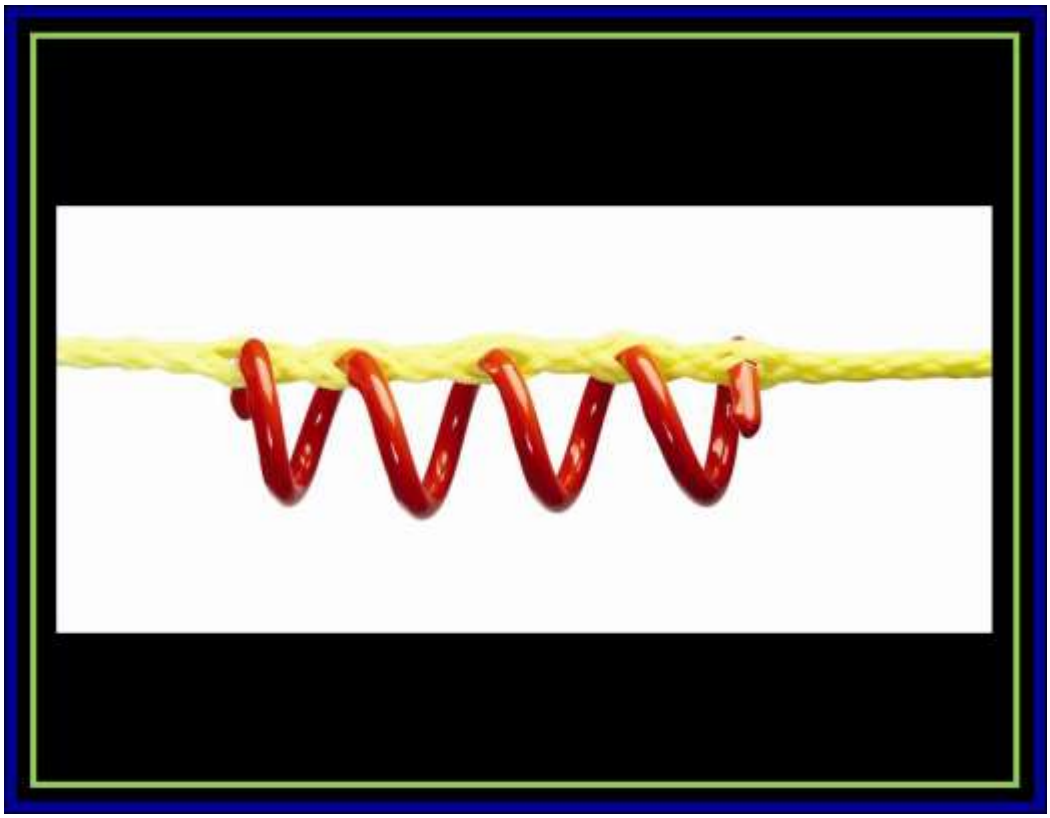
To explain the meaning and the purpose of the Lifeline used in underground coal mines as outlined in SHA 30 CFR 75.380 and 75.381.

Single Directional Indicator – Signifies the route of escape.

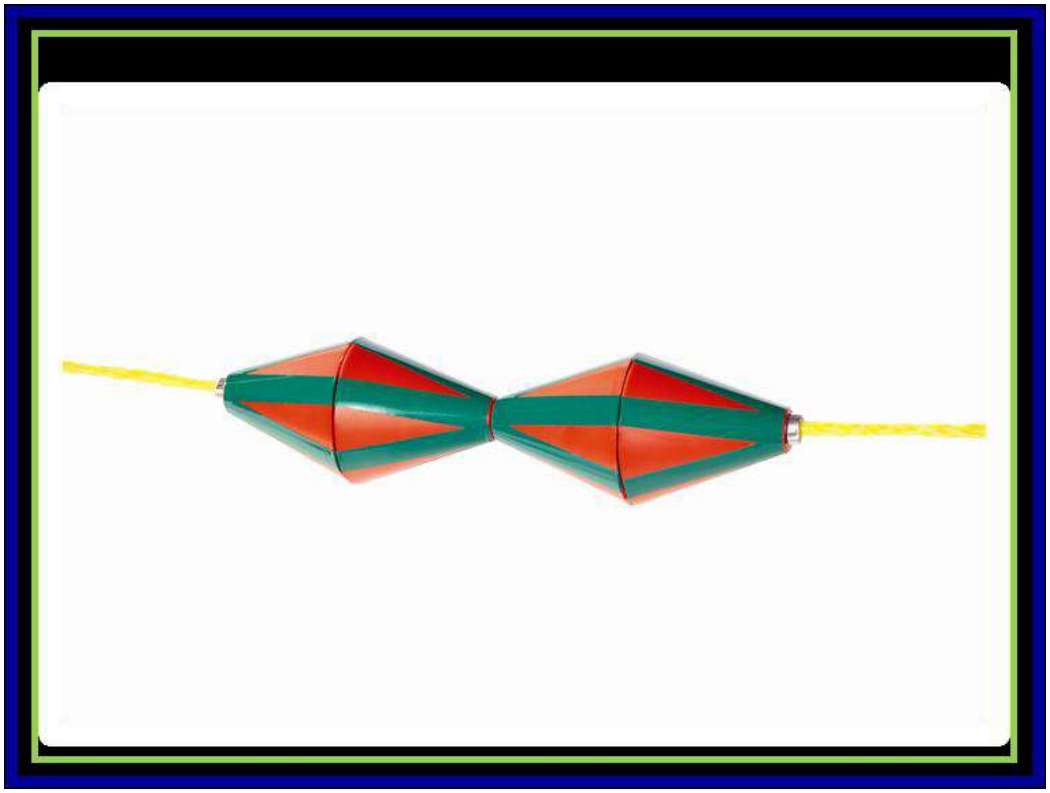


Branch Line – Two cones represent a Branch Line immediately ahead.

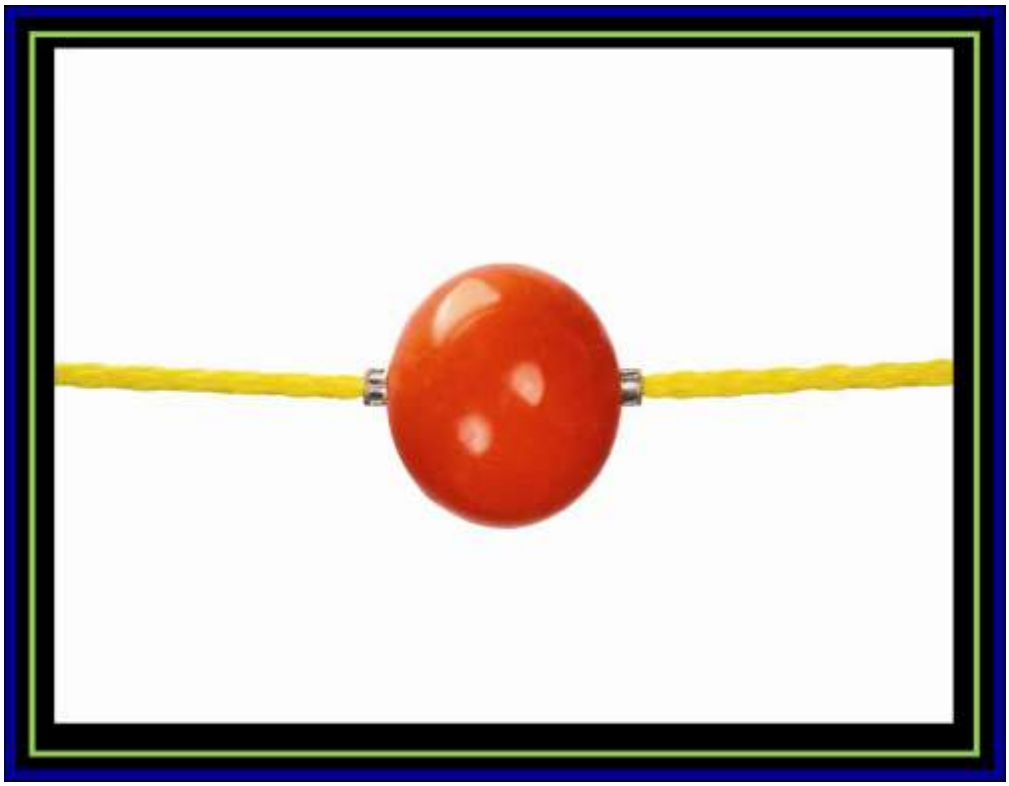
Refuge Alternative – Rigid spiral coil signified Branch Line to a Refuge Chamber



SCSR Cache – Back-to-Back Cones signify a Branch Line to a SCSR Cache



Personnel Door – Sphere (Ball) signifies a Personnel Door



Reflective Material or Marker are to be:

- At least 2 inches wide.
- Placed at intervals not to exceed 25 feet.

ESCAPEWAYS

Know Your Route to Get OUT!!

ESCAPEWAYS

1. Q. From every active section there are two escapeways, they are referred to as?

   A. Primary and Alternate Escapeways.

2. Q. Ture or False: The primary escapeway of every active section must be ventilated with intake air as long as it is examined every seven days?

   A. True: Always ventilated with intake air.

3. Q. A ventilating current of air is no longer considered “intake air” but “return air” only after it ventilates an active working face and ventilates _____-_____ _____.

   A. Worked-out areas.

4. Q. What does every working section’s primary intake escapeway’s lifeline go to?

   A. Nearest available escape facility.

5. Q. For each shift that miners work underground, there shall be in attendance a responsible person designated to take charge during mine emergencies, this person hold the position of what?

   A. Shift Foreman.

6. Q. The responsible person shall have knowledge of what?

   A.
   1. Location of miners.
   2. Mine ventilation system.
   3. Mine escapeways and refuge chambers.
   4. Mine communications/monitoring system.
   5. Locations of firefighting equipment.
   6. Emergency Response Plan.
   7. Mine Rescue Notification Plan.
   8. Mine Emergency Evacuation & Firefighting Program.

7. Q. The lifeline provided in the primary and alternate escapeway of a working section must extend to the _____ of the section.

   A. Loading point

8. Q. When evacuating from a **main entries** working section, the first route of travel to the surface would be the _____ entry.

A. Track Entry

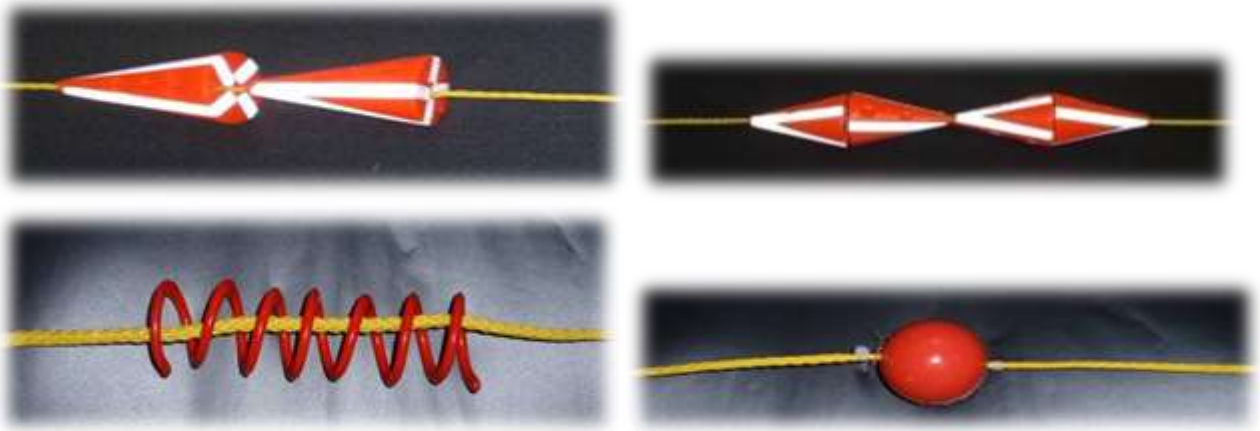
9. Q. When evacuating from a working section what five items should you take with you?

A. SCSR
Escapeway map
Tether line
Radio
First Aid kit

10. Q. What direction would take you to the escape facility?

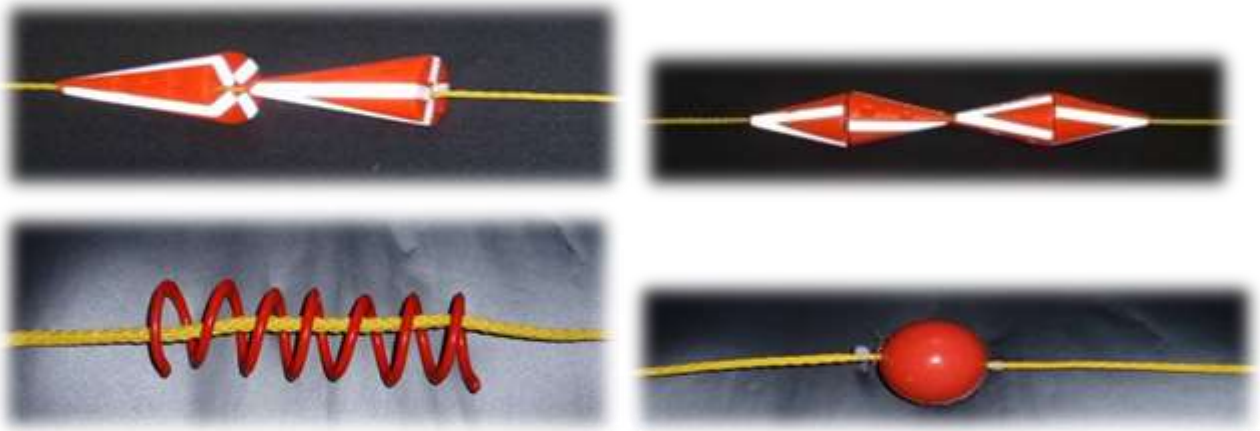
A. Left

11. Q. Which cones indicates you are approaching a branch line or intersection?



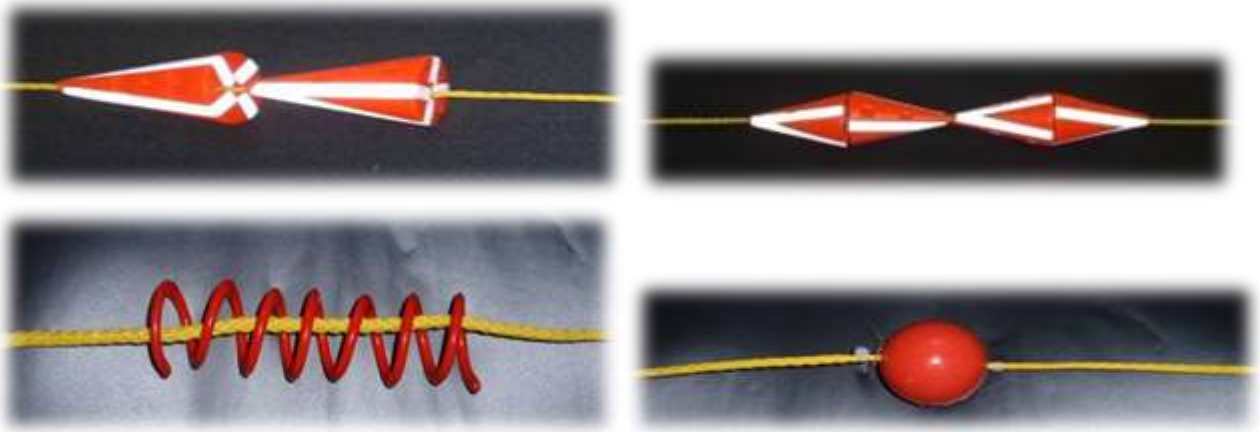
A. Two cones represent a branch line immediately ahead.

12. Q. Which cones indicates you are approaching a cache of SCSR's?

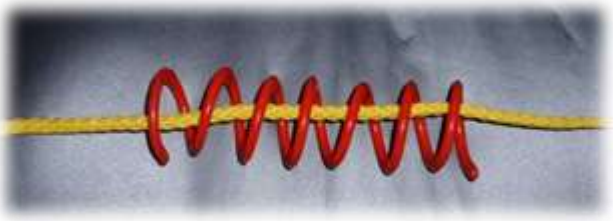


A. Back-to-Back cones signify a branch line to a SCSR cache.

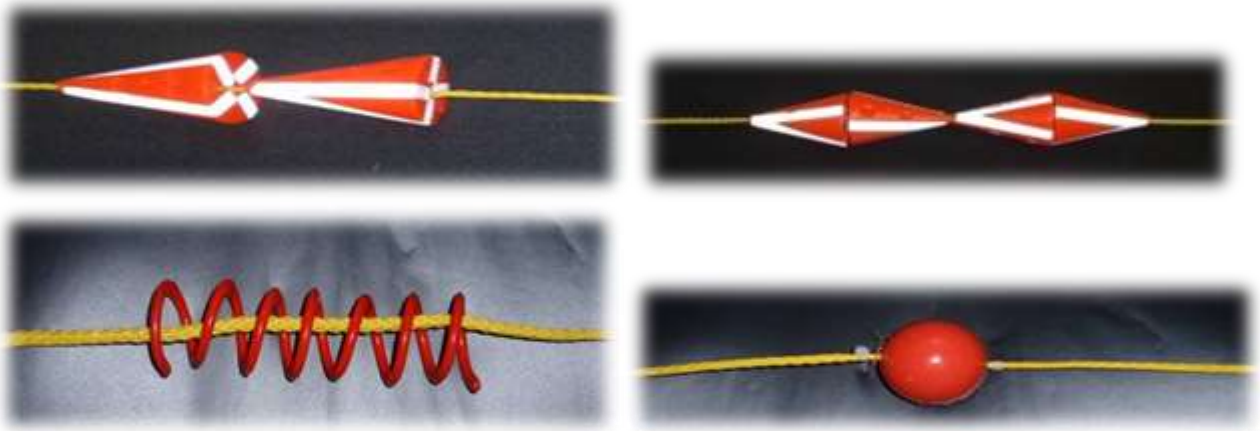
13. Q. Which cones indicates you are approaching a refuge chamber?



A. Rigid spiral coil signifies a branch line to a refuge chamber.



14. Q. Which cones indicates you are approaching a door?



A. Sphere (ball) signifies a personnel door.

15. Q. An escapeway map shall show the designated escapeways from the working sections to the _____?

A. Surface or shaft bottom.

16. Q. True or False: The escapeway map must also show the location of refuge chambers, SCSR storage locations, direction of air, and location of doors.

A. True

17. Q Escapeway maps are not only required on the working sections, but also _____ ?

A. Required in each area where mechanized mining equipment is being installed or removed.

18. Q. All maps shall be kept up-to-date and any changes in route of travel, location of doors, location of refuge chambers, or direction of airflow shall be shown on the maps by the end of the _____ on/in which the change is made.

A. Shift.

19. Q. True or False: Refuge chambers shall be provided within 1,000 feet from the nearest working face and from locations where mechanized mining equipment is being installed or removed?

A. True

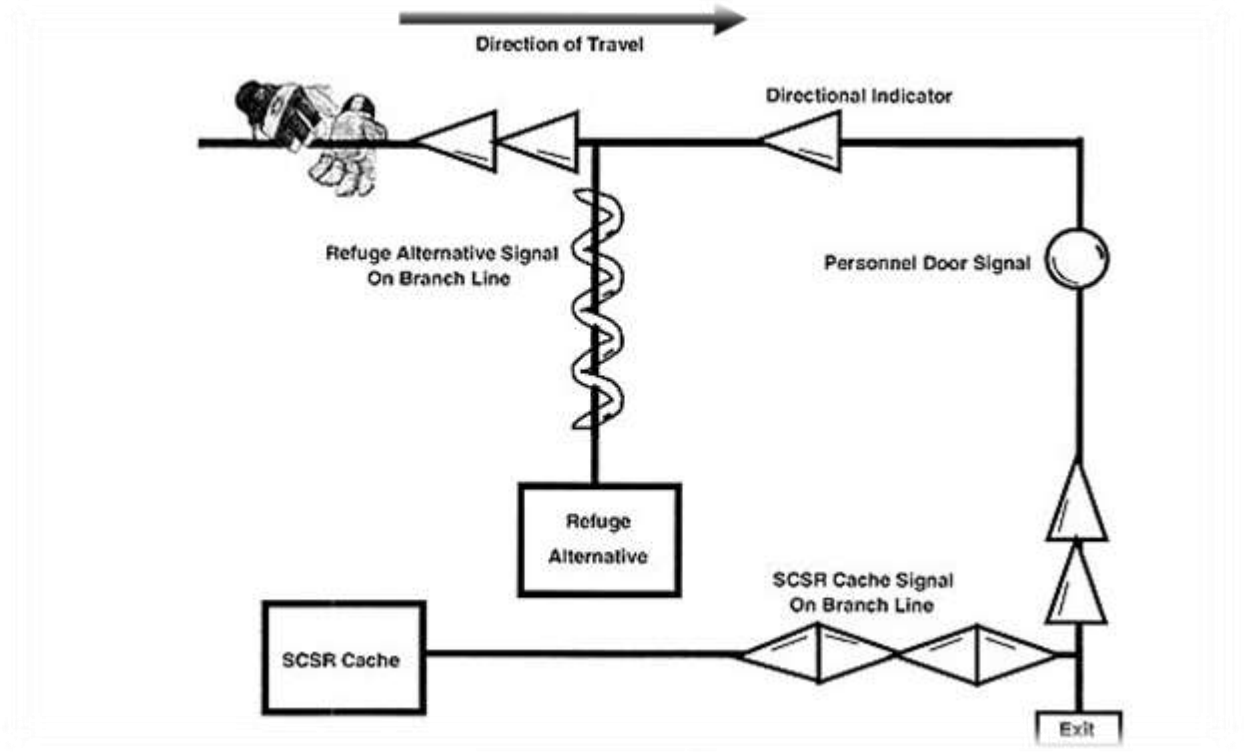
20. True or False: If a refuge chamber is removed from service, all person in the area serviced by the refuge chamber must be withdrawn?

A. True – Except persons needed to correct the problem and the fireboss these persons are exempt.

21. Q. True or False: Refuge chambers must contain a fire extinguisher?

A. True.

Escapeways



Notes:

DOCUMENTS, FORMS AND PRACTICE MAPS

Documents, forms, practice maps and more information are available on our website, https://minesafety.wv.gov.