Indiana Department of Labor

Bureau of Mines

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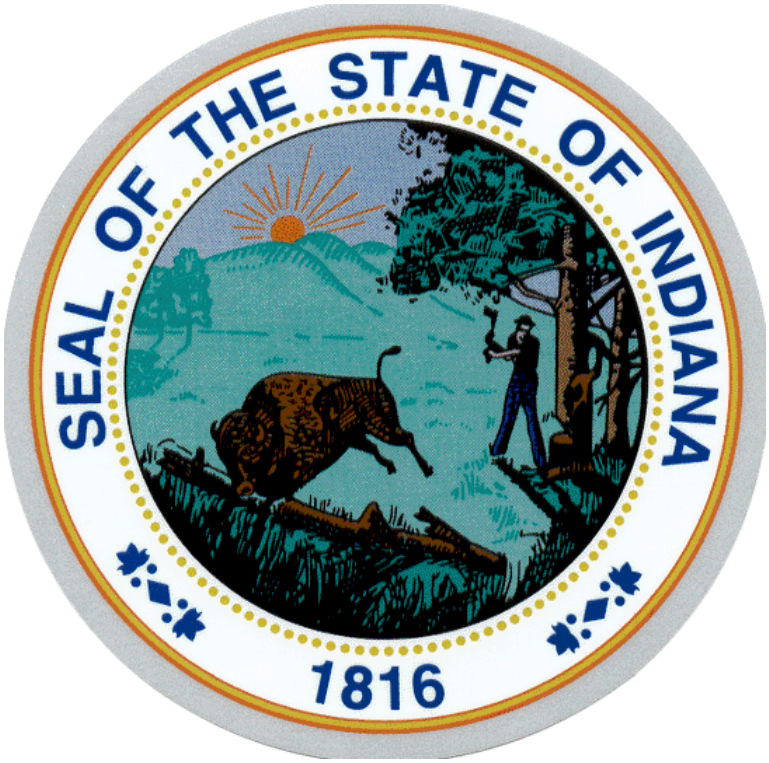
MINE FOREMAN'S STUDY GUIDE



QUALIFICATIONS

IC 22-10-3-10(b)

- **Must hold an Indiana Miner's License**
- **Applicant for Mine Foreman**
  1. **Must have four years of experience in underground coal mining.**
     - **However: persons who have graduated and hold a degree in engineering or an approved four (4) year program in coal mining technology from an accredited school, college, or university are required to have only two (2) years of practical underground mining experience to qualify for the examination and persons who have graduated and hold a two (2) year associate in applied science degree in coal mining technology from an accredited school, college or university are required to have only three (3) years practical underground mining experience to qualify for the examination.**
  2. **Must have thorough knowledge of the coal mining laws in Indiana, and the mining laws under Title 30 CFR, and the Federal Mine Safety and Health Act of 1977 Amended by the MINER ACT 0f 2006.**
  3. **Must prove to the Mining Board by a written and oral examination, and by demonstration that you are competent and qualified where applicable, that the applicant has a thorough knowledge of:**
     - **i. The theory and practice of coal mining**
     - **ii. The nature and properties of poisonous, noxious, and explosive gases and methods for their detection and control**
     - **iii. The requirements of the coal mining laws of this state.**

     b. A certificate of competency may not be issued to any person whose grade is less than 75%.

     c. Applicants for examination must pay the Bureau of Mines an examination fee of $25.00.

PURPOSE

Supervision of Mines

IC 22-10-3-14

Each commercial mine shall be supervised by a properly certified mine foreman who shall see that the provisions of the coal-mining laws of Indiana that pertain to their (the certified mine foreman) duties and to the health and safety of the employees are complied with. When the mine workings are so extensive that the mine foreman is unable personally to carry out the lawfully required duties, the operator shall employ enough properly certified assistants who shall act under the direction of the mine foreman. The mine foreman (known as the operator) or the mine foreman's assistants shall not permit any person to work in an unsafe place except for the purpose of making it safe and such work shall be under the direction and instruction of a certified official.

The mine foreman shall provide such data and information regarding the operation of the mine as may be required by the Director on blanks which shall be furnished by the Director. The mine foreman is responsible for the health and safety of all employees. The mine foreman must also see that adequate supplies are on hand for the safe operation of the mine. The mine foreman must read and countersign all mine record books (promptly). The mine foreman shall also see that there are properly certified mine examiners to insure proper pre-shift and on-shift inspections. The mine foreman must insure adequate and proper ventilation. The mine foreman is responsible to ensure that all mining laws are complied with.

Mining Terms & Definitions

Act: **The Federal Mine Safety and Health Act of 1977. Found in the 30 CFR part 75.2**

Active workings: **Any place in a coal mine where miners are normally required to work or travel. Found in the 30 CFR part 75.2**

Qualified person: **As the context requires:**

(1) An individual deemed qualified by the Secretary and designated by the operator to make tests and examinations required by this part 75; and

(2) An individual deemed, in accordance with minimum requirements to be established by the Secretary, qualified by training, education, and experience, to perform electrical work, to maintain electrical equipment, and to conduct examinations and tests of all electrical equipment. Found in the 30 CFR part 75.2

Rock dust: **Pulverized limestone, dolomite, gypsum, anhydrite, shale, adobe, or other inert material, preferably light colored, 100 percent of which will pass through a sieve having 20 meshes per linear inch and 70 percent or more of which will pass through a sieve having 200 meshes per linear inch; the particles of which when wetted and dried will not cohere to form a cake which will not be dispersed into separate particles by a light blast of air; and which does not contain more than 5 percent combustible matter or more than a total of 4 percent free and combined silica (SiO_2), or, where the Secretary finds that such silica concentrations are not available, which does not contain more than 5 percent of free and combined silica. Found in the 30 CFR part 75.2**

Working face: **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. Found in the 30 CFR part 75.2**

Working place: **The area of a coal mine inby the last open crosscut. Found in the 30 CFR part 75.2**

Working section: **All areas of the coal mine from the loading point of the section to and including the working faces. Found in the 30 CFR part 75.2**

Definitions found in the 30 CFR Part 75.301

Air course: **An entry or a set of entries separated from other entries by stoppings, overcasts, other ventilation control devices, or by solid blocks of coal or rock so that any mixing of air currents between each is limited to leakage.**

Intake air: **Air that has not yet ventilated the last working place on any split of any working section, or any worked-out area, whether pillared or non-pillared.**

Return air: **Air that has ventilated the last working place on any split of any working section or any worked-out area whether pillared or non-pillared. If air mixes with air that has ventilated the last working place on any split of any working section or any worked-out area, whether pillared or non-pillared, it is considered return air. For the purposes of the 30 CFR Part 75.507-1, air that has been used to ventilate any working place in a coal producing section or pillared area, or air that has been used to ventilate any working face if such air is directed away from the immediate return, is return air. Notwithstanding the definition of intake air, for the purpose of ventilation of structures, areas or installations that are required by this subpart D to be ventilated to return air courses, and for**

ventilation of seals, other air courses may be designated as return air courses by the operator only when the air in these air courses will not be used to ventilate working places or other locations, structures, installations or areas required to be ventilated with intake air.

Worked-out area: **An area where mining has been completed, whether pillared or non-pillared, excluding developing entries, return air courses, and intake air courses.**

Definitions
30 CFR Part 75.400-1

(a) Coal dust: **Particles of coal that can pass a No. 20 sieve.**

(b) Float coal dust: **Coal dust consisting of particles of coal that can pass a No. 200 sieve.**

***(c) Loose coal*: Coal fragments larger in size than coal dust.**

Definitions found in the Indiana Code Title 22, Article 10, Chapter 3, Section 1

Director: **Means the director of the Bureau of Mines and Mining of Indiana.**

Interested Persons: **Means the director, safety personnel designated by the operator, state, and federal coal mine inspectors, and to the extent required by law, any other person. Found in the**

***Man or men*: As used in this article includes woman and women. The masculine gender includes the feminine. The feminine, the masculine.**

***Mine*: means an underground commercial coal mine.**

***Mine Examiner*: Means a properly certified person designated by the mine foreman to examine the mine for gas and other dangers.**

***Mine Inspector:* Means the person appointed to assist in administering this article.**

***Operator:* Means an individual, firm, association, partnership, or corporation operating an underground coal mine or any part thereof.**

***Shot Firer*: Means a properly certified person designated by the mine foreman to perform the function as required in this article in connection with breaking down coal or rock.**

***Abandoned areas* means sections, panels, and other areas that are not ventilated and examined in the manner required for working places under section 303 of this title; Definition Found in the Federal Mine and Safety Act 0f 1977 Public Law 91-173, as amended by Public Law 95-164 (h)**

EXAMINATIONS
Weekly
30 CFR Part 75.364

(a) *Hazardous conditions.* At least every 7 days, an examination for hazardous conditions at the following locations shall be made by a certified person designated by the operator:
(b) In each escapeway so that the entire escapeway is traveled.

(c) *Measurements and tests.* At least every 7 days, a certified person shall—

(1) Determine the volume of air entering the main intakes and, in each intake, split;

(2) Determine the volume of air and test for methane in the last open crosscut in any pair or set of developing entries or rooms, in the return of each split of air immediately before it enters the main returns, and where the air leaves the main returns; and

(3) Test for methane in the return entry nearest each set of seals immediately after the air passes the seals.

(d) *Recordkeeping.* At the completion of any shift during which a portion of a weekly examination is conducted, a record of the results of each weekly examination, including a record of hazardous conditions found during each examination and their locations, the corrective action taken, and the results and location of air and methane measurements, shall be made. The results of methane tests shall be recorded as the percentage of methane measured by the examiner. The record shall be made by the person making the examination or a person designated by the operator. If made by a person other than the examiner, the examiner shall verify the record by the initials and date by or at the end of the shift for which the examination was made. The record shall be countersigned by the mine foreman or equivalent mine official by the end of the mine foreman's or equivalent mine official's next regularly scheduled working shift. The records required by this section shall be made in a secure book that is not susceptible to alteration or electronically in a computer system so as to be secure and not susceptible to alteration.

EXAMINATIONS
On-shift
30 CFR Part 75.362

(a)(1) At least once during each shift, or more often if necessary for safety, a certified person designated by the operator shall conduct an on-shift examination of each section where anyone is assigned to work during the shift and any area where mechanized mining equipment is being installed or removed during the shift. The certified person shall check for hazardous conditions and violations of the mandatory health or safety standards referenced in paragraph (a)(3) of this section, test for methane and oxygen deficiency, and determine if the air is moving in its proper direction.

(2) A person designated by the operator shall conduct an examination and record the results and the corrective actions taken to assure compliance with the respirable dust control parameters specified in the approved mine ventilation plan. In those instances when a shift change is accomplished without an interruption in production on a section, the examination shall be made anytime within 1 hour after the shift change. In those instances when there is an interruption in production during the shift change, the examination shall be made before production begins on a section. Deficiencies in dust controls shall be corrected before production begins or resumes. The examination shall include: Air quantities and velocities; water pressures and flow rates; excessive leakage in the water delivery system; water spray numbers and orientations; section ventilation and control device placement; roof bolting machine dust collector vacuum levels; scrubber air flow rate; work practices required by the ventilation plan; and any other dust suppression measures. Measurements of the air velocity and quantity, water pressure and flow rates are not required if continuous monitoring of these controls is used and indicates that the dust controls are functioning properly.

(3) On-shift examinations shall include examinations to identify violations of the standards listed below:

(i) 75.202(a) and 75.220(a)(1)—roof control;

(ii) 75.333(h) and 75.370(a)(1)—ventilation, methane;

(iii) 75.400 and 75.403—accumulations of combustible materials and application of rock dust;

(iv) 75.1403—other safeguards, limited to maintenance of travelways along belt conveyors, off track haulage roadways, and track haulage, track switches, and other components for haulage;

(v) 75.1722(a)—guarding moving machine parts; and

(vi) 75.1731(a)—maintenance of belt conveyor components.

(b) During each shift that coal is produced, a certified person shall examine for hazardous conditions and violations of the mandatory health or safety standards referenced in paragraph (a)(3) of this section along each belt conveyor haulageway where a belt conveyor is operated. This examination may be conducted at the same time as the preshift examination of belt conveyors and belt conveyor haulageways, if the examination is conducted within 3 hours before the oncoming shift.

(c) Persons conducting the on-shift examination shall determine at the following locations:

(1) The volume of air in the last open crosscut of each set of entries or rooms on each section and areas where mechanized mining equipment is being installed or removed. The last open crosscut is the crosscut in the line of pillars containing the permanent stoppings that separate the intake air courses and the return air courses.

(2) The volume of air on a longwall or shortwall, including areas where longwall or shortwall equipment is being installed

or removed, in the intake entry or entries at the intake end of the longwall or shortwall.

(3) The velocity of air at each end of the longwall or shortwall face at the locations specified in the approved ventilation plan.

(4) The volume of air at the intake end of any pillar line—

(i) Where a single split of air is used in the intake entry furthest from the return air course immediately outby the first open crosscut outby the line of pillars being mined; or

(ii) Where a split system is used in the intake entries of each split immediately inby the split point.

(d)(1) A qualified person shall make tests for methane—

(i) At the start of each shift at each working place before electrically operated equipment is energized; and

(ii) Immediately before equipment is energized, taken into, or operated in a working place; and

(iii) At 20-minute intervals, or more often if required in the approved ventilation plan at specific locations, during the operation of equipment in the working place.

(2) Except as provided for in paragraph (d)(3) of this section, these methane tests shall be made at the face from under permanent roof support, using extendable probes or other acceptable means. When longwall or shortwall mining systems are used, these methane tests shall be made at the shearer, the plow, or the cutting head. When mining has been stopped for more than 20 minutes, methane tests shall be conducted prior to the start up of equipment.

(3) As an alternative method of compliance with paragraph (d)(2) of this section during roof bolting, methane tests may be made by sweeping an area not less than 16 feet inby the last area of permanently supported roof, using a probe or other

acceptable means. This method of testing is conditioned on meeting the following requirements:

(i) The roof bolting machine must be equipped with an integral automated temporary roof support (ATRS) system that meets the requirements of 30 CFR 75.209.

(ii) The roof bolting machine must have a permanently mounted, MSHA-approved methane monitor which meets the maintenance and calibration requirements of 30 CFR 75.342(a)(4), the warning signal requirements of 30 CFR 75.342(b), and the automatic de-energization requirements of 30 CFR 75.342(c).

(iii) The methane monitor sensor must be mounted near the inby end and within 18 inches of the longitudinal center of the ATRS support and positioned at least 12 inches from the roof when the ATRS is fully deployed.

(iv) Manual methane tests must be made at intervals not exceeding 20 minutes. The test may be made either from under permanent roof support or from the roof bolter's work position protected by the deployed ATRS.

(v) Once a methane test is made at the face, all subsequent methane tests in the same area of unsupported roof must also be made at the face, from under permanent roof support, using extendable probes or other acceptable means at intervals not exceeding 20 minutes.

(vi) The district manager may require that the ventilation plan include the minimum air quantity and the position and placement of ventilation controls to be maintained during roof bolting.

(e) If auxiliary fans and tubing are used, they shall be inspected frequently.

(f) During each shift that coal is produced and at intervals not exceeding 4 hours, tests for methane shall be made by a certified **person or by an atmospheric monitoring system (AMS) in each**

return split of air from each working section between the last working place, or longwall or shortwall face, ventilated by that split of air and the junction of the return air split with another air split, seal, or worked-out area. If auxiliary fans and tubing are used, the tests shall be made at a location outby the auxiliary fan discharge.

(g) Certification.

(1) The person conducting the on-shift examination in belt haulage entries shall certify by initials, date, and time that the examination was made. The certified person shall certify by initials, date, and the time at enough locations to show that the entire area has been examined.

(2) The certified person directing the on-shift examination to assure compliance with the respirable dust control parameters specified in the approved mine ventilation plan shall:

(i) Certify by initials, date, and time on a board maintained at the section load-out or similar location showing that the examination was made prior to resuming production; and

(ii) Verify, by initials and date, the record of the results of the examination required under (a)(2) of this section to assure compliance with the respirable dust control parameters specified in the mine ventilation plan. The verification shall be made no later than the end of the shift for which the examination was made.

(3) The mine foreman or equivalent mine official shall countersign each examination record required under (a)(2) of this section after it is verified by the certified person under (g)(2)(ii) of this section, and no later than the end of the mine foreman's or equivalent mine official's next regularly scheduled working shift. The record shall be made in a secure book that is not susceptible to alteration or electronically in a computer system so as to be secure and not susceptible to alteration.

(4) Records shall be retained at a surface location at the mine for at least 1 year and shall be made available for inspection by

authorized representatives of the Secretary and the representative of miners.

ESCAPEWAYS
30 CFR Part 75.380

Escapeways; bituminous and lignite mines.

- **(a) Except in situations addressed in §75.381, §75.385 and §75.386, at least two separate and distinct travelable passageways shall be designated as escapeways and shall meet the requirements of this section.**

(b)(1) Escapeways shall be provided from each working section, and each area where mechanized mining equipment is being installed or removed, continuous to the surface escape drift opening or continuous to the escape shaft or slope facilities to the surface.

(2) During equipment installation, these escapeways shall begin at the projected location for the section loading point. During equipment removal, they shall begin at the location of the last loading point.

(c) The two separate and distinct escapeways required by this section shall not end at a common shaft, slope, or drift opening, except that multiple compartment shafts or slopes separated by walls constructed of noncombustible material may be used as separate and distinct passageways.

(d) Each escapeway shall be—

(1) Maintained in a safe condition to always assure passage of anyone, including disabled persons;

(2) Clearly marked to show the route and direction of travel to the surface;

(3) Maintained to at least a height of 5 feet from the mine floor to the mine roof, excluding the thickness of any roof support, except that the escapeways shall be maintained to at least the height of the coalbed, excluding the thickness of any roof support, where the coalbed is less than 5 feet. In areas of mines where escapeways pass through doors, the height may be less

than 5 feet, provided that sufficient height is maintained to enable miners, including disabled persons, to escape quickly in an emergency. In areas of mines developed before November 16, 1992, where escapeways pass over or under overcasts or undercasts, the height may be less than 5 feet provided that sufficient height is maintained to enable miners, including disabled persons, to escape quickly in an emergency. When there is a need to determine whether sufficient height is provided, MSHA may require a stretcher test where 4 persons carry a miner through the area in question on a stretcher;

(4) Maintained at least 6 feet wide except--

(i) Where necessary supplemental roof support is installed, the escapeway shall not be less than 4 feet wide; or

(ii) Where the route of travel passes through doors or other permanent ventilation controls, the escapeway shall be at least 4 feet wide to enable miners to escape quickly in an emergency, or

(iii) Where the alternate escapeway passes through doors or other permanent ventilation controls or where supplemental roof support is required and sufficient width is maintained to enable miners, including disabled persons, to escape quickly in an emergency. When there is a need to determine whether sufficient width is provided, MSHA may require a stretcher test where 4 persons carry a miner through the area in question on a stretcher, or

(iv) Where mobile equipment near working sections, and other equipment essential to the ongoing operation of longwall sections, is necessary during normal mining operations, such as material cars containing rock dust or roof control supplies, or is to be used for the evacuation of miners off the section in the event of an emergency. In any instance, escapeways shall be of sufficient width to enable miners, including disabled persons, to escape quickly in an emergency. When there is a need to determine whether sufficient width is provided, MSHA may require a stretcher test where 4 persons carry a miner through the area in question on a stretcher;

(5) Located to follow the most direct, safe and practical route to the nearest mine opening suitable for the safe evacuation of miners; and

(6) Provided with ladders, stairways, ramps, or similar facilities where the escapeways cross over obstructions.

(7) Provided with a continuous, durable directional lifeline or equivalent device that shall be—

(i) Installed and maintained throughout the entire length of each escapeway as defined in paragraph (b)(1) of this section;

(ii) Flame-resistant in accordance with the requirements of part 18 of this chapter upon replacement of existing lifelines; but in no case later than June 15, 2009;

(iii) Marked with a reflective material every 25 feet;

(iv) Located in such a manner for miners to use effectively to escape;

(v) Equipped with one directional indicator cone securely attached to the lifeline, signifying the route of escape, placed at intervals not exceeding 100 feet. Cones shall be installed so that the tapered section points inby;

(vi) Equipped with one sphere securely attached to the lifeline at each intersection where personnel doors are installed in adjacent crosscuts;

(vii) Equipped with two securely attached cones, installed consecutively with the tapered section pointing inby, to signify an attached branch line is immediately ahead.

(A) A branch line leading from the lifeline to an SCSR cache will be marked with four cones with the base sections in contact to form two diamond shapes. The cones must be placed within reach of the lifeline.

(B) A branch line leading from the lifeline to a refuge alternative will be marked with a rigid spiraled coil at least eight inches in length. The spiraled coil must be placed within reach of the lifeline (see Illustration 1 below).

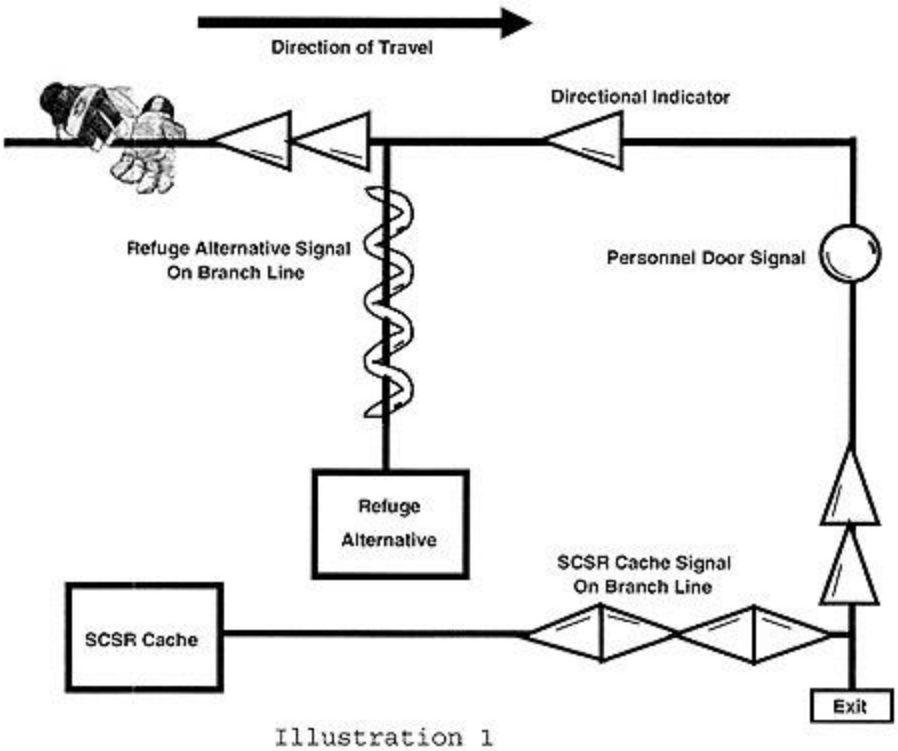


Illustration 1

(e) Surface openings shall be adequately protected to prevent surface fires, fumes, smoke, and flood water from entering the mine.

(f) *Primary escapeway*.

(1) One escapeway that is ventilated with intake air shall be designated as the primary escapeway. The primary escapeway shall have a higher ventilation pressure than the belt entry unless the mine operator submits an alternative in the mine ventilation plan to protect the integrity of the primary escapeway, based on mine specific conditions, which is approved by the district manager.

(2) Paragraphs (f)(3) through (f)(7) of this section apply as follows:

(i) To all areas of a primary escapeway developed on or after November 16, 1992;

(ii) Effective as of June 10, 1997, to all areas of a primary escapeway developed between March 30, 1970 and November 16, 1992; and

(iii) Effective as of March 11, 1997, to all areas of the primary

escapeway developed prior to March 30, 1970 where separation of the belt and trolley haulage entries from the primary escapeway existed prior to November 16, 1992.

(3) The following equipment is not permitted in the primary escapeway:

(i) Mobile equipment hauling coal except for hauling coal incidental to cleanup or maintenance of the primary escapeway.

(ii) Compressors, except--

(A) Compressors necessary to maintain the escapeway in safe, travelable condition;

(B) Compressors that are components of equipment such as locomotives and rock dusting machines; and

(C) Compressors of less than five horsepower.

(iii) Underground transformer stations, battery charging stations, substations, and rectifiers except--

(A) Where necessary to maintain the escapeway in safe, travelable condition; and

(B) Battery charging stations and rectifiers and power centers with transformers that are either dry-type or contain nonflammable liquid, provided they are located on or near a working section and are moved as the section advances or retreats.

(iv) Water pumps, except--

(A) Water pumps necessary to maintain the escapeway in safe, travelable condition;

(B) Submersible pumps;

(C) Permissible pumps and associated permissible switchgear;

(D) Pumps located on or near a working section that are moved as the section advances or retreats;

(E) Pumps installed in anthracite mines; and

(F) Small portable pumps.

(4) Mobile equipment operated in the primary escapeway, except for continuous miners and as provided in paragraphs (f)(5), (f)(6), and (f)(7) of this section, shall be equipped with a fire suppression system installed according to 75.1107-3 through 75.1107-16 that is--

(i) Manually operated and attended continuously by a person trained in the systems function and use, or

(ii) A multipurpose dry chemical type capable of both automatic and manual activation.

(5) Personnel carriers and small mobile equipment designed and used only for carrying people and small hand tools may be operated in primary escapeways if--

(i) The equipment is provided with a multipurpose dry chemical type fire suppression system capable of both automatic and manual activation, and the suppression system is suitable for the intended application and is listed or approved by a nationally recognized independent testing laboratory, or,

(ii) Battery powered and provided with two 10 pound multipurpose dry chemical portable fire extinguishers.

(6) Notwithstanding the requirements of paragraph (f)(3)(i), mobile equipment not provided with a fire suppression system may operate in the primary escapeway if no one is inby except those persons directly engaged in using or moving the equipment.

(7) Notwithstanding the requirements of paragraph (f)(3)(i), mobile equipment designated and used only as emergency vehicles or ambulances, may be operated in the primary escapeway without fire suppression systems.

(g) Except where separation of belt and trolley haulage entries from designated escapeways did not exist before November 15, 1992, and except as provided in 75.350(c), the primary escapeway must be separated from belt and trolley haulage entries for its entire length, to and including the first connecting crosscut outby each loading point except when a greater or lesser distance for this separation is specified and approved in the mine ventilation plan and does not pose a hazard to miners.

(h) *Alternate escapeway.* One escapeway shall be designated as the alternate escapeway. The alternate escapeway shall be separated from the primary escapeway for its entire length, except that the alternate and primary escapeways may be ventilated from a common intake air shaft or slope opening.

(i) Mechanical escape facilities shall be provided and maintained for—

(1) Each shaft that is part of a designated escapeway and is greater than 50 feet in depth; and

(2) Each slope from the coal seam to the surface that is part of a designated escapeway and is inclined more than 9 degrees from the horizontal.

(j) Within 30 minutes after mine personnel on the surface have been notified of an emergency requiring evacuation, mechanical escape facilities provided under paragraph (i) of this section shall be operational at the bottom of shaft and slope openings that are part of escapeways.

(k) Except where automatically activated hoisting equipment is used, the bottom of each shaft or slope opening that is part of a designated escapeway shall be equipped with a means of signaling a surface location where a person is always on duty when anyone is underground. When the signal is activated or the evacuation of persons underground is necessary, the person shall assure that mechanical escape facilities are operational as required by paragraph (j) of this section.

(l)(1) Stairways or mechanical escape facilities shall be installed in shafts that are part of the designated escapeways and that are 50 feet or less in depth, except ladders may be used in shafts that are part of the designated escapeways and that are 5 feet or less in depth.

(2) Stairways shall be constructed of concrete or metal, set on an angle not to exceed 45 degrees from the horizontal, and equipped on the open side with handrails. In addition, landing platforms that are at least 2 feet by 4 feet shall be installed at intervals not to exceed 20 vertical feet on the stairways and equipped on the open side with handrails.

(3) Ladders shall be constructed of metal, anchored securely, and set on an angle not to exceed 60 degrees from the horizontal.

(m) A travelway designed to prevent slippage shall be provided in slope and drift openings that are part of designated escapeways, unless mechanical escape facilities are installed. and set on an angle not to exceed 60 degrees from the horizontal.

SMOKING PROHIBITION
30CFR Part 75.1702

No person shall smoke, carry smoking materials, matches, or lighters underground, or smoke in or around oil houses, explosives magazines, or other surface areas where such practice may cause a fire or explosion. The operator shall institute a program, approved by the Secretary, to ensure that any person entering the underground area of the mine does not carry smoking materials, matches, or lighters.

ROCK DUSTING
30CFR Part 75.402

All underground areas of a coal mine, except those areas in which the dust is too wet or too high in incombustible content to propagate an explosion, shall be rock dusted to within 40 feet of all working faces, unless such areas are inaccessible or unsafe to enter or unless the Secretary or his authorized representative permits an exception upon his finding that such exception will not pose a hazard to the miners. All crosscuts that are less than 40 feet from a working face shall also be rock dusted.

COAL DUST

1. **Is it possible to have an explosion in a mine without explosive gas being present?**
    a. **yes, in addition to explosive gas, the fine coal dust deposited on the floor, ribs, roof, and timbers is explosive.**

2. **What usually causes explosions to spread over a wide area and sometimes extend throughout the mine?**
    a. **coal dust**

3. **How does coal dust contribute to severity of an explosion?**
    a. **by being raised in clouds and ignited; the explosion is thus propagated throughout the mine.**

4. **Is all coal dust explosive?**
    a. **all bituminous coal dust and lignite dusts are explosive.**

5. **How can coal dust be kept out of suspension?**
    a. **by sprinkling with water or other dust-allying methods.**

CONTROL OF COAL DUST, USE OF ROCK DUST

1. **How should dry and dusty sections be treated?**
    a. **Dust should be controlled by clean-up and scooping. The roadways should be watered and the section well rock dusted.**

2. **What benefit is derived from rock dusting?**
    a. **The danger of a coal dust explosion is reduced, and the illumination is increased.**

3. **What parts of a mine should be rock dusted?**
    a. **All safe and accessible areas.**

4. **What is the disadvantage to having a high velocity of air on the belt line?**
    a. **Air could blow coal fines off the belt. It could also blow smoke and or Carbon Monoxide a long distance before being monitored by the AMS system.**

5. **What dust control measures are used at belt transfer points?**
    a. **Water sprays.**

6. **What dust control measures are used along haulage roads?**
    a. **Water, Calcium Chloride, or other wetting agents will be used as needed.**

ACTIONS FOR EXCESSIVE METHANE
30CFR Part 75.323

Actions for excessive methane.

(a)*Location of tests.* Tests for methane concentrations under this section shall be made at least 12 inches from the roof, face, ribs, and floor.

(b)*Working places and intake air courses.*

(1) When 1.0 percent or more methane is present in a working place or an intake air course, including an air course in which a belt conveyor is located, or in an area where mechanized mining equipment is being installed or removed—

(i) Except intrinsically safe atmospheric monitoring systems (AMS), electrically powered equipment in the affected area shall be deenergized, and other mechanized equipment shall be shut off;

(ii) Changes or adjustments shall be made at once to the ventilation system to reduce the concentration of methane to less than 1.0 percent; and

(iii) No other work shall be permitted in the affected area until the methane concentration is less than 1.0 percent.

(2) When 1.5 percent or more methane is present in a working place or an intake air course, including an air course in which a belt conveyor is located, or in an area where mechanized mining equipment is being installed or removed—

(i) Everyone except those persons referred to in 104(c) of the Act shall be withdrawn from the affected area; and
(ii) Except for intrinsically safe AMS, electrically powered equipment in the affected area shall be disconnected at the power source.

Proximity
30CFR Part 75.1732

1. **What underground mining equipment is required to have a proximity detection system installed?**
    a. **Continuous mining machines.**

2. **Who is required to wear miner-wearable components (Prox) underground.**
    a. **Each person on the working section.**

3. **What warning signal(s) are required on the miner-wearable component?**
    a. **An audible and visual signal that alerts the miners before the system cause a machine to stop. These signals must be distinguishable from other signals.**

4. **What warning signal(s) are required on the machine?**
    a. **A visual warning signal.**

5. **When is a miner required to verify the components of the proximity detection system are functioning properly?**
    a. **At the beginning of each shift, within 1 hour after shift change when there is no interruption of production, and/ or**

immediately prior to the use of the continuous miner is used.

6. How long do the records have to be kept on the surface for inspections of the proximity detection systems?

b. 1 year

Communications

30CFR Part 75.1600

1. In what locations are two-way communications required?

a. Between the surface and landing of main shafts, between the surface and each working section not more than 500 feet outby the last open cross-cut and not more than 800 feet from the farthest point of penetration of the working places on such section, at each refuge alternative, and on the surface within 500 feet of all main portals.

2.What requirements apply to a mine phone on the working section?

a. The incoming communication signal shall activate an audible alarm, distinguishable from the surrounding noise level, or a visual alarm that can be seen by a miner regularly employed on the working section.

Atmospheric Monitoring Systems

30 CFR Part 75.351

(e)(1)(i)At or near the working section belt tailpiece in the air stream ventilating the belt entry.

(ii) No more than 50 feet upwind from the point where the belt air course is combined with another air course or splits into multiple air courses;

(iii) At intervals not to exceed 1,000 feet along each belt entry. However, in areas along each belt entry where air velocities are between 50 and 100 feet per minute, spacing of sensors must not exceed 500 feet. In areas along each belt entry where air velocities are less than 50 feet per minute, the sensor spacing must not exceed 350 feet;

(v) Not more than 100 feet downwind of each belt drive unit, each tailpiece, transfer point, and each belt take-up. If the belt drive, tailpiece, and/or take-up for a single transfer point are installed together in the same air course, and the distance between the units is less than 100 feet, they may be monitored with one sensor downwind of the last component. If the distance between the units exceeds 100 feet, additional sensors are required downwind of each belt drive unit, each tailpiece, transfer point, and each belt take-up; and(v) At other locations in any entry that is part of the belt air course as required and specified in the mine ventilation plan.

Lock-Out Tag-Out/ Electrical Work

30 CFR Part 75.511

No electrical work shall be performed on low-, medium-, or high-voltage distribution circuits or equipment, except by a qualified person or by a person trained to perform electrical work and to maintain electrical equipment under the direct supervision of a qualified person. Disconnecting devices shall be locked out and suitably tagged by the persons who perform such work, except that in cases where locking out is not possible, such devices shall be opened and suitably tagged by such persons. Locks or

tags shall be removed only by the persons who installed them or, if such persons are unavailable, by persons authorized by the operator or his agent.

30 CFR Part 75.820

Electrical work; troubleshooting and testing.

(a) Electrical work on all circuits and equipment associated with high-voltage longwalls must be performed only by persons qualified under § 75.153 to perform electrical work on all circuits and equipment.

(b) Prior to performing electrical work, except for troubleshooting and testing of energized circuits and equipment as provided for in paragraph (d) of this section, a qualified person must do the following:

(1) Deenergize the circuit or equipment with a circuit-interrupting device.

(2) Open the circuit disconnecting device. On high-voltage circuits, ground the power conductors until work on the circuit is completed.

(3) Lock out the disconnecting device with a padlock. When more than one qualified person is performing work, each person must install an individual padlock.

(4) Tag the disconnecting device to identify each person working and the circuit or equipment on which work is being performed.

(c) Each padlock and tag must be removed only by the person who installed them, except that, if that person is unavailable at the mine, the lock and tag may be removed by a person authorized by the operator, provided—

(1) The authorized person is qualified under paragraph (a) of this section; and

(2) The operator ensures that the person who installed the lock and tag is aware of the removal before that person resumes work on the affected circuit or equipment.

(d) Troubleshooting and testing of energized circuits must be performed only—

(1) On low- and medium-voltage circuits;

(2) When the purpose of troubleshooting and testing is to determine voltages and currents; and

(3) By persons qualified to perform electrical work and who wear protective gloves on circuits that exceed 40 volts in accordance with the following table:

Circuit voltage	Type of glove required
Greater than 120 volts (nominal) (not intrinsically safe)	*Rubber insulating gloves with leather protectors.*
40 volts to 120 volts (nominal) (both intrinsically safe and non-intrinsically safe)	*Either rubber insulating gloves with leather protectors or dry work gloves.*
Greater than 120 volts (nominal) (intrinsically safe)	*Either rubber insulating gloves with leather protectors or dry work gloves.*

(4) Rubber insulating gloves must be rated at least for the nominal voltage of the circuit when the voltage of the circuit exceeds 120 volts nominal and is not intrinsically safe.

(e) Before troubleshooting and testing a low- or medium-voltage circuit contained in a compartment with a high-voltage circuit, the high-voltage circuit must be deenergized, disconnected, grounded, locked out and tagged in accordance with paragraph (b) of this section.

(f) Prior to the installation or removal of conveyor belt structure, high-voltage cables extending from the section power center to longwall equipment and located in the belt entries must be:

(1) Deenergized; or

(2) Guarded in accordance with § 75.816 of this part, at the location where the belt structure is being installed or removed; or

(3) Located at least 6.5 feet above the mine floor.

ROOF CONTROL

Roof bolting

A bearing plate shall be firmly installed with each roof bolt. Found in 30 CFR Part 75.204(c)(1)

- ***Tensioned roof bolts*** **(4) In each roof bolting cycle, the actual torque or tension of the first tensioned roof bolt installed with each drill head shall be measured immediately after it is installed. Thereafter, for each drill head used, at least one roof bolt out of every four installed shall be measured for actual torque or tension. If the torque or tension of any of the roof bolts measured is not within the range specified in the roof control plan, corrective action shall be taken. Found in 30 CFR Part 75.204(f)**
- ***Non-tensioned grouted roof bolts.*** **The first non-tensioned grouted roof bolt installed during each roof bolting cycle shall be tested during or immediately after the first row of bolts has been installed. If the bolt tested does not withstand at least 150 foot-pounds of torque without rotating in the hole, corrective action shall be taken. Found in 30 CFR Part 75.204(g)**
- **Warning Devices: Except during the installation of roof supports, the end of permanent roof support shall be posted with a readily visible warning, or physical barrier shall be installed to impede travel beyond permanent support. Found in 30 CFR Part 75.208**

Roof support removal. Found in 30 CFR Part 75.213

(a)(1) All persons who perform the work of removing permanent roof supports shall be supervised by a

management person experienced in removing roof supports.

(2) Only persons with at least one year of underground mining experience shall perform permanent roof support removal work.

Roof control plan.

Each mine operator shall develop and follow a roof control plan, approved by the District Manager, that is suitable to the prevailing geological conditions, and the mining system to be used at the mine. Additional measures shall be taken to protect persons if unusual hazards are encountered. Found in 30 CFR Part 75.220

Coal Properties and Uses

1. **What is the average weight of solid coal per cubic foot?**
   a. **about 80 pounds**

2. **What are some of the everyday items that coal is used to produce?**
   a. **Soaps, aspirin, solvents, dyes, plastics, paper, metals, Rayon, Nylon, Cement, and fuel.**

3. **How fast is a coal dust explosion?**
   a. **150 feet per second – 300 feet per second**

4. **At what temperature can coal dust ignite?**
   a. **The minimum ignition temperature of coal dust is 311 degrees Fahrenheit.**

VENTILATION

30 CFR Part 75.312 Main mine fan examinations and records.

(a) To assure electrical and mechanical reliability of main mine fans, each main mine fan and its associated components, including devices for measuring or recording mine ventilation pressure, shall be examined for proper operation by a trained person designated by the operator. Examinations of main mine fans shall be made at least once each day that the fan operates unless a fan monitoring system is used. No examination is required on any day when no one, including certified persons, goes underground, except that an examination shall be completed prior to anyone entering the mine.

(b) At least every 31 days, the automatic fan signal device for each main mine fan shall be tested by stopping the fan.

30 CFR Part 75.370 Mine ventilation plan; submission and approval.

(a)(1) The operator shall develop and follow a ventilation plan approved by the district manager. The plan shall be designed to control methane and respirable dust and shall be suitable to the conditions and mining system at the mine. The ventilation plan shall consist of two parts, the plan content as prescribed in CFR Part 75.371 and the ventilation map with information as prescribed in 30 CFR Part 75.372. Only that portion of the map which contains information required under 30 CFR Part 75.371 will be subject to approval by the district manager.

30 CFR Part 75.321 Air quality.

(a) The air in areas where persons work or travel, except as specified in paragraph (a)(2) of this section, shall contain at least 19.5 percent oxygen and not more than 0.5 percent carbon dioxide, and the volume and velocity of the air current in these areas shall be sufficient to dilute, render harmless, and carry away flammable,

explosive, noxious, and harmful gases, dusts, smoke, and fumes.

(2) The air in areas of bleeder entries and worked-out areas where persons work or travel shall contain at least 19.5 percent oxygen, and carbon dioxide levels shall not exceed 0.5 percent time weighted average and 3.0 percent short term exposure limit.

(b) Notwithstanding the provisions of 30 CFR Part 75.322, for the purpose of preventing explosions from gases other than methane, the following gases shall not be permitted to accumulate in excess of the concentrations listed below:

- **(1) Carbon monoxide (CO)-- 2.5%**
- **(2) Hydrogen (H_2) -- .80%**
- **(3) Hydrogen sulfide (H_2S) -- .80%**
- **(4) Acetylene (C_2H_2) --. 40%**
- **(5) Propane (C_3H_8) -- .40%**
- **(6) MAPP (methyl-acetylene-propylene-propodiene) -- .30**

VENTILATION

General

1. **What is the purpose of mine ventilation?**
   a. **To provide sufficient air to the employees and to dilute, render harmless, and carry away dangerous, explosive, and noxious gases.**

2. **How many fresh air courses are necessary to provide miners a route of escape.**
   a. **At least two (2)**

3. **What is the minimum number of persons that may be working in an underground coal mine before ample ventilation is required?**
   a. **Ample ventilation is required in all mines where one or more person(s) work.**

4. Why should a mine be ventilated continuously?

a. A stoppage of the ventilating current may permit the accumulation of dangerous or noxious gases.

5. What percentage of Oxygen is required to be provided for miners underground.

a. Nineteen and one-half (19.5%) percent.

6. Where should ventilation on the production unit of a mine be directed?

a. To the last open cross-cut and to every working face.

7. Where is it likely for explosive levels of Hydrogen (H2) gas to build up?

a. Battery charging stations. (Hydrogen gas shall not be allowed to accumulate over .8%)

8. What are the requirements of a main mine fan.

a. Installed on the surface in an incombustible housing, equipped with an automatic device that gives a signal at the mine when the fan either slows or stops. Equipped with a pressure recording device or system. Protected by one or more weak walls or explosion doors, or a combination of weak walls and explosion doors that are located in direct line with possible explosive forces; the motor shall operate from a power circuit independent of all mine power circuits.

9. How is the ventilation current controlled?

a. By using stoppings, doors, overcasts, regulators, check curtains, and line brattices.

11. Through what portions of the mine should the air current not be permitted to pass before reaching working places?

b. Through abandoned workings not regularly inspected.

12. What means should be used to ensure ventilation at faces where dust, gas or smoke may exist?

c. Line brattice (curtain) or other approved methods of ventilation should be used.

13. How shall personnel doors (mandoors) be installed?

a. Personnel doors shall be constructed of noncombustible material and shall be of sufficient strength to serve their intended purpose of maintaining separation and permitting travel between air courses, and shall be installed as follows in permanent stoppings constructed after November 15, 1992

14. What action should be taken before miners are permitted to return into a mine after failure of the ventilating system for 15 minutes or longer?

a. The mine ventilation should be restored for at least 15 minutes unless a longer period is specified in the approved mine ventilation plan, and the mine examined and reported safe by a qualified person.

9. When should changes in ventilation be made?

a. When the mine is idle.

10. What is the danger of not having sufficient velocity of air on haulage and travelways?

a. It could allow for the accumulation of explosive, toxic, or noxious gases.

11. What is the disadvantage of permitting intake air to pass by seals before ventilating active parts of a mine?

a. Failure of the seals may permit dangerous gases to be carried to the active workings.

12. How should battery charging stations be ventilated?

a. Directly to the return.

13. What is the speed of a ventilating current called?

a. The velocity.

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

a. **Excessive power consumption could cause coal dust and float dust to be blown off of the belt, and you have to reduce the spacing on your atmospheric monitor systems.**

15. **Why should extremely low velocities be avoided?**
    a. **Low velocities may not properly sweep out the gases, smoke, or dust. You may not have enough air to cut, load, or produce coal. You may have to decrease the spacing in your Atmospheric Monitor Systems**

16. **How may high velocities be avoided?**
    a. **Using airways of a larger area and by splitting the air current, removing airway restrictions.**

17. **What is mine resistance?**
    a. **The resistance of the surfaces, bends, and obstructions in the airways.**

18. **What factors determine mine resistance?**
    a. **The area, perimeter, length, and obstructions of the airways plus the velocity of the ventilating current.**

19. **How does the mine resistance vary in relation to the velocity?**
    a. **The resistance varies directly as the square of the velocity. (For instance, if the air speed is doubled the resistance increases four times.)**

20. **What effect do constricted airways have upon mine resistance?**
    a. **Constricted airways increase.**

21. **What effect do constricted airways have upon velocity when the volume of air remains constant?**
    a. **The velocity is increased in inverse proportion to the area.**

22. **What is ventilating pressure?**

a. The ventilating pressure is the pressure which is exerted upon an air current to ventilate the mine.

23. How is the ventilating pressure measured?

a. With water gauges or continuous recorders.

24. How is ventilating pressure produced by fans?

a. By the speed at which the fan is operating and the pitch of its blades.

b. What effect can obstructions in airways have upon the quantity of air circulated, the fan speed remaining constant?

a. The ventilation efficiency could be decreased.

25. What is meant by splitting the ventilating current?

a. Dividing the main current into separate individual currents.

26. What are the three systems of ventilation?

a. Blowing (force or positive pressure), exhaust (or negative pressure), or a combination of the two.

27. When is an airlock required at personnel doors?

a. An airlock shall be established where the air pressure differential between creates a static force exceeding 125 pounds on closed personnel doors along escapeways.

29. What is the main disadvantage of having the intake portal near a dumping point?

a. Dust from the dumping point can be carried into the mine.

36. What may be the disadvantage of having the mine shaft or slope on the intake during cold weather?

a. Freezing temperatures may interfere with operation.

37. What are the principal requirements for permanent stoppings?

a. shall be constructed of noncombustible material. Materials that are suitable for the construction of permanent stoppings include concrete, concrete block, brick, cinder block, tile, or steel. No ventilation controls shall be constructed of aluminum.

38. What effect do leaky stoppings have upon ventilation costs?

a. Costs are increased due to waste of the air.

39. As a mine deepens what effect will it have on leaky stoppings?

a. The increased pressure will cause the stoppings to lose more air.

40. In what way do leaky stoppings increase the cost of ventilation?

a. By requiring the fan to move a greater quantity of air than necessary to properly ventilate the working faces.

41. What is the economic effect of airtight stoppings?

a. Costs are decreased by an increase in ventilating efficiency.

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

a. By sealing them.

Water Gauge

1. What is a water gauge?

a. An instrument to determine differences in air pressure.

2.What does a water gauge consist of?

a. The water gauge consists of a glass U tube partially filled with water and open at both ends.

3. How is a water gauge used to determine differences in air pressure?

a. By connecting the ends of the tube to the points that the difference is to be measured.

4. How is ventilating pressure determined by the water gauge?

b. By the difference in elevation of the two water columns.

5. How is the water gauge graduated?

c. In inches and tenths thereof.

6. What pressure is denoted by each inch difference in the level of the water columns?

a. 5.2 pounds per square foot.

Line Brattice

1. **What is a line brattice?**
    a. **It is a curtain erected from the last breakthrough, along the entry or room, to the face.**

2. **What materials are used for line brattices?**
    a. **Flame resistant materials.**

3. **What is the purpose of a line brattice?**
    a. **To assure a sufficient volume of air at the face to remove dangerous gases and smoke from explosives and to control float dust.**

4. **How should the space behind the line brattice be maintained?**
    a. **Clean and open for the free flow of air.**

Doors

1. **What is the purpose of equipment doors?**
    a. **To direct the course of the ventilation and permit traffic to pass without affecting the ventilation.**

2. **What provision should be made to prevent a short circuit of a main ventilating current controlled by equipment doors?**
    a. **Doors should be hung in pairs to form air locks, and only one door should open at a time to prevent a short circuit of the ventilation.**

3. **How far apart should the equipment doors of an air lock be placed?**
    a. **At sufficient distance to accommodate mine equipment while leaving at least one set of doors always closed.**

4. **Should haulage equipment be permitted to park within airlock doors or curtains?**
    a. **No.**

5. **In which direction should personnel doors and equipment doors swing to close?**
    a. **In the direction of the air current so that the pressure will keep the door closed.**

6. **How should personnel doors and equipment doors be constructed.**
    a. **Personnel doors shall be constructed of noncombustible material and shall be of sufficient strength to serve their intended purpose of maintaining separation and permitting travel between air courses and shall be installed as follows in permanent stoppings.**

7. **At what intervals will personnel doors be installed.**
    a. **The distance between personnel doors shall be no more than 300 feet in seam heights below 48 inches and 600 feet in seam heights 48 inches or higher.**

Regulators

1. **What is a regulator?**
    a. **An adjustable partial obstruction in an airway.**

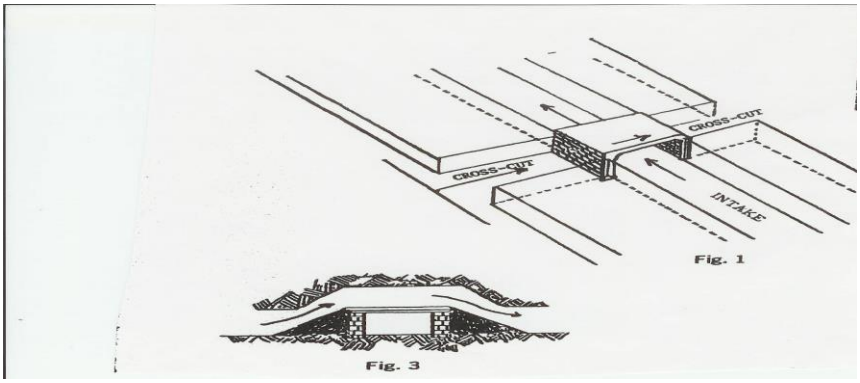
2. **What is the purpose of a regulator?**
    a. **To control the distribution of the air by regulating the resistance of flow of an air split.**

3. **How is a regulator constructed?**
    a. **It shall be constructed of non-combustible material.**

4. **What is the effect of a regulator on the amount of air entering a split?**
    a. **The regulator serves as a valve to decrease or increase the amount as desired.**

5. **Why are regulators essential to the ventilation of a mine?**
    a. **They proportion the air to meet the requirements of each individual split.**

Overcast



An overcast is a form of a bridge built of incombustible materials, which permits an air current to pass over another. Overcasts are normally built in an intersection opposite a break-through. It also aids the haulage of a mine because it eliminates the necessity for doors. The common errors made in the construction of an overcast are: rough and abrupt interruption to the ventilating current, and insufficient area to allow the free flow of the air current.

ELECTRICAL

High Voltage

30 CFR Part 75.807 Installation of high-voltage transmission cables

All underground high-voltage transmission cables shall be installed only in regularly inspected air courses and haulageways, and shall be covered, buried, or placed so as to afford protection against damage, guarded where men regularly work or pass under them unless they are 6 1/2 feet or more above the floor or rail, securely anchored, properly insulated, and guarded at ends, and covered, insulated, or placed to prevent contact with trolley wires and other low-voltage circuits.

30 CFR Part 75.514 Electrical connections or splices; suitability

All electrical connections or splices in conductors shall be mechanically and electrically efficient, and suitable connectors shall be used. All electrical connections or splices in insulated wire shall be reinsulated at least to the same degree of protection as the remainder of the wire.

MINE EMERGENCY

30 CFR Part 75.1504 Evacuation Drills

Each operator of an underground coal mine shall conduct mine emergency evacuation training and drills and require all miners to participate.

(a) *Schedule of training and drills*. Each miner shall participate in a mine emergency evacuation training and drill once each quarter. Quarters shall be based on a calendar year (Jan-Mar, Apr-Jun, Jul-Sep, Oct-Dec).

FIRE PROTECTION

30 CFR Part 75.1100 Requirements

Each coal mine shall be provided with suitable firefighting equipment adapted for the size and conditions of the mine. The Secretary shall establish minimum requirements of the type, quality, and quantity of such equipment.

30 CFR Part 75.1100-1 Type and quality of firefighting equipment

Firefighting equipment required under this subpart shall meet the following minimum requirements:

(a) Waterlines: Waterlines shall be capable of delivering 50 gallons of water a minute at a nozzle pressure of 50 pounds per square inch

30 CFR Part 75.1100-B(3)(ii)(b) Belt conveyors. In all coal mines, waterlines shall be installed parallel to the entire length of belt conveyors and shall be equipped with firehose outlets with valves at 300-foot intervals along each belt conveyor and at tailpieces. At least 500 feet of firehose with fittings suitable for connection with each belt conveyor waterline system shall be stored at strategic locations along the belt conveyor. Waterlines may be installed in entries adjacent to the conveyor entry belt as long as the outlets project into the belt conveyor entry.

GENERAL MINING

1. **What must be done when 1.5% of Methane gas is discovered? 30 CFR Part 75.323(b)(2)(i) and (ii)**
    a. **Except for the miners charged with the duties of making ventilation changes, all miners will be withdrawn from the affected area, the power will be cut off and the gas diluted to safe levels.**

2. **What will be done before employees are permitted to enter idle or abandoned areas?**
    a. **the areas will be examined by a certified mine examiner or foreman and determined safe.**

2. **How should all unused and abandoned parts of the mine be protected against the accumulations of harmful gases?**
    a. **by ventilation or by proper sealing.**

3. **What should be done when you encounter a 1.0% accumulation of Methane in any portion of a mine? 30 CFR Part 75.323(b)(1)**
    a. **(i) Except intrinsically safe atmospheric monitoring systems (AMS), electrically powered equipment in the affected area shall be deenergized, and other mechanized equipment shall be shut off.**

(ii) Changes or adjustments shall be made at once to the ventilation system to reduce the concentration of methane to less than 1.0 percent; and

(iii) No other work shall be permitted in the affected area until the methane concentration is less than 1.0 percent.

4. **What should be done with electric power in a section when ventilation has failed, or accumulations of methane have been removed?**
   a. **the section should be thoroughly examined and pronounced safe by a certified mine official.**

5. **When is a preshift examination required?**

30 CFR Part 75.360(a)(1)

a. Within 3 hours prior to any 8 hour interval in which any person is scheduled to work or travel underground.

5. **Why is sulfur undesirable in coal?**
   a. **it corrodes metal.**

6. **What is the average weight of solid coal per cubic foot?**
   a. **about 80 pounds**

7. **When is an on-shift examination required?**

30 CFR Part75.362(a)(1)

a. at least during each shift… in those instances when a shift change is accomplished without an interruption in production on a section, the examination shall be made anytime within 1 hour after the shift change. In those instances when there is an interruption in production during the shift change, the examination shall be made before production begins on a section.

8. **When is a supplemental examination required?**

30 CFR Part 75.361(a)(1)

a. within 3 hours before anyone enters an area in which a preshift examination has not been made for that shift.

9. **When shall a qualified person make tests for Methane?**

30 CFR part 75.362(d)(1)

a. (i) At the start of each shift at each working place before electrically operated equipment is energized; and

(ii) Immediately before equipment is energized, taken into, or operated in a working place; and

(iii) At 20-minute intervals, or more often if required in the approved ventilation plan at specific locations, during the operation of equipment in the working place.

(2) Except as provided for in paragraph (d)(3) of this section, these methane tests shall be made at the face from under permanent roof support, using extendable probes or other acceptable means. When longwall or shortwall mining systems are used, these methane tests shall be made at the shearer, the plow, or the cutting head. When mining has been stopped for more than 20 minutes, methane tests shall be conducted prior to the start-up of equipment.

(3) As an alternative method of compliance with paragraph (d)(2) of this section during roof bolting, methane tests may be made by sweeping an area not less than 16 feet inby the last area of permanently supported roof, using a probe or other acceptable means. This method of testing is conditioned on meeting the following requirements:

(i) The roof bolting machine must be equipped with an integral automated temporary roof support (ATRS) system that meets the requirements of 30 CFR 75.209.

(ii) The roof bolting machine must have a permanently mounted, MSHA-approved methane monitor which meets the maintenance and calibration requirements of 30 CFR 75.342(a)(4), the warning signal requirements of 30 CFR 75.342(b), and the automatic de-energization requirements of 30 CFR 75.342(c).

(iii) The methane monitor sensor must be mounted near the inby end and within 18 inches of the longitudinal center of the ATRS support and positioned at least 12 inches from the roof when the ATRS is fully deployed.

(iv) Manual methane tests must be made at intervals not exceeding 20 minutes. The test may be made either from under permanent roof support or from the roof bolter's work position protected by the deployed ATRS.

(v) Once a methane test is made at the face, all subsequent methane tests in the same area of unsupported roof must also be made at the face, from under permanent roof support, using extendable probes or other acceptable means at intervals not exceeding 20 minutes.

(vi) The district manager may require that the ventilation plan include the minimum air quantity and the position and placement of ventilation controls to be maintained during roof bolting.

PRACTICAL MINING STATEMENTS

Three elements must be present for an explosion to occur: fuel, oxygen, and ignition source.

Electrical fires are best extinguished by nonconducting agents such as carbon dioxide and certain dry chemicals.

"Class A" fire extinguishers are used for ordinary combustible material fires such as paper, wood, cardboard, and plastics.

Hydrogen gas can be liberated when water or steam contacts hot carbon materials.

Hydrogen gas can be liberated by the excessive charging of batteries.

Explosions in coal mines are often caused by ignitions of methane, coal dust, or combination of the two.

An indication of an explosion may be a jump in the pressure recording chart for the main fan.

Non-conductive tubes or pipes are inserted into temporary and permanent seals for the purpose of collecting air samples from the sealed area.

In potentially explosive atmospheres, non-sparking tools, nails, and spades should be used.

Carbon monoxide is a product of incomplete combustion of any carbon material.

Explosions, fires, and other disasters frequently result in adverse roof and rib conditions.

Regulators are used in mine ventilation to regulate airflow to meet the needs of the affected areas.

Overcasts are used to permit two air currents to cross without mixing.

The lower explosive limit of carbon monoxide is 12.5 percent.

All gas detectors should be checked for calibration, battery charge, zeroed in fresh air, and examined for any physical damage.

CSE SRLD

1. The SRLD is a closed-circuit, self-contained oxygen supply system designed for use in toxic or oxygen-deficient atmospheres.

2. Inspect the SRLD daily.

3. In the unlikely event the oxygen bottle fails to deliver oxygen to the breathing bag, the unit can be started manually.

4. Do not store the SRLD in temperatures above 150 degrees.

5. Do not use the SRLD if frozen (colder than 32 degrees Fahrenheit).

6. Do not use a damaged SRLD.

7. Additional oxygen is produced as moisture from the user's exhaled breath contacts the SRLD chemical bed, additional oxygen is produced.

8. There are two moisture indicators on the SRLD.

9. If either of the moisture seals are entirely blue the SRLD must be replaced.

10. The SRLD must be replaced at 5 years of service if it is worn, 10 years if it is in storage or supply cache.

Donning procedure

1. Pull SRLD from pouch.
2. Set SRLD on solid, dry surface.
3. Remove hardhat and shine light on SRLD.
4.Pull open steel security band.
- **a. Locate fabric loop on SRLD top.**
- **b. Unclip fabric loop.**
- **c. Hook finger through loop**
- **d. Hold SRLD down while pulling loop up.**

5.Remove steel top and bottom covers.
6.Loop neck strap around neck
7.Grab starter tag hanging under SRLD.
8.Pull down once and let go.
-Breathing bag will fill.
9. Spit out gum or chewing tobacco.
10. Inhale one deep breath
11. Now pull-out mouthpiece plug, don't twist.
12. Insert mouthpiece. Grip with teeth.
13. Exhale into mouthpiece to activate Oxygen.
-Breathing will take some work. You will feel resistance.
14. Just keep breathing.
15. Nose clamp- Pull clamp apart, clamp nose shut.
16. Put SRLD glasses on.
17. Wear glasses over SRLD goggles.
18. Tighten neck strap to take weight off mouthpiece and breathing hose.

19. Pass chest strap around your back and clip chest strap to hook.
20. Tighten chest strap so SRLD is snug against chest.
21. Put hardhat back on

INSPECTIONS: Before entering the workplace, visually inspect the SRLD to be sure it has not been opened, tampered with, or otherwise damaged. Be sure the security band is tight, and the moisture indicator on top is blue. If the indicator is white or pink DO NOT USE!

MAINTENANCE: Keep the SRLD clean, especially around the moisture indicators. Avoid dirt build up between the carrying pouch and canister. Do not store in temperatures greater than 150 degrees F or less than 32 degrees F.

Ocenco EBA 6.5 Self Contained Self Rescuer

Capabilities:

1. The self-contained self-rescuer device will provide the wearer protection against irrespirable atmosphere for about 1 hour.

Limitations:

1. Cannot be reused (must be discarded or sent back to the factory for refurbishment after use.)
2. Cannot be substituted for conventional respiratory equipment (gas masks or self-contained breathing apparatus)
3. Has a 15-year service life if properly inspected
4. Has a 10-year service life if stored properly.

Inspection:

1. Before going underground every miner should examine their self-contained self-rescuer for any external damage.

Methods of inspection:

1. Examine oxygen pressure gauge is in the green.
2. Examine latch seals.

3. **Case view obstructed or not clear to adequately examine device.**
4. **Case cracked, burned, deformed, or excessively worn.**
5. **Excessive wear or gap around the cover seals**
6. **Loose or missing parts with the bottle parts.**
7. **The on/off valve positioned towards the base.**
8. **Red rubber bottle pad is cut or displaced.**
9. **Pressure gauge bent of indicator needle is broken.**
10. **Scrubber canister not in mounts or is dented.**
11. **Dirt, debris, or moisture visible through case or the pressure gauge window.**
12. **Plastic handle loops are broken.**
13. **Handle straps are missing or broken.**
14. **Yellow mouthpiece plug detached from mouthpiece.**
15. **Check the case seals.**

Donning:

1. **Kneel**
2. **Remove hard hat**
3. **Open latch on the top of the device**
4. **Remove the latch release and bands**
5. **Remove the cover from the base**
6. **Open oxygen valve**
7. **Loop neck strap over head**
8. **Insert mouthpiece and exhale into bag**
9. **Fit nose clips**
10. **Purge bag**
11. **Adjust neck strap**
12. **Fasten and adjust waist strap**
13. **Put on goggles**
14. **Replace hard hat**
15. **Breathe and escape.**

Ocenco M-20 Self Contained Self Rescuer

Capabilities:

1. The self-contained self-rescuer device will provide the wearer protection against irrespirable atmosphere for about (10) minutes.

Limitations:

1. Cannot be reused (must be discarded or sent back to factory for refurbishment.

2. Cannot be substituted for conventional respiratory equipment (gas masks or self-contained breathing apparatus)

3. Has a 15-year service life if properly inspected.

4. Has a 10-year service life if stored properly

5. Has a 5-year service life if worn properly.

Inspection:

1. Before going underground every miner should examine his self-contained self-rescuer for any external damage.

Methods of Inspection:

1. Cylinder pressure gauge needle in the green.

2. Pressure gauge bent, or indicator needle broken.

3. Case view obstructed or not clear to adequately examine device.

4. Case cracked, burned, deformed, or excessively worn.

5. Excessive gap between the cover and base.

6. Tamper indicating ball missing.

7. Latch or cover band damaged or misaligned.

8. Dirt, debris, or moisture visible through case or pressure gauge window.

Donning

1. Release the yellow lever.

2. Pull yellow neck strap upward.

3. Insert yellow mouthpiece.

4. Fit yellow nose clip.

5. Fit and adjust yellow neck strap.

6. Breath and escape.

FUNDAMENTAL FORMULAS

To have a more complete understanding of mine ventilation, there are certain fundamentals and calculations that are necessary. For all practical purposes the following eight (8) formulas should suffice:

$Q = AV$ $\qquad\qquad$ $p = 5.2i$

$Hp = \frac{PV}{33{,}000}$ $\qquad\qquad$ $A = \text{Width} \times \text{Height}$

$P = pA$ $\qquad\qquad$ $I = \frac{P}{5.2}$

$S = LO$

$O = \text{Height} + \text{Height} + \text{Width} + \text{Width}$

$R = KLOV^2$

In Which:

A = Area of airway in ft^2	**p = Pressure in lbs. Per sq. ft.**
Q = Quantity in ft^3 per minute	**L = Length of airway in feet**
P = Total Pressure	**Hp = Horsepower**
O = Perimeter of airway in feet	**i = Inches water gage**
K = Coefficient of friction	**S = Rubbing surface**
V = Velocity, ft. per min.	**R = Resistance**

AREA

A – The area of an airway is obtained by multiplying its width by its height. If an air passage has a width of 12 ft. and a height of 5 ft., then (12ft X 5ft) = 60 square ft.

LENGTH

L – The actual linear length measurement of an airway in feet.

PERIMETER

O – The perimeter of an airway is found by adding the four sides together. For an airway measuring 12ft. x 5ft., the perimeter is 12ft + 12ft + 5ft + 5ft or 34 ft.

RUBBING SURFACE

S – the rubbing surface of an airway is obtained by multiplying its perimeter by the length. What is the rubbing surface of an airway 12ft. by 5ft. having a total length of 5,000ft.? The perimeter is 34ft. (see preceding solution); and the rubbing surface is 34ft X 5,000ft or 170,000 square ft.

VELOCITY

V – The average velocity of air in linear feet per minute as read with an anemometer over a cross-sectional area of the air course.

QUANTITY

Q – The volume of air passing through the mine. It is obtained by multiplying the cross-sectional area of the airway in square feet by the velocity indicated by the anemometer in lineal feet per minute. If a velocity of 500 lineal feet per minute is measured by the anemometer in a cross-sectional area of 60 square ft. then (60ft X 500ft) = 30,000 cu. ft. Per min.

PRACTICE EXAMPLES

Using the formula Q = AV, if the area of an airway is 50 square feet and the velocity as shown by the anemometer is 500 lineal feet per minute, then the quantity would equal 25,000 cubic feet per minute.

Q = AV
Q = 50 ft. area X 500 ft. velocity
Q = 25,000 cubic feet per minute

Using the formula p =5.2(i), if the water gauge reading is 3 inches, then

p = 5.2i
p = 5.2 X 3 inches water gauge
P = 15.6 pounds pressure per square foot

Formula P = pA is used to find the total pressure exerted against the air to move it through the mine. For instance, if the pressure per square foot is 15.6 and the area of the opening is 50 square feet then,

P = pA
P = 15.6 X 50
P = 780 pounds total pressure

Using the formula S = LO, it is necessary to find the rubbing surface of a mine airway before the resistance can be calculated because it is against the surface that the air must rub while passing through the mine. For instance, if we substitute length of an airway equal to 5,000 feet and with a perimeter of 50 feet, then

S = LO
S = 5,000ft X 50ft
S = 250,000 sq. ft. of surface the air would rub against

FORMULAS TO KNOW TO DILUTE GASES

A. To find the percentage (%) of Methane (CH4) when the cubic feet and the total volume are known, divide the cubic feet of methane by the total volume of air.

Use the formula:

$$\text{CH4 \%} = \frac{\text{CH4 cfm}}{\text{Air cfm}}$$

B. To find the cubic feet of methane liberated per minute when the percentages (%) of methane and the total volume of air per minute are known, multiply the volume of air per minute by the percentage of Methane.

Use the formula:

CH4 cfm = Air cfm X CH4 %

C. To find the total volume of air per minute needed to dilute Methane to a desired percentage, multiply the cubic feet per minute (cfm) of air by the percentage of Methane. Divide that answer by the desired percentage of Methane. Subtract the original cfm of air from this amount.

EXAMPLE PROBLEMS

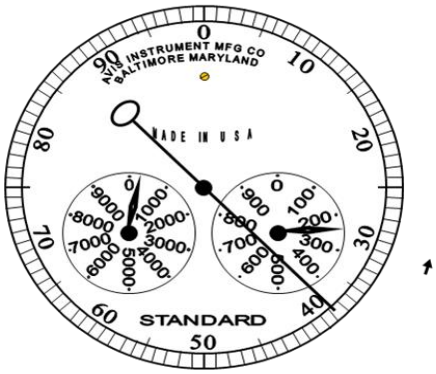
A. What is the percentage of methane in an air course which has a volume of air of 10,000 cubic feet per minute and 80 cubic feet per minute of methane?
80cfm divided by 10,000cfm = .008
Change .008 to percentage =
Answer .8% Methane

B. If split of air has 20,000 cubic feet of air per minute and the methane content is 5% per minute how many cubic feet of methane is liberated per minute?
20,000cfm x .05 = Answer 1000

C. If the return current of a mine is 30,000 cubic feet per minute and contains 8% of methane, how much air must be added to reduce the methane to 3%?
30,000cfm x .08 = 2400cfm
2400cfm divided by .03 = 80,000cfm

Anemometers

Take care to record correct dial reading.



Dial Reading = 239 feet per minute.

(Anemometer)

The form of 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 employed to measure the velocity of the air current in mine airways as expressed in feet.

In taking a reading a place is first found where the air has a straight course and will not be deflected unequally to either side, and where the area of the airway can be measured.

Hold the anemometer at arm's length in such a way that the blades will turn in a plane at right angles to the air current. Using the reset lever on the anemometer, so all dial hands will be on zero, the brake lever near the handle is released and the anemometer is exposed to the air current for one full minute, moving about to obtain an average reading for the entire sectional area of the airway after which the brake is applied. (The reading of the anemometer times the area of the airway in square feet gives the quantity of air passing in cubic feet per minute.)

Instruments

1. Q. What is an anemometer?
A. An instrument 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 by the revolutions of the fan shaft for given period of time.

3. Q. How is an anemometer graduated?
A. In feet.

4. Q. For what period are mine air velocities determined?
A. For one minute.

5. Q. How is an anemometer used to obtain air velocities in mines?
A. It is traversed in an air current for one minute to determine lineal feet of air travel.

6. Q. In which direction should the air current pass through the anemometer?
A. The air current should enter the back of the anemometer.

7. Q. Why should the anemometer be traversed in the airway while taking the reading?
A. So that an accurate reading may be obtained.

8. Q. What is the purpose of the reset on the anemometer?
A. To set dials at zero.

9. Q. What is the purpose of the clutch on the anemometer?
A. To engage or disengage the dial gears.

10. Q. What three instruments are necessary to get an air reading?
A. Anemometer, watch, and measuring tape.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BAROMETER

1. **Q. What is a barometer?**
   a. **An instrument for determining atmospheric pressure or elevation.**

2. **What is atmospheric pressure?**
   a. **The pressure exerted by the air above a given point.**

3. **What is the normal pressure of air on the earth's surface at sea level?**
   a. **About 14.7 pounds per square inch.**

4. **What is the barometer reading for normal air pressure at sea level?**
   a. **29.92 inches.**

5. **What affect does a low barometric pressure have on an underground coal mine?**
   a. **It can cause the out-gassing of seals, pillars, coal ribs, mine roof, and mine floor, leading to an increase in Methane liberation.**

6. **What affect does a high barometric pressure have on an underground coal mine?**
   a. **It can cause in-gassing at seals, allowing Oxygen into sealed works.**

ANEROID BAROMETER

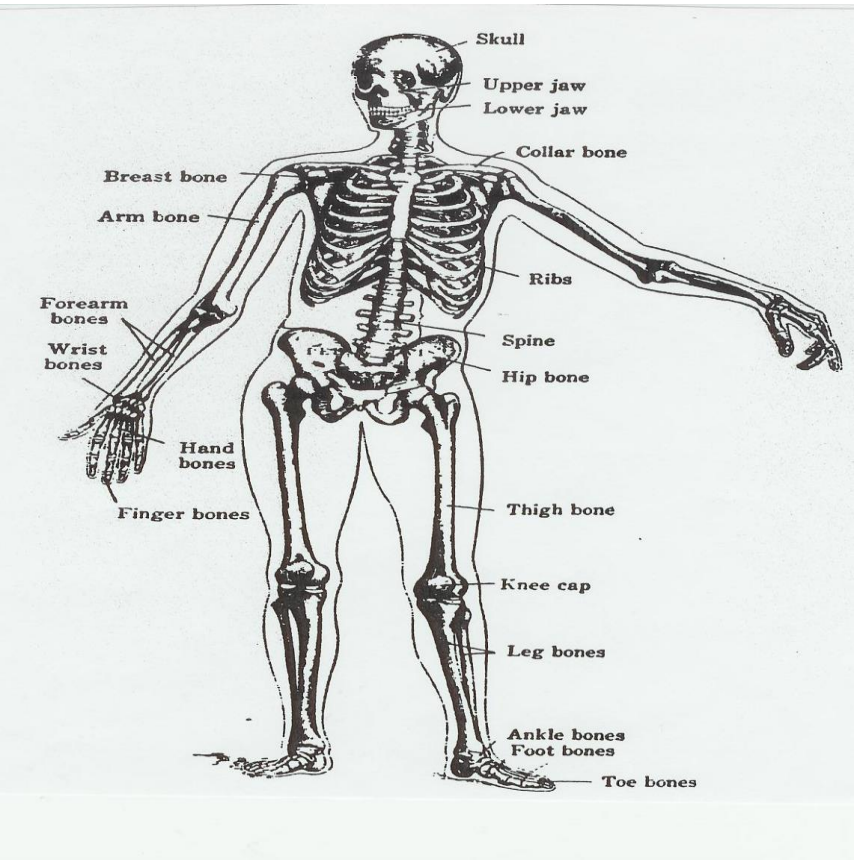
FIRST AID

First Aid is emergency care or treatment given to an ill or injured person before regular medical aid can be obtained.

What are the 6 fundamentals of first aid?

1. Artificial Respiration (CPR)
2. Control of bleeding
3. Treatment of shock
4. Caring for open wounds and burns
5. Treatment of dislocation and fractures
6. Transportation of the injured

Into what three parts is the body divided for first aid?
The body is divided into the head, the trunk, and the extremities.



Bleeding

Define bleeding from the following:

Artery **spurting blood, bright in color.**
Capillary **blood oozing from a wound**
Vein **continuous flow of blood, dark red in color**

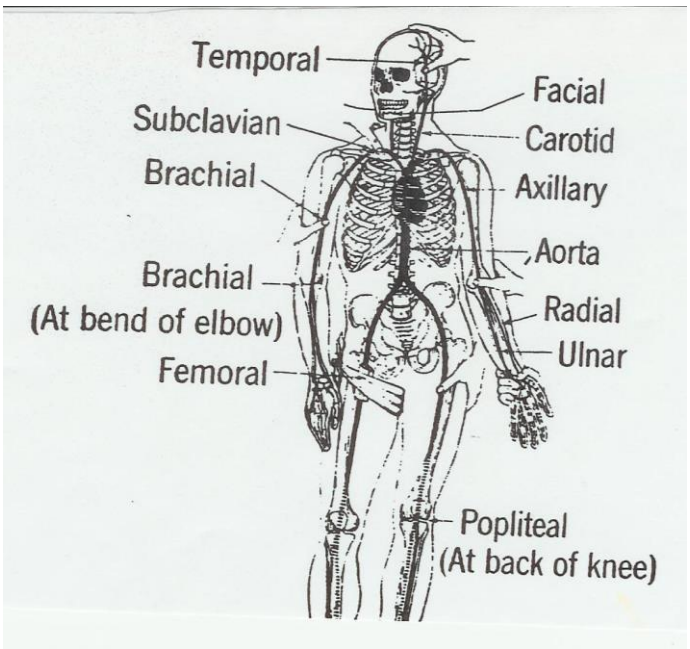
A tourniquet is a wide band of cloth or other material placed just above the wound to stop all flow of blood. A tourniquet should only be used as a last resort when the appropriate pressure point fails to stop the bleeding.

A pressure point is a place on the body where an artery passes directly between the outer skin and a bone. Thereby applying pressure at this point will reduce the flow of blood. There are 22 pressure points, 11 on each side of the body.

A compress bandage is a bandage applied directly over the wound to control bleeding.

Digital Pressure

Pressure placed in between a wound and the heart. See the image for common pressure points used in the control of bleeding.



Signs and Treatment of Shock

Signs of Shock

- **Cool, clammy skin.**
- **Pale or ashen skin.**
- **A gray or bluish tinge to lips or fingernails.**
- **Rapid pulse.**
- **Rapid breathing.**
- **Nausea or vomiting.**
- **Enlarged pupils.**
- **Weakness or fatigue.**
- **Dizziness or fainting.**
- **Changes in mental status or behavior, such as anxiousness or agitation.**

Treatment of Shock

- **Lay the person down and elevate the legs and feet slightly, unless you think this may cause pain or further injury.**
- **Keep the person still and don't move the person unless necessary.**
- **Begin CPR if the person shows no signs of life, such as not breathing, coughing or moving.**
- **Loosen tight clothing and, if needed, cover the person with a blanket to prevent chilling.**
- **Don't let the person eat or drink anything.**
- **If the person vomits or is bleeding from the mouth, and no spinal injury is suspected, turn the person onto a side to prevent choking.**

Heart Attack

Signs of a Heart Attack

1. Shortness of breath
2. Nausea
3. Sweating
4. Pale ashen skin
5. Chest pains and/or pressure
6. Pain or discomfort that spreads to the shoulder, arm, back, neck, jaw, teeth or sometimes the upper belly
7. Light-headed

Treatment for Heart Attack

1. Call for help if applicable.
2. Chew an aspirin or take Nitroglycerin (if prescribed to the victim) if available.
3. Begin hands only CPR if the patient is not breathing or there is no pulse.
4. Use and Automatic External Defibrillator if the person is unconscious.

The cycle for CPR is:

1. Hand position – two hands in center of chest (on lower half of sternum)
2. 1 ½ to 2 inches chest compressions
3. Cycle 30 compressions 2 breaths
4. Rate 30 compressions in about 18 seconds
5. Carotid pulse is taken in the neck area to the side of the Adam's apple

Dislocations and Fractures

Dislocations

1. What is a dislocation? A dislocation is slipping out of normal position of one or more bones forming a joint.

2. What other injuries usually accompany a dislocation? Torn and stretched ligaments.

3. What is the general treatment for dislocations? Applying dressings, and in some instances splints, so that the parts are immobilized in the line of deformity in which they are found.

Fractures

1. Fractures are breaks or cracks in the bones.
2. They are defined as open or closed. Closed fractures, the skin is not broken and Open fractures, the skin is broken.

Signs of fractures and dislocations:

1. Pain
2. Swelling
3. Deformity
4. Discoloration
5. Bruising of the skin
6. Inability to use affected part

Respiration

Give four reasons for breathing to stop?

1. Drowning
2. Electrocution
3. heart disease
4. Poisoning

What action would you take if a victim stops breathing?
1. Call for help
2. Check pulse
3. Start CPR

Burns

1. First degree – involve only the top layer of skin, the skin is red and dry. Treatment: Immediately immerse the burn in cool tap water or apply cold, wet compresses.

2. Second degree – deeper than first degree burns, skin will look red and have blisters. Skin will appear wet if blisters are broken. Treatment: keep your burn area under water for at least five minutes, up to 30 minutes. Gently pat the burn dry with a clean towel. Cover your burn with a clean bandage or wound dressing like non-stick gauze. Avoid touching your burn or placing clothing on your skin that can cause friction or rub against your wound.

3. Third degree – burns extend through the skin and into the structures below the skin. These burns may look brown and charred or black. The tissues underneath may look white. Treatment: Do not remove clothing stuck to the burn. Do not soak the burned area in water. Cover the burn with a cool clean cloth or bandage. Keep the burn raised above the level of the heart.

Scenario

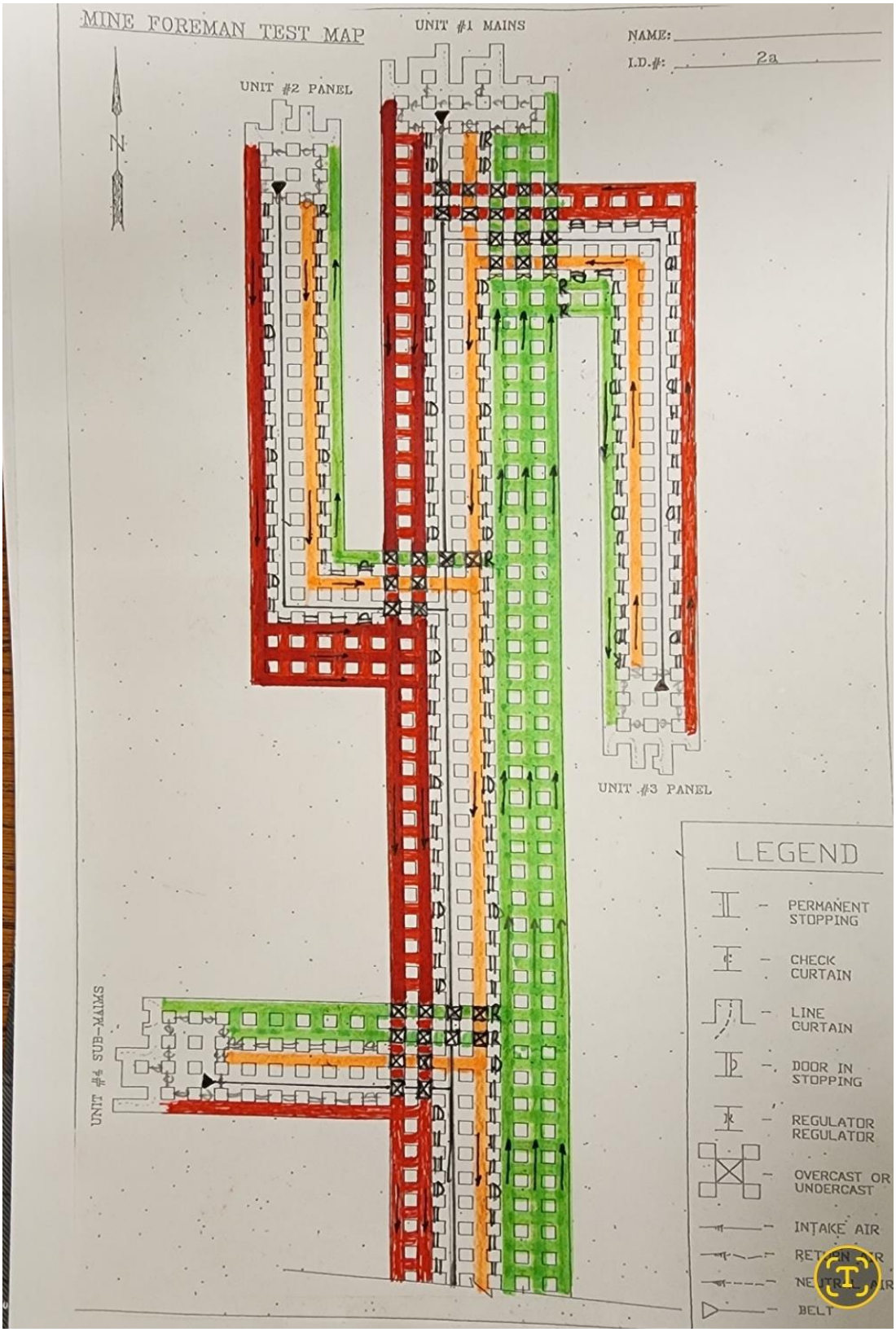
What should you do if a conscious person has a compound fracture between the knee and foot and bright red blood was spurting?

1. Make sure the area is safe.
2. Call for help if applicable.
3. Make the victim as comfortable as possible and would not move them unless necessary for safety purposes. Apply direct pressure to the arterial bleeding with a compress bandage. If bleeding was not controlled, I would apply digital pressure by hand or with tourniquet. Treat victim for potential shock.

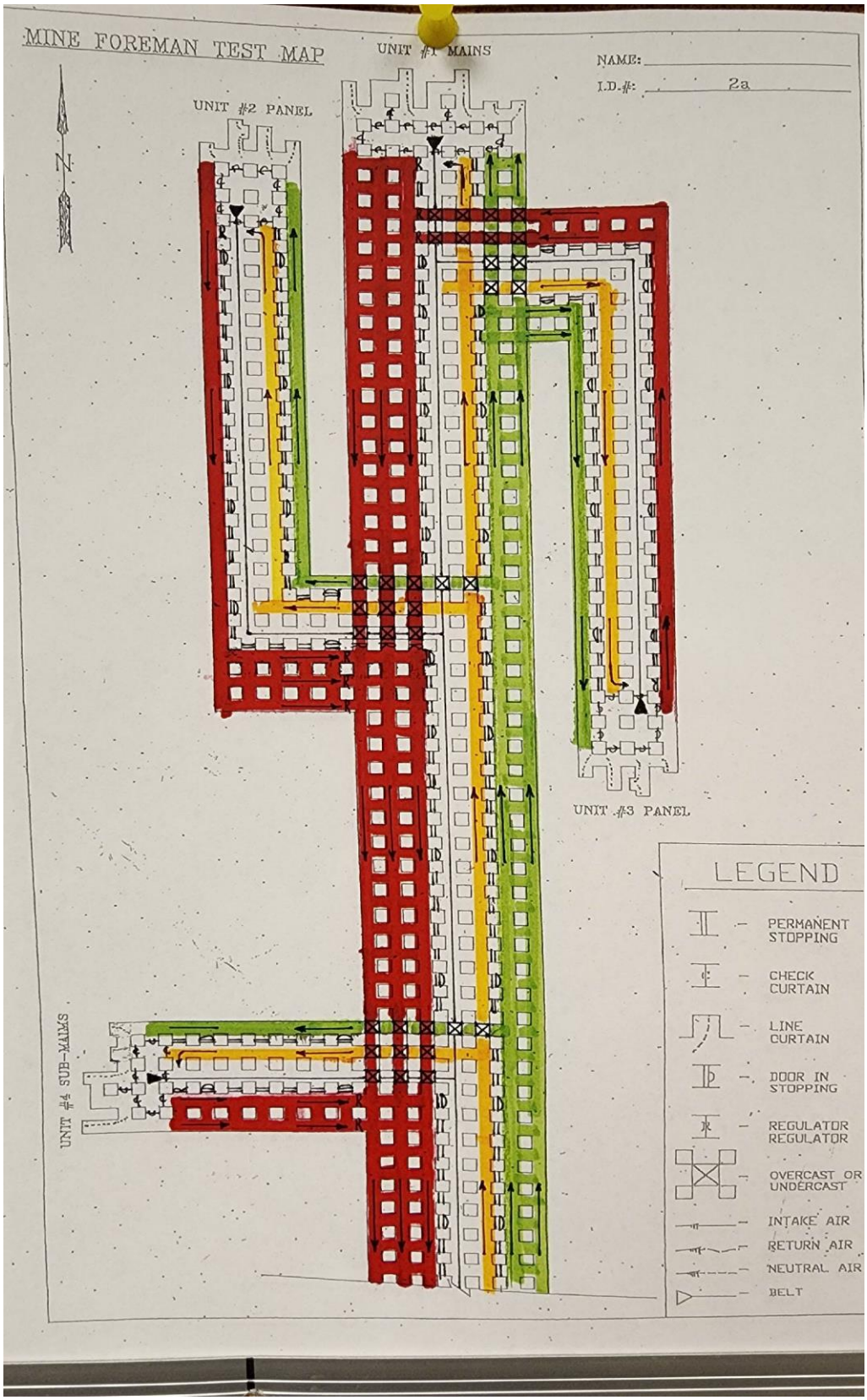
Next carefully support the leg and immobilize it by using a rigid or an air splint. Carefully load the patient onto a stretcher, transport them out of the mine for medical attention.

The following pages contain proper ventilation examples for different scenarios. They are not representative of the only proper ventilating techniques, moreover, a reference.

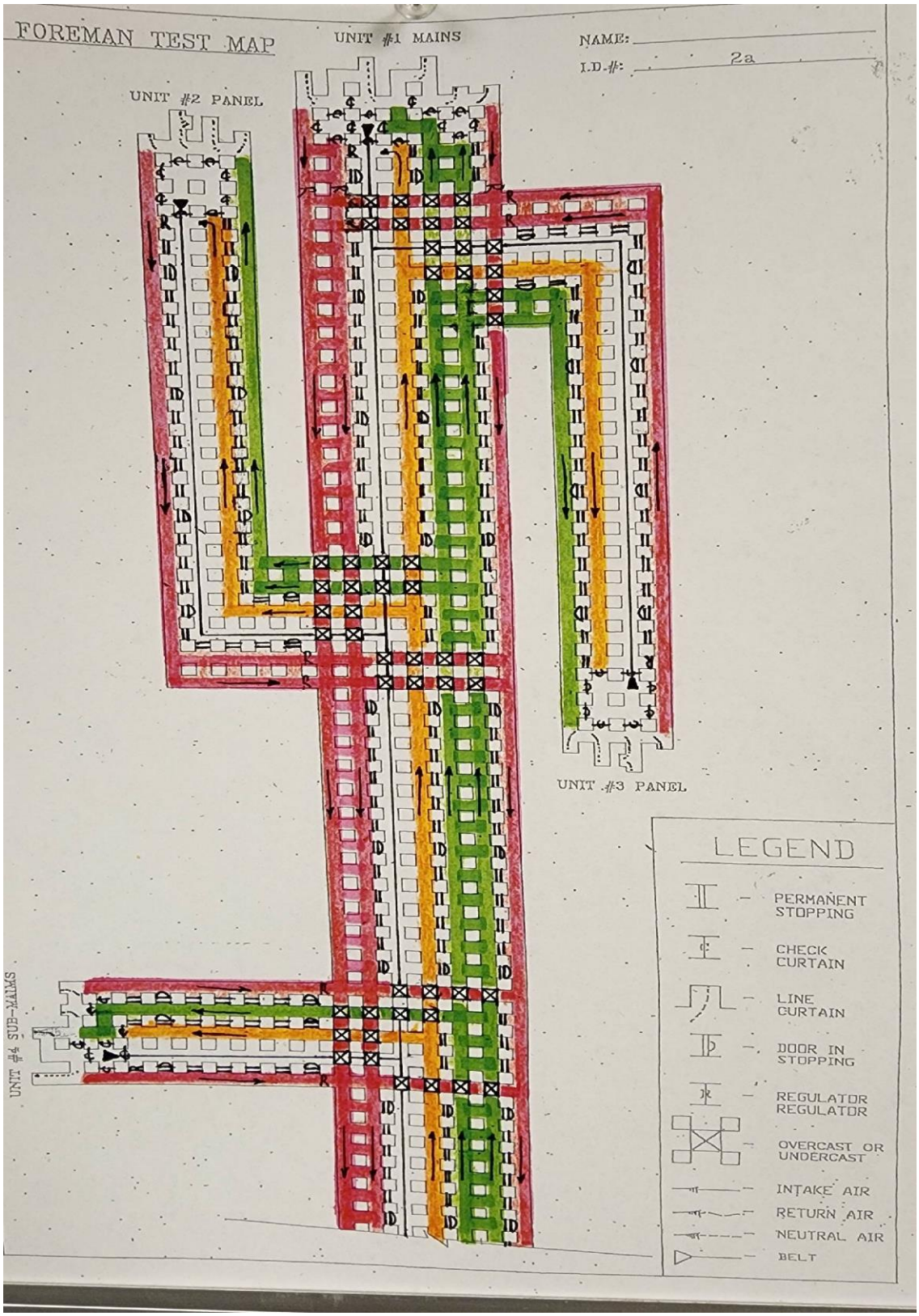
Positive Pressure (Intake Fan) Single MMU Sections



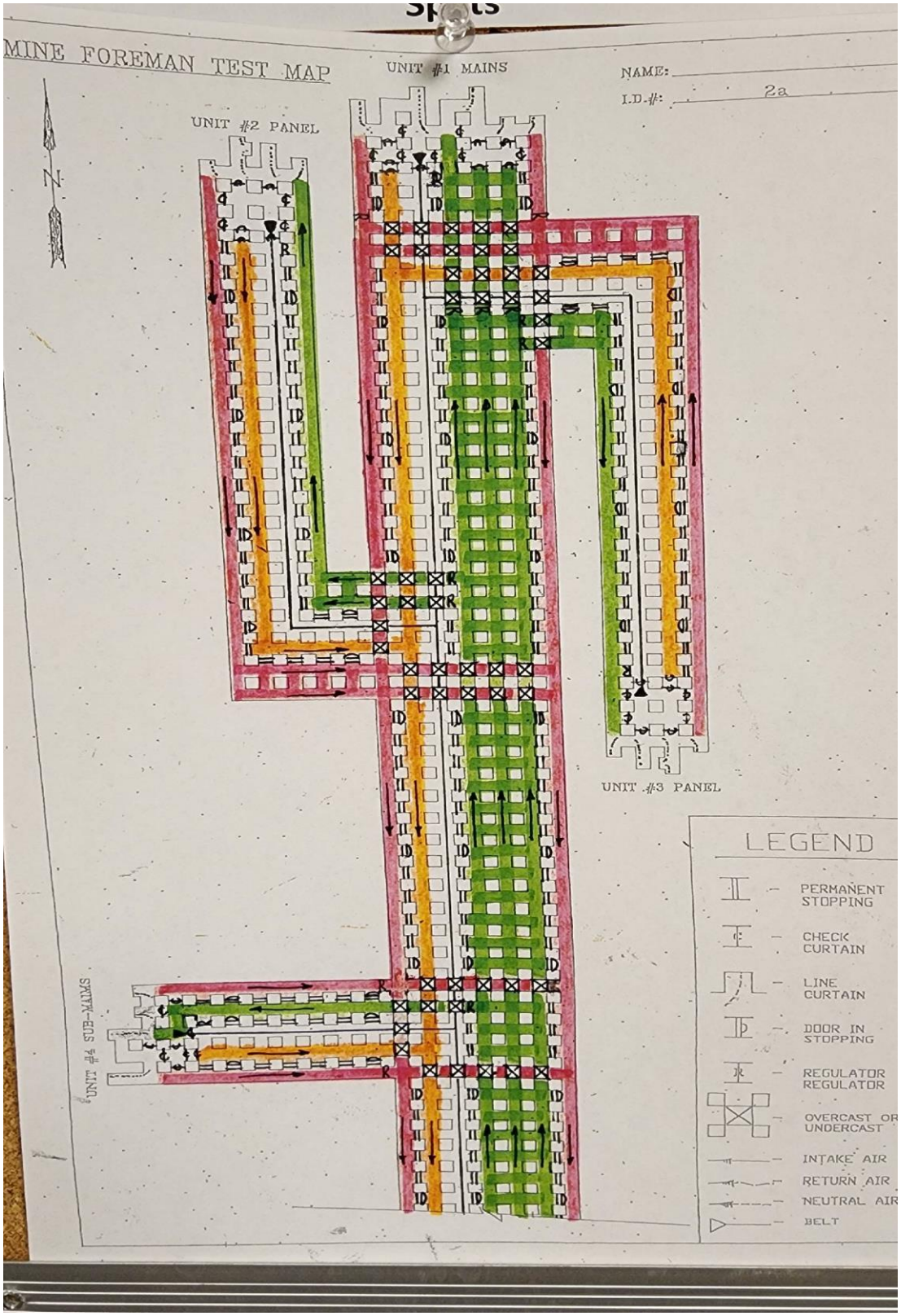
Negative Pressure (Exhausting Return Fan) Single MMU Sections



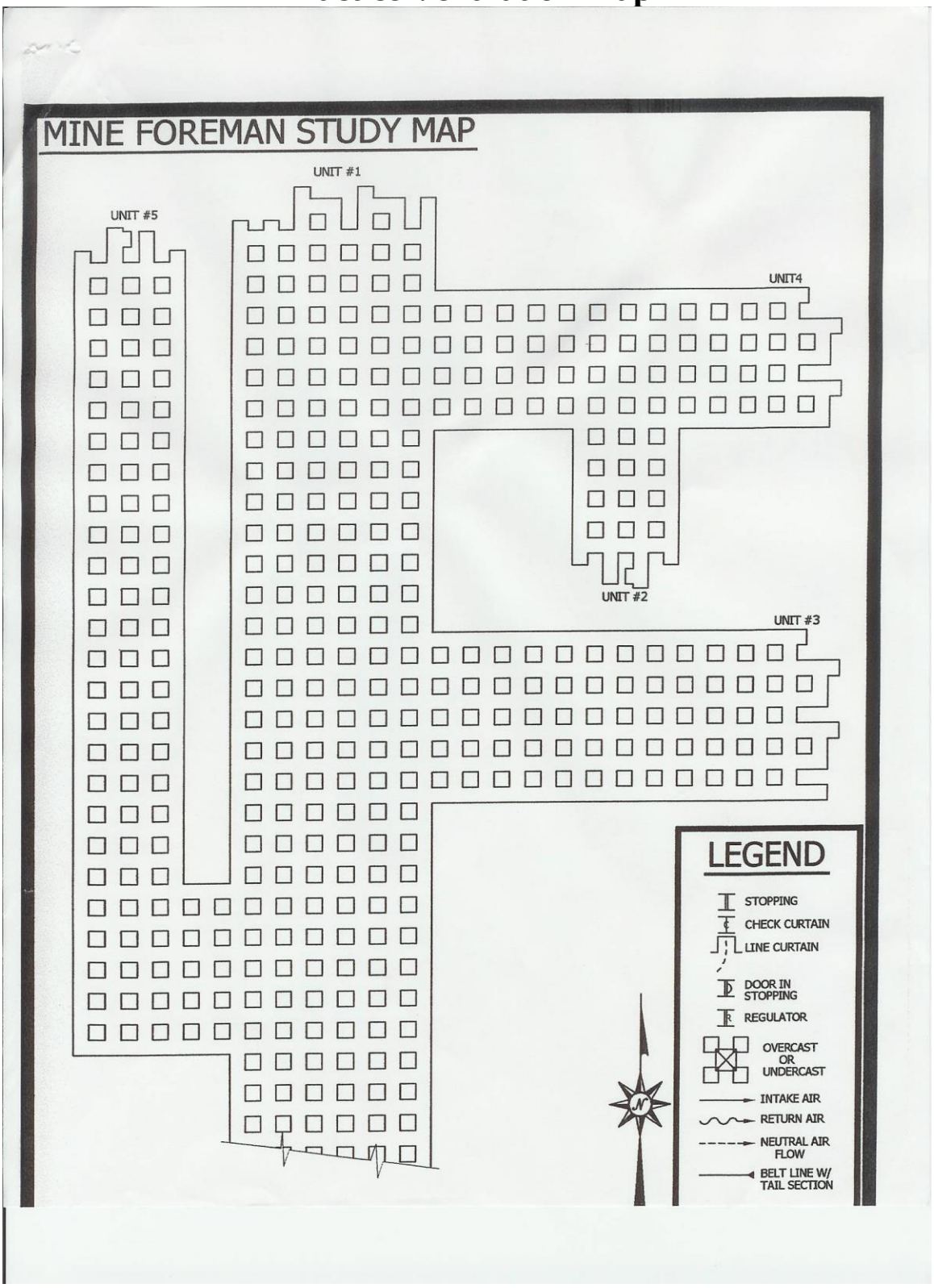
Negative Pressure (Exhausting Return Fan) Single MMU and Split MMU Sections Combination



Positive Pressure (Intake Fan) Single MMU and Split MMU Sections Combination



Practice Ventilation Map



Underground Coal Mine Gas Chart

	Hydrogen Sulfide	Methane	Carbon Dioxide	Nitrogen	Oxygen	Carbon Monoxide	Hydrogen
Origin	Rarely found old pipelines in poorly ventilated areas	Occluded in Coal and decomposition of vegetation in water	Complete combustion Small quantity found naturally in air	Found naturally in air	Found naturally in air	Incomplete combustion Mine fires & explosions Blasting	Charging of batteries, mine fires, explosions
Chemical Symbol	H2S	CH4	CO2	N2	O2	CO	H2
Explosive Range	4.3 - 46%	5 - 15%	None	None	None	12.5 - 73%	4.0-74%
Effect on Life	.07% causes death in one hour. Destroys olfactory nerves	Death by suffocation	Death by suffocation	Death by suffocation	Necessary for life	.10% in air causes complete collapse Occludes oxygen from the blood	Inert
Detection	Multi-gas detector Odor Chemical analysis	Multi-gas detector Chemical analysis	Chemical analysis	Chemical analysis Multi-gas detector	Chemical analysis Multi-gas detector	Chemical analysis Multi-gas detector	Chemical analysis Multi-gas detector
Specific Gravity	1.191	0.555	1.5291	0.967	1.105	0.967	0.07
Ignition Temperature	700 degrees	1100 - 1380 Degrees	None	None	None	1100 degrees	935 degrees