

## APPLICATION INSTRUCTIONS

- Complete all lines on the application (2 pages), DO NOT leave anything blank
- Sign the application
- Have application Notarized
- Attach a copy of your most recent 5000-23
- Mine Examiner application must have a letter(s) of experience on letterhead & signed attached to it, showing at least four years underground experience
- State Mine Inspector must have a letter(s) of experience on letterhead & signed attached to it, showing at least ten years underground experience (of which at least two years must be in Illinois)
- Electrical Hoisting Engineer must have at least 30 hours of logged experience; this will be turned in with the application or before/at the testing
- Make 2 copies, immediately send the original to Wendy Koehler, keep a copy, post a copy at the mine or class site
- Completed application, 5000-23, letter(s) of experience, check or money order for \$50.00 made payable to Illinois Department of Natural Resource or IDNR should be mailed immediately to:

Wendy Koehler  
Dept of Natural Resources  
Office of Mines & Minerals  
One Natural Resources Way  
Springfield, IL 62702

-If you are retesting you must complete a new application and make a \$50 payment

Wendy Koehler 217/558-4925 or 217/299-8155; [wendy.koehler@illinois.gov](mailto:wendy.koehler@illinois.gov)

**ALL APPLICATIONS MUST BE TURNED INTO WENDY AT LEAST  
30 DAYS BEFORE THE TESTING DATE**

**ALL INCOMPLETE APPLICATIONS WILL BE RETURNED TO THE  
APPLICANT FOR COMPLETION**



# Mine Examiner

## Mine Examiner Experience and Documentation

### Candidates for Mine Examiner Must:

- Document 4 Years' Experience (Underground)
- Document 3 Years' Experience for Associates Degree in Mining Technology
- Document 2 Years' Experience for Mining Engineer Degree
- Be 21 Years Old
- Be a citizen of the United States or lawfully admitted for permanent residence
- Be of Good Repute and Temperate Habits
- Document First Aid & Mine Rescue Training
- Pass Examination
- Possess First Class Papers

### Documents Needed:

- Application
- Application Instructions
- Letter of Experience from Present or Past Employers
- 5000-23 or Equivalent for First Aid & Mine Rescue



ILLINOIS DEPARTMENT OF NATURAL RESOURCES  
MINE EXAMINER

APPLICATION OF CANDIDATE FOR EXAMINATION BEFORE THE  
OFFICE OF MINES AND MINERALS

\_\_\_\_\_ 20 \_\_\_\_\_

TO THE HONORABLE MEMBERS OF THE STATE MINING BOARD, Springfield, Illinois

BOARD MEMBERS:

We, the undersigned, know \_\_\_\_\_ ,  
(Name)

To be of good moral character and temperate habits and do respectfully recommend the above person to your  
Honorable body as a worthy candidate for examination for certificate of competency as: Mine Examiner

Signature	Address	Occupation
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

This Certificate must be signed by not less than 10 residents of the community in which you reside.

=====

MINE EXAMINER

Affidavit of Candidate for Examination before the  
ILLINOIS STATE MINING BOARD

I, \_\_\_\_\_ , Social Security # \_\_\_\_\_ , do  
Solemnly swear (or affirm) that I am a citizen of the United States of America or lawfully admitted for  
permanent residence. My address is:

\_\_\_\_\_ Mailing Address \_\_\_\_\_ City \_\_\_\_\_ County \_\_\_\_\_ State \_\_\_\_\_ Zip

I am \_\_\_\_\_ years old, born \_\_\_\_\_ in the state of \_\_\_\_\_ .  
Age D.O.B. State

I am currently employed at: \_\_\_\_\_ MIIN # \_\_\_\_\_

I have had practical mining experience for \_\_\_\_\_ years. Phone Number ( \_\_\_\_\_ ) \_\_\_\_\_ .

If your answer to the following question is "yes", please attach a signed detailed explanation.  
Have you ever had your mining credentials suspended or revoked in Illinois or any other state or ever been  
denied mining credentials in Illinois or other States?  Yes  No

(Candidate's Signature) \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ , 20 \_\_\_\_\_ .

\_\_\_\_\_  
(Notary Public)

MINE EXAMINER -TRAINING AND EXPERIENCE QUESTIONNAIRE

1. If foreign born, how long have you been in the United States and where and when did you become a citizen?  
\_\_\_\_\_
2. What is the extent of your education? \_\_\_\_\_
3. What special training in the mining profession have you taken? \_\_\_\_\_
4. Do you hold a certificate of qualification as a miner, issued by the Miners' Examining Board of Illinois?  
\_\_\_\_\_
5. What certifications of competency issued by the State Mining Board of Illinois do you now hold?  
\_\_\_\_\_
6. What certificates of competency issued by another State do you now hold?  
\_\_\_\_\_
7. At what mine and in what capacity are you employed at the present time?  
\_\_\_\_\_
8. List the names of the coal companies/mine construction properties by which you have been employed during the past ten years, giving the names and addresses of each and the capacity in which you were employed by each company/project.  

Name	Address	Job Capacity
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
9. With what gas detection and ventilation measurement devices are you familiar?  
\_\_\_\_\_
10. Have you completed training in mine rescue methods and appliances as prescribed either by the Department of Natural Resources, Office of Mines and Minerals or other accredited institution? \_\_\_\_\_  
Where? \_\_\_\_\_ When? \_\_\_\_\_
11. Have you completed training in first aid to the injured as prescribed by either the Department of Natural Resources, Office of mines and Minerals or other accredited institution? \_\_\_\_\_  
Where? \_\_\_\_\_ When? \_\_\_\_\_

revised 6/13

**A \$50.00 application fee, payable to Illinois Department of Natural Resources (IDNR) should be submitted along with this application.**

# Mine Manager

## Mine Manager Experience and Documentation

### Candidates for Mine Manager Must:

Possess Valid Mine Examiners Papers

Be 23 Years Old

Be a citizen of the United States or lawfully admitted for permanent residence

Be of Good Repute and Temperate Habits

Pass Examination

### Documents Needed:

Application

Application Instructions

Documentation or Verification of Examiners Papers







MINE MANAGER -TRAINING AND EXPERIENCE QUESTIONNAIRE

1. If foreign born, how long have you been in the United States and where and when did you become a citizen?  
\_\_\_\_\_
2. What is the extent of your education? \_\_\_\_\_
3. What special training in the mining profession have you taken? \_\_\_\_\_
4. Do you hold a certificate of qualification as a miner, issued by the Miners' Examining Board of Illinois?  
\_\_\_\_\_
5. What certifications of competency issued by the State Mining Board of Illinois do you now hold?  
\_\_\_\_\_
6. What certificates of competency issued by another State do you now hold?  
\_\_\_\_\_
7. At what mine and in what capacity are you employed at the present time?  
\_\_\_\_\_
8. List the names of the coal companies/mine construction properties by which you have been employed during the past ten years, giving the names and addresses of each and the capacity in which you were employed by each company/project.  

Name	Address	Job Capacity
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
9. With what gas detection and ventilation measurement devices are you familiar?  
\_\_\_\_\_
10. Have you completed training in mine rescue methods and appliances as prescribed either by the Department of Natural Resources, Office of Mines and Minerals or other accredited institution? \_\_\_\_\_  
Where? \_\_\_\_\_ When? \_\_\_\_\_
11. Have you completed training in first aid to the injured as prescribed by either the Department of Natural Resources, Office of mines and Minerals or other accredited institution? \_\_\_\_\_  
Where? \_\_\_\_\_ When? \_\_\_\_\_

revised 6/13

**A \$50.00 application fee, payable to Illinois Department of Natural Resources (IDNR) should be submitted along with this application.**

# State Mine Inspector

## State Mine Inspector Experience and Documentation

### Candidates for State Mine Inspector Must:

- Document 10 Years' Experience (2 in Illinois)
- Possess Valid Mine Managers Papers
- Be 30 Years Old
- Be a Resident of this State
- Be of Good Repute and Temperate Habits
- Pass Examination

### Documents Needed:

- Application
- Application Instructions
- Documentation or Verification of Mine Managers Papers
- Documentation of 10 Years' Experience



**ILLINOIS DEPARTMENT OF NATURAL RESOURCES  
STATE MINE INSPECTOR**

APPLICATION OF CANDIDATE FOR EXAMINATION BEFORE THE  
OFFICE OF MINES AND MINERALS

\_\_\_\_\_ 20 \_\_\_\_\_

TO THE HONORABLE MEMBERS OF THE STATE MINING BOARD, Springfield, Illinois

**BOARD MEMBERS:**

We, the undersigned, know \_\_\_\_\_ ,  
(Name)

To be of good moral character and temperate habits and do respectfully recommend the above person to your Honorable body as a worthy candidate for examination for certificate of competency as: State Mine Inspector

Signature	Address	Occupation
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

This Certificate must be signed by not less than 10 residents of the community in which you reside.

=====

**STATE MINE INSPECTOR**

Affidavit of Candidate for Examination before the  
**ILLINOIS STATE MINING BOARD**

I, \_\_\_\_\_, Social Security # \_\_\_\_\_, do  
Solemnly swear (or affirm) that I am a resident of this State. My address is:

\_\_\_\_\_ Mailing Address \_\_\_\_\_ City \_\_\_\_\_ County \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

I am \_\_\_\_\_ years old, born \_\_\_\_\_ in the state of \_\_\_\_\_ .  
Age D.O.B. State

I am currently employed at: \_\_\_\_\_ MIIN # \_\_\_\_\_

I have had practical mining experience for \_\_\_\_\_ years. Phone Number ( \_\_\_\_\_ ) \_\_\_\_\_ .

If your answer to the following question is "yes", please attach a signed detailed explanation.  
Have you ever had your mining credentials suspended or revoked in Illinois or any other state or ever been denied mining credentials in Illinois or other States?  Yes  No

(Candidate's Signature) \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_\_ .

\_\_\_\_\_  
(Notary Public)

**STATE MINE INSPECTOR -TRAINING AND EXPERIENCE QUESTIONNAIRE**

1. If foreign born, how long have you been in the United States and where and when did you become a citizen?  
\_\_\_\_\_
2. What is the extent of your education? \_\_\_\_\_
3. What special training in the mining profession have you taken? \_\_\_\_\_
4. Do you hold a certificate of qualification as a miner, issued by the Miners' Examining Board of Illinois?  
\_\_\_\_\_
5. What certifications of competency issued by the State Mining Board of Illinois do you now hold?  
\_\_\_\_\_
6. What certificates of competency issued by another State do you now hold?  
\_\_\_\_\_
7. At what mine and in what capacity are you employed at the present time?  
\_\_\_\_\_
8. List the names of the coal companies/mine construction properties by which you have been employed during the past ten years, giving the names and addresses of each and the capacity in which you were employed by each company/project.

Name	Address	Job Capacity

9. With what gas detection and ventilation measurement devices are you familiar?  
\_\_\_\_\_
10. Have you completed training in mine rescue methods and appliances as prescribed either by the Department of Natural Resources, Office of Mines and Minerals or other accredited institution? \_\_\_\_\_  
Where? \_\_\_\_\_ When? \_\_\_\_\_
11. Have you completed training in first aid to the injured as prescribed by either the Department of Natural Resources, Office of mines and Minerals or other accredited institution? \_\_\_\_\_  
Where? \_\_\_\_\_ When? \_\_\_\_\_

revised 6/13

**A \$50.00 application fee, payable to Illinois Department of Natural Resources (IDNR) should be submitted along with this application.**

# Electrical Hoisting Engineer

## Hoisting Engineer Experience and Documentation

### Candidates for Hoisting Engineer Must:

- Be 21 Years Old
- Be a citizen of the United States or lawfully admitted for permanent residence
- Have Two Years Hoisting Experience or 30 Hours of Log Time
- Attend Hoisting Classes (Mandatory)
- Be of Good Repute and Temperate Habit
- Pass Examination

### Documents Needed:

- Application
- Application Instructions
- Documentation or Verification of Hoisting Experience
- Completed Log Sheet (Signed by Valid Engineer)







**ELECTRICAL HOISTING ENGINEER -TRAINING AND EXPERIENCE QUESTIONNAIRE**

1. If foreign born, how long have you been in the United States and where and when did you become a citizen?  
\_\_\_\_\_
  
2. What is the extent of your education? \_\_\_\_\_
  
3. What special training in the mining profession have you taken? \_\_\_\_\_  
\_\_\_\_\_
  
4. What certifications of competency issued by the State Mining Board of Illinois do you now hold?  
\_\_\_\_\_  
\_\_\_\_\_
  
5. What certificates of competency issued by another State do you now hold?  
\_\_\_\_\_  
\_\_\_\_\_
  
6. At what mine and in what capacity are you employed at the present time?  
\_\_\_\_\_  
\_\_\_\_\_
  
7. List the names of the coal companies/mine construction properties by which you have been employed during the past ten years, giving the names and addresses of each and the capacity in which you were employed by each company/project.  

Name	Address	Job Capacity
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
  
8. List the actual experience and length of time you had working with electrical hoists in Illinois or other States.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

revised 6/13

**A \$50.00 application fee, payable to Illinois Department of Natural Resources (IDNR) should be submitted along with this application.**





## Study Guide

- 1 Know the duties of an examiner/mine manager.
- 2 Know the Gas Chart.
- 3 Know how to ventilate a mine map.
- 4 Know the hoisting signals and where they have to be displayed.
- 5 Be able to find the quantity of air or methane in an entry.
- 6 Be able to reduce the methane content in an entry.
- 7 Be able to find the area.
- 8 What does the CMA require for fire prevention and fire control.
- 9 The laws concerning storage of explosives.
- 10 Define the terms mine, mine manager, mine examiner, operator.
- 11 Know the legal requirements for mine manager and examiner.
- 12 Who can revoke a certification?
- 13 What are the major causes of mine fires and how do we guard against them.
- 14 What are the major causes of mine explosions and how may we guard against them.
- 15 Define air splits?
- 16 What does the law require concerning coal dust?
- 17 What are the requirements concerning rock dust?
- 18 Name 10 requirements concerning the ventilating fan.
- 19 What are the principles of first aid?
- 20 What is a self rescuer?
- 21 Know the different types damp.



### Mine Examiner

Each applicant for certificate of competency as a mine examiner shall produce evidence satisfactory to the \_\_\_\_\_ that he is a citizen of the United States or lawfully admitted for permanent residence, at least \_\_\_\_\_ years of age and of \_\_\_\_\_ and \_\_\_\_\_ and that he has had at least \_\_\_\_\_ practical underground mining experience, and has been issued a \_\_\_\_\_ by the Department of Natural Resources. He shall pass an examination as to his experience in mines generating dangerous gasses, \_\_\_\_\_ of the nature and properties of mine gasses, the laws of ventilation, \_\_\_\_\_ and the laws of this state relating to safeguards against fires from any source in mines. He shall also submit to the mining board satisfactory evidence that he has completed a \_\_\_\_\_ to the injured and mine rescue methods and appliances prescribed by the Department. Persons who have graduated and holds a degree in mining engineering or an approved four-year program in coal mining technology from an accredited school, college, or university, are required to have only \_\_\_\_\_ of \_\_\_\_\_ practical underground mining experience to qualify for examination for a certificate of competency.

Persons who graduated and hold a two-year associate in Applied Science Degree in coal mine technology from an accredited school college, or university are required to have only \_\_\_\_\_ practical underground mining experience to qualify for the examination for a certificate of competency as a mine examiner.





## MINE EXAMINERS QUESTIONS

1. In a mine employing 50 men, the mine manager can act in the capacity of mine examiner while acting as mine manager. T F
2. If an examiner shall find dangerous roof or an accumulation of gas or other conditions he shall first report it to the mine manager. T F
3. When the immediate services of a certified mine examiner are not available a temporary mine examiner may be employed for a period not exceeding:
  - a. 23 days
  - b. 30 days
  - c. 7 days
4. A mine examiner must be a citizen of Illinois. T F
5. A certified mine examiner shall be required at most of the coal mines. T F
6. On a non-coal producing shift, the examiner doesn't have to make the mine in it's entirety if men are only working in the shaft, slope, drift or in the immediate shaft bottom. T F
7. In a non-gassy mine the examiner shall make a pre-shift examination on all three shifts. T F
8. A mine examiner must be at least:
  - a. 22 years of age
  - b. 30 years of age
  - c. 21 years of age
  - d. 20 years of age w/mining degree
9. An examiner who has his papers revoked or canceled shall be notified in writing \_\_\_\_\_ days before any hearing on charges is set.
  - a. 10 days
  - b. 7 days
  - c. 15 days
  - d. 25 days
10. A person who has graduated and holds a two year degree in coal mining technology requires \_\_\_\_\_ years to acquire examiners papers.
  - a. 2 years experience
  - b. 3 years experience
  - c. 4 years experience
  - d. 1 year experience
11. The pre-shift examination begins \_\_\_\_\_ before the oncoming shift.
  - a. 2 hours
  - b. 3 hours
  - c. 4 hours
  - d. 1 hour
12. On non-coal producing shifts the examiner need only examine
  - a. the area surrounding the bottom area
  - b. the entire mine
  - c. only the shaft or slope
  - d. need only to make a partial examination
13. Persons seeking certification as a mine examiner must have both first aid and mine rescue training. T F
14. A Mine Examiner should first "Danger Out" (tag) any area where Ch4 is found. T F



## EXAMINERS GUIDE

The following conditions should be tagged as hazards and recorded as such in the examiners books:

- Any area of the mine where the methane is over 1.0%
- Any severe reduction or loss of ventilating air current
- Any unsupported top in an area where workers are exposed to the top conditions
- Any top that is considered hazardous (cutting, working, taking weight, etc)
- Any friction hazard (beltline running in coal, rubbing on timbers, etc)
- Any work area where the methane or oxygen content is beyond limits of Article 31.
- Approaches to recent falls

The following conditions should be tagged as conditions needing attention in the near future (not immediate hazards) and recorded in remarks:

- Significant coal accumulations on beltlines, in drives and tails (non-friction conditions)
- BO rollers on beltlines (if the rollers will become a friction hazard if ignored)
- Any beltline becoming black in color due to a lack of rockdust
- Any intake or return entry becoming black in color due to a lack of rock dust
- Any last open cross cut or face area black in color due to a lack of rock dust
- Any escapeway blocked by excessive standing water
- Any damaged stoppings or regulators affecting ventilation

Other conditions may arise occasionally, not specifically covered in Illinois Law, such as damaged cables with exposed electrical leads or other electrical components not protected from contact with workers or materials that may cause a fire hazard. Always notify management of any condition that you feel may pose a safety hazard to any workers in the mine. Management and the State Inspector will decide how to best address the situation.



## ILLINOIS MINING LAWS

### PRACTICAL COAL MINING COURSE LESSON

#### ILLINOIS MINING LAWS

(Answers stated in simplified terms)

1. Q. What are the duties of a mine manager as prescribed by "The Coal Mining Act"?

A. He shall see that the mine examiner properly performs his duties as follows:

(The duties of the mine examiner; Section 6.04-6.11)

When performing his duties, he shall carry an approved gas detector in good working order, a sounding rod, an anemometer, a watch, a measure, pencil, paper, and chalk. Within 3 hours before the beginning of the shift, he shall examine all active working places, testing with an approved gas detector for firedamp, and for oxygen deficiency; he shall also test the roof, ribs and faces of active working areas, travel ways, roadways, and the approaches to abandoned workings for any unsafe condition. He shall use the anemometer to measure the amount of air passing through the last cross-cut of each pair of entries or in the last room of each division in the long-wall sections, and he shall measure the air at all other places where he deems necessary, to determine that the air is traveling in its right course. He shall examine the seals, doors, stoppings, brattices, and overcast to determine if they are in good condition. And as evidence of his examinations of working places, seals, doors, etc... he shall inscribe in chalk in some suitable place his initials and the date. If and when he discovers dangerous conditions of any kind, he shall place danger signs at all entrances to such places. If and when he finds places "behind in rock dusting" or places that are not sufficiently roof-bolted or other-wise properly timbered, he shall include these findings in his daily examiner's record. Upon completion of his examination of the mine or of the sections of the mine assigned to him to examine, he shall make a daily record in ink or indelible pencil of his findings. If any dangerous conditions were found, he shall state the nature of the conditions in his report.

This report must be completed and signed by the examiner and checked by the mine manager before the men are permitted to enter the mine.

For all mines classified as "Gassy". The mine shall be examined within 3 hours before the beginning of all shifts on which any work is done underground, whether coal producing or maintenance, except, on idle shifts and the only work to be done is in the shaft or around the immediate shaft bottom, then only the areas surrounding the bottom has to be examined.

For mines classified as "Non-gassy", only one examination, 3 hours prior to the beginning of the first coal producing shift is required. At these mines, and on idle shifts, the examiner is required to examine only the section or sections where the men will work. For idle nights, the section or sections where work is to be done shall be examined only if it was not examined for the day shift.

The mine manager shall examine the examiner's report and if dangers are reported, he shall instruct his bosses and or other workman as to the dangers reported and give appropriate instructions about correcting these dangers.

He shall see that his face bosses and other competent men make on-shift examinations at the faces and other active working places for any dangerous conditions at least once daily and as often as is needed.

He shall visit every active working place at least once every two weeks.

He shall require his face bosses to be in constant attendance of their sections and to visit each working place on his section at least once daily.

He shall provide a checking system to account for each man when he is in or out of the mine.

He shall provide timbers, props, roof-bolts, etc. for each place as needed.

He shall see that cross-cuts are made as required by law, also that doors, stoppings, brattices, and curtains are erected where needed.

He shall take a daily barometer reading and make record of same; if the barometer indicated changes that may create dangerous gassy conditions he shall notify his face bosses, examiners, and others who he deems should be on the look-out for such dangers.

He shall keep watch over the mine ventilating system and the air courses. If the mine fan should fail, he shall have the electricity cut-off in the mine and notify his face bosses and have the men withdrawn from the face regions. In the mines classified as "gassy", if the ventilation is restored within a reasonable time, the faces and other places where gas may accumulate shall be examined by competent men and if found safe, the power can be turned back on and work resumed. If it is found to be unsafe, the men must be removed from the mine until the mine is restored to a safe condition and reexamined.

He shall measure the mine intake and return and the air on each split at least weekly.

He shall examine or have examined the main escape ways and the escapement shaft at least once weekly. When unsafe conditions are found, a record of this shall be made and he shall see that these conditions are corrected immediately.

He shall have the safety catches, ropes and cages examined and tested each day before the men are lowered into the mine at the beginning of the day shift.

At shift mines and where men use cages, he must have cagers stationed at the top and bottom landings before the men are lowered into or hoisted from the mine.

He must see that adequate lighting is provided at top and bottom landings.

He or his assistants shall be on duty before the men are lowered into the mine and remain at the mine until they are hoisted out at the end of the shift.

He is responsible for the proper handling and storage of explosives used in the mine.

He shall make the necessary rules and instruct the men in the proper use and storage of explosives.

When coal is broken down on shift with compressed air, he shall see that the faces are properly examined before the faces are loaded out.

He shall see that roadways, belt lines and other places in the mine are kept free of excessive accumulations of loose coal and dust, and these places are properly rock dusted.

He shall see that the miners are instructed as to the requirements of the mining laws and require their compliance of these laws.

When his work requires help in fulfilling these duties, he may designate assistants who will carry out his duties as he deems necessary in the proper management of the mine.

**2. Q. What does the Illinois Coal Mining Act require shall be done regarding excessive coal dust in a mine? Explain fully.**

A. Coal dust and other combustible materials shall not be permitted to accumulate in dangerous quantities in active underground workings of a mine.

Where underground mining operations raise an excessive amount of dust into the air, water or water with a wetting agent added to it or other effective methods shall be used to allay the dust at its source. All underground mines, except those mines or areas of mines in which dust is too wet or too high in incombustible content to propagate an explosion, shall be rock-ducted to within 40 feet of all faces. In mines where rock-dusting is required, rock-dusting shall be started at the bottom and rock-dusting shall be maintained as the mine is developed; haulage ways, parallel entries, rooms and cross-cuts shall be rock-dusted. Where rock-dust is applied, it shall be distributed upon the roof, floor, and sides of all open places and maintained in such quantity that the incombustible content of the combined coal dust, rock-dust and other dust will not be less than 65%. Where methane is present in any ventilating current, the 65% of incombustible content of such dust shall be increased 1% for each 0.1% of methane.

**3. Q. What is the law regarding refuge places along haulage roads?**

A. Refuge places shall be provided not more than 60 feet apart along haulage entries. Room necks and cross-cuts may be used as refuge places. Refuge places shall be kept clear of refuse and other obstructions.

4. Q. **What is the law regarding refuge places where men get on and off man trips?**  
A. Where man trips are operated there shall be on one side of the man trips, where men get on and off, a refuge place at least 3 feet from the rail and free from all obstructions for the full distance of the man trips.
5. Q. **What is the law with regards to stoppings in coal mines in the state?**  
A. In cross-cuts connecting main and cross entry inlet and outlet air courses the permanent stoppings shall be erected of incombustible materials, and shall be erected within 600 feet of the face of mine and cross entries at all times. Temporary stoppings of wood or other equally effective material shall be maintained, as nearly air tight as possible, between the last permanent stopping and the cross-cut nearest the face in the main and cross entries. In room and stub entries the stoppings shall be built of wood or other equally effective material. All stoppings shall be kept in good condition, so as to keep air up to the working faces.
6. Q. **What does the Illinois Mining Law require every workman to first do when he goes into a place to work?**  
**Discuss fully.**  
A. Every miner shall sound and thoroughly examine the roof, ribs, and face of his working place before commencing work, and if he finds loose rock or other dangerous conditions, he shall not work in such dangerous place except to make such dangerous conditions safe.
7. Q. **After what period of time must the men be removed from a mine if the fan stops?**  
A. When the ventilating fan at any mine fails or stops, immediate action shall be taken to cut off the electric power and withdraw workmen from the face regions of the mine. In non-gassy mines if the ventilation is restored within a reasonable time the power may be turned on and work resumed without the necessity of re-examination. In gassy mines if the ventilation is restored within a reasonable time, the face regions and other places where methane is likely to accumulate shall be re-examined by competent personnel, and if such region and places are found to be free from explosive gas the power may be restored and work resumed.
8. Q. **What is the minimum quantity of air that must enter a mine as prescribed by the state mining law?**  
A. In non-gassy mines not less than 150 cubic feet per minute for each workman. In mines classified as gassy, not less than 200 cubic feet per minute per man. In these cases the quantity of air must be measured at the foot of the downcast and of the upcast.
9. Q. **What is the minimum quantity of air that must be passing through the last open cross-cut between the intake and return of any pair or set of entries?**  
A. Not less than 9,000 cubic feet per minute, however, if in the opinion of the State Mine Inspector, the quantity of air in any case is inadequate, he can give a written order increasing the amounts required.
10. Q. **What is the minimum percentage of oxygen allowable in the air ventilating the working places and section?**  
A. 19.5%
11. Q. **What is the maximum percentage of methane allowable in active working places?**  
A. 1%
12. Q. **What is the maximum percentage of carbon dioxide allowable in active working places?**  
A. 0.5%. No quantities of noxious or poisonous gases are allowed in the air currents of any mine in the state.

- 13. Q. What are the laws of Illinois in reference to persons seeking certificates as mine examiners?**
- A. He shall be a citizen of the United States or lawfully admitted for permanent residence; he shall be at least 21 years of age; he shall have temperate habits and a good reputation; at least 4 years of practical mining experience, except, if he holds a degree in mining engineering from an accredited school, then he is required to have only 2 years of underground experience as prescribed by the Illinois Mining Board as to his ability to perform the duties of a mine examiner. And completed courses in mine First Aid and methods of mine rescue.
- 14. Q. What are the laws of Illinois in reference to persons seeking certificates as mine managers?**
- A. He shall be a citizen of the United States or lawfully admitted for permanent residence; be at least 23 years of age; have completed courses in first aid and mine rescue; have temperate habits and have a good reputation; have at least 4 years of underground mining experience and pass the state examination to his ability in the management of mines.
- 15. Q. Under what conditions may the certificate of a mine manager, hoisting engineer, or mine examiner be cancelled or revoked?**
- A. Any certificate issued by the Department may be cancelled or revoked by said Department upon notice and hearing; if it is established in the judgment of said Department that the holder thereof had obtained said certificate by fraud or misrepresentation of his experience or has become unworthy to hold said certificate.
- 16. Q. What are the rights of the person against whom such charges or complaints that the holder of the certificate of mine manager, hoisting engineer or examiner should be cancelled or revoked?**
- A. Any person against whom charges or complaints are made thereunder shall have the right to appear before the Department and defend himself against said charges, and he shall have 15 days notice in writing of such charges previous to such hearing; provided, that the Department in its discretion, may suspend the certificate of any person charged as aforesaid, pending such hearing, but said hearing shall not be unreasonably deferred.
- 17. Q. List the code of signals prescribed by the Coal Mining Act for use at coal mines in this State for signaling between the top, the bottom and the hoisting engineer.**
- A. From the bottom to the top; one ring or whistle shall signify to hoist coal or empty cage, and also to stop either when in motion. Two rings or whistles shall signify to lower cage. Three rings or whistles shall signify that men are coming up or going down; when return signal is received from the engineer the men shall get onto the cage and the proper signal to hoist or to lower shall be given. Four rings or whistles shall signify to hoist slowly, implying danger. Five rings or whistles shall signify accident in the mine and a call for a stretcher. Six rings or whistles shall signify hold cage perfectly still until signaled otherwise. From top to bottom; one ring or whistle shall signify, all ready, get on cage. Two rings or whistles shall signify, send away empty cage. The operator of any mine may, without the consent of the State Mine Inspector, add to the code of signals.
- 18. Q. What does the Illinois mining law require a Mine Examiner to carry with him when making an examination of a mine?**
- A. An approved gas detector, anemometer, watch, measure, pencil, writing pad, sounding rod and chalk.
- 19. Q. What is the law regarding minimum number of workmen allowed on each split or division of mine air?**
- A. The main current of air shall be so split or subdivided as to give a separate current of reasonably pure air to every 100 men. The State Mine Inspector has the authority to order, in writing, separate currents for smaller groups of men, if in his judgment special conditions render it necessary.



## MINE MANAGERS QUESTIONS

1. A mine manager must be at least
  - a. 24 years old
  - b. 23 years old
  - c. 21 years old
  - d. 25 years old
  
2. If a mine manager's certification is canceled or revoked he will be notified \_\_\_\_\_ days before any hearing on charges against him are set.
  - a. 10 days
  - b. 7 days
  - c. 15 days
  - d. 30 days
  
3. The mine manager or his assistant shall visit each working place in the mine
  - a. twice a week
  - b. once a week
  - c. once every two weeks
  - d. once each month
  
4. The mine manager or his assistant shall examine the escape shaft and roadways leading there
  - a. twice a week
  - b. once a week
  - c. once every two weeks
  - d. once each calendar day
  
5. The Mine manager shall or shall have the air measured at the inlet and outlet
  - a. once a week
  - b. each day
  - c. each shift
  - d. once a month
  
6. The mine manager is responsible for all hoisting equipment. T F
  
7. The mine manager determines the number of persons who ride the cage. T F
  
8. The mine manager, not the superintendent, is responsible for a mine check-in/check-out system. T F
  
9. A mine manager may examine (as a mine examiner) at any time. T F
  
10. It is lawful to operate any underground mine without a mine manager. T F
  
11. A mine manager may leave at quitting time at any mine. T F



# DIESEL REGS

g) Standards for Diesel Engines in Underground Coal Mines.  
The following rules govern the operation of diesel equipment in underground coal mines. In addition to these rules, compliance with 30 CFR 31, 32, and 36 (1983) as pertaining to the operation and maintenance of diesel equipment is required.

1)

A) Before operating any diesel equipment in an underground mine, the operator must submit to the Department of Mines and Minerals a mining plan amendment which shall contain a ventilation plan stating the quantity of air in the areas where the diesel equipment will be operating and the number of diesel units which the mine operator plans to operate. An operator must meet also the quantity of air requirements of Section 31.02 of the Coal Mining Act of 1953. This plan must also contain the projected quantities of diesel fuel to be used in a 24-hour period. The State Mine Inspector shall adjust the quantity of diesel fuel allowed in the mine in accordance with Sections (11) and (12) herein by submitting such adjustment in writing to the Department.

B) No diesel equipment shall be placed in initial operation

underground until it is checked for approval in accordance with Sections (2) and (10) herein and tested in accordance with Sections (3) and (4) herein by the State Mine Inspector for the district in which the mine is located. The State Mine Inspector shall submit to the Department, in writing, the mine operator's name, type of equipment, serial number and Mine Safety and Health Administration (MSHA) certification number.

C)

- i) To amend a mining plan to include the use of diesel equipment in underground coal mines, an operator must submit a request for a mining plan amendment to the Mining Board. Upon receipt of that request, the State Mine Inspector shall test the mine in which the equipment is proposed to be used to insure that sufficient ventilation exists to comply with this rule.
  - ii) The State Mine Inspector shall test the diesel equipment which is proposed to be used in the mine prior to its installation for compliance with this rule. If this equipment meets the requirements of this rule, it shall be installed in the mine in which it is to be operated and tested again by the State Mine Inspector to insure it complies with the requirements of this rule. This equipment may not be operated until such time as its use is approved by the Mining Board.
  - iii) The State Mine Inspector shall provide a written report of the results of the testing of the equipment to the Mining Board. Within 10 days of receipt of the State Mine Inspector's report, the Mining Board shall approve or disapprove the operator's request. Within 10 days of such action, the Mining Board shall notify the operator of its decision. A denial of the operator's request shall be accompanied by a statement of reasons for the denial.
- 2) All diesel equipment operated in by the last open crosscut and in return air courses shall be permissible and shall be maintained and operated in a permissible condition as defined by 30 CFR 31 and 36 (1983). "Permissible", as used herein, shall mean diesel equipment which will not cause an underground ignition if an explosive mixture of gas is present and this piece of diesel equipment is operated in the presence of this explosive mixture of gas.
- 3) The quantity of ventilating air maintained in the last open





crosscut where multiple diesel units are operating in a working section shall be at least 100 percent of the air quantity specified on the approval plate of the first diesel unit (the unit requiring the highest air quantity on its approval plate), plus 75 percent of the approved plate air quantity of the second diesel unit (next highest air quantity), plus 50 percent of the approval plate air quantity of each additional diesel unit operating in that split of air.

- 4) Air quality in which diesel equipment is operated shall be sampled to determine if the composition of the air is within safe limits with respect to CO, NO, and NO<sub>2</sub>. These safe limits are currently defined as being equal to or less than the following values:

	TLV-TWA
Carbon Monoxide (CO)	50 ppm
Nitrogen Dioxide (NO <sub>2</sub> )	3 ppm
Nitric Oxide (NO)	35 ppm

(Reference: 30 CFR 75.301-2 MSHA and Threshold Limit Values for Chemical Substances in Work Air adopted by American Conference of Government and Industrial Hygienists, 1982)

- 5) Air quality measures for face equipment shall be taken in the operator compartment of the diesel equipment at a point where the air current exists the last open crosscut. Measurements must comply with Section (4) above.
- 6) Air quality measurements shall also be taken in the immediate return from each working section, while all units of diesel equipment being employed in that Section during the shift are operating. Measurements must comply with Section (4) above.
- 7) The measurements required in Sections (5) and (6) shall be made no less than twice a shift in mines and working sections employing diesel engines for the first time. After 500 hours of operating time has been accumulated in compliance with Sections (5), (6) and (7), the measurement frequency shall be reduced to once a week for the air quality measurements in the operator's compartment (Section (5)) and once per shift for air quality measurements in the immediate returns (Section (6)).
- 8)
- A) Air quality measurement shall be taken by one of the following recognized methods:
- i) gas concentration indicator tubes;
  - ii) vacuum bottle sample and subsequent analysis; or
  - iii) direct readout instruments which the Mine Safety and Health Administration has certified under 30 CFR

75.303-1, 75.303-2 (1985).

- B) These testers shall be provided and maintained by the mine operators.
- 9) All tests shall be made by a competent person and the results of these tests shall be permanently recorded and kept in a place at the mine accessible to federal or state mine inspectors or officials, mine employees, or mine employee's representatives. These records shall be made available for inspection during the hours the mine's offices are open to the public. "Competent person" as used herein and in Section (14) below, shall mean a person trained by an instructor certified by MSHA under 30 CFR 48.3(h) (1985) or the Department to provide such training.
- 10) Air quality for outby diesel equipment shall meet the standards provided in 30 CFR 32 (1983) as that section pertains to mobile powered diesel equipment.
- 11) Diesel fuel storage and handling in a working section shall comply with the following:
- A) Only one diesel fuel center will be allowed to be in permanent residence.
  - B) The diesel fuel center may be stored in combination with and/or in the same area as hydraulic oil, lubricating oil greases.
  - C) At least two approved ABC fire extinguishers will be available at the storage area.
  - D) The storage area shall be vented directly to the returns.
  - E) Storage shall be limited to a typical 24-hour supply for a given working section or not to exceed 500 gallons.
- 12) Diesel fuel storage for the mine shall comply with the following:
- A) The underground storage area shall be vented directly to the returns.
  - B) At least two 150 lb. approved ABC type fire extinguishers and no less than 200 lbs. of rock dust shall be available at the underground mine storage area.
  - C) Storage underground shall be limited to a typical 24-hour supply for all normally operating diesel units in the mine.

- 13) All diesel engines, in particular, their intake and exhaust systems, shall be maintained in accordance with the manufacturers specifications and instructions and in accordance with 30 CFR 31.4-31.5 (1985). Maintenance manuals shall be made available by the operator to the inspectors when requested.
- 14) Maintenance and inspection of diesel equipment will be conducted only by competent persons authorized by the mine operator (not to include State Mine Inspectors).
- 15) An approved ABC type fire extinguisher shall be carried at all times on each unit of diesel powered equipment.
- 16) No gasoline powered device will be allowed in an underground coal mine.

(Source: Amended at 10 Ill. Reg. 8104, effective June 15, 1986)





# DIESEL GUIDELINES

January 19, 1996

To: State Mine Inspectors

Please be advised of the following information concerning Diesel Equipment Testing:

\* THIS WILL SUPERSEDE ANY PAST GUIDELINES FOR DIESEL TESTING

GUIDE FOR AIR QUALITY TESTING  
Ref. 62 Illinois Administrative Code 220.230 (g)

\* Face Equipment (Equipment used in/inby last open crosscut)

1. Test operator's compartment where air exits last open crosscut.
2. TLV-TWAS: CO - 50 ppm      NO<sub>2</sub> - 3 ppm      NO - 35 ppm

\* Frequency of test shall be twice per shift until a cumulative total of 500 hours diesel operation has been achieved at a mine.

\* After 500 hours of diesel operation has been achieved at the mine, the operators compartment test is to be done one time per week.

\* Immediate Return - Working Section

1. Test immediate return for CO, NO<sub>2</sub>; NO
2. TLV-TWAS: CO - 50 ppm      NO<sub>2</sub> - 3 ppm      NO - 35 ppm

\* Frequency of test shall be twice per shift until a cumulative total of 500 hours diesel operation has been achieved at a mine.

\* After 500 hours of diesel operation has been achieved at the mine, the air quality measurements in the operators compartment is reduced to once a week, and once per shift for air quality measurements in the immediate returns.

The State Mine Inspector should review all test results recorded by the operator for compliance with this rule.

New Equipment

1. Equipment shall be tested on the surface after normal operating temperature has been achieved.

2. The operator's compartment shall be tested for CO, NO<sub>2</sub>, and NO.

TLV-TWAS: CO - 50 ppm      NO<sub>2</sub> - 3 ppm      NO - 35 ppm

3. The exhaust gas discharge shall be tested at a point 6 feet downwind of the exhaust discharge point.

CO - 50 ppm      NO<sub>2</sub> - 3 ppm      NO - 35 ppm

4. The vehicle shall be retested on the mine bottom in accordance with items 2 and 3, after normal operating temperature has been achieved. Test should be made in normal ventilated areas where machine would be used.

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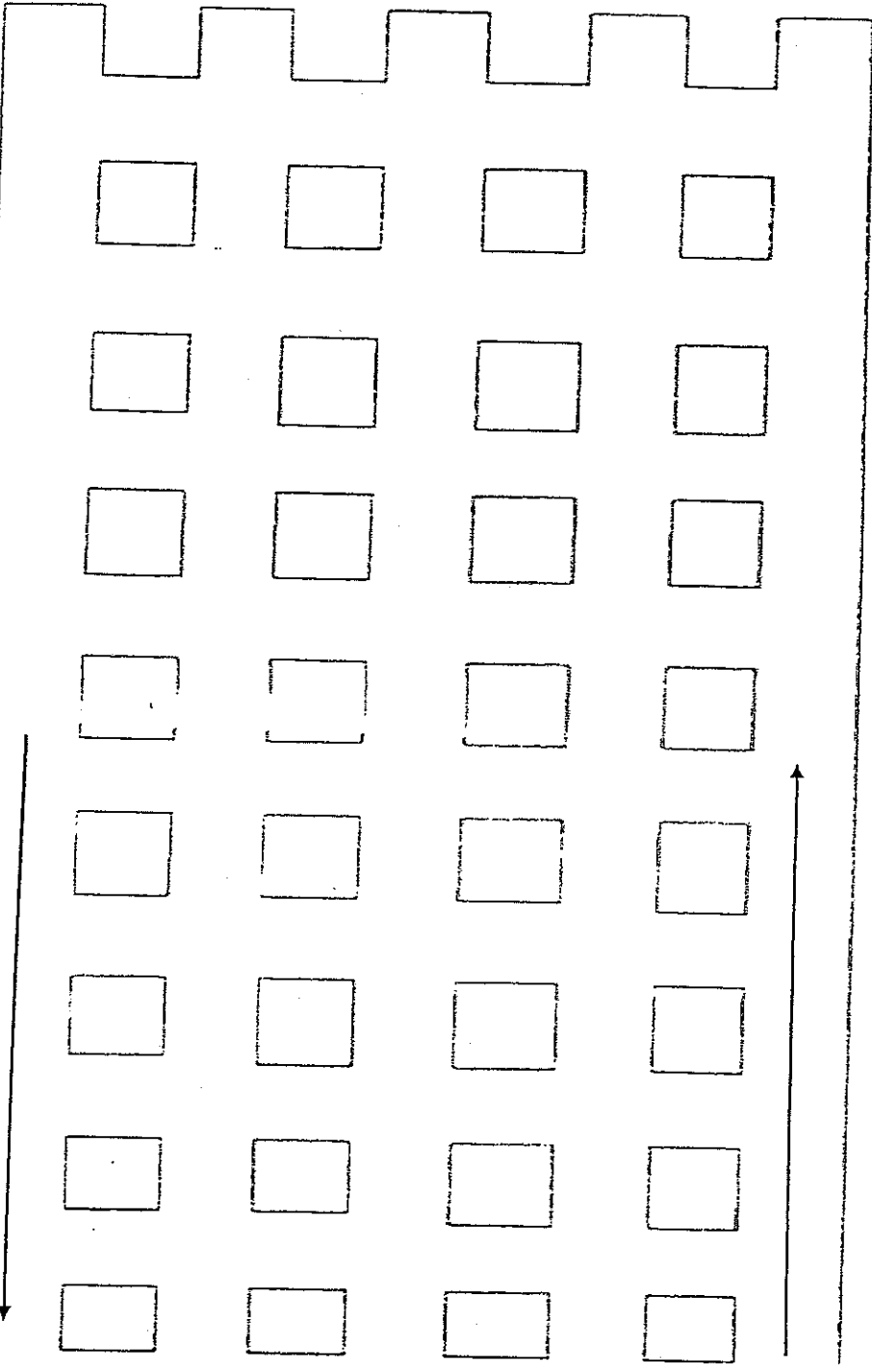
Director

## Outby Equipment

- \* Frequency of testing for outby equipment shall be twice per shift until a cumulative total of 500 hours diesel operation has been achieved at the mine.
- \* After 500 hours of diesel operation has been achieved at the mine, the test on outby equipment shall be reduced to one test per week.
  1. Test CO, NO<sub>2</sub>, NO. Test shall be taken in one of the following locations at the inspectors discretion:
    - a) At each intake split where outby diesel equipment is operated.
    - b) Operator's compartment
    - c) Large diesel equipment operating in areas where the quantity of air does not meet the approval plate requirements shall have the working area tested daily. (Each Shift)  
Non permissible equipment or equipment with no approval plate shall be tested weekly.
- \* Frequency of test shall be twice per shift until a cumulative total of 500 hours diesel operation has been achieved at a mine.
  2. TLV-TWAS: CO - 50 ppm      NO<sub>2</sub> - 3 ppm      NO - 35 ppm

The State Mine Inspector should review all tests results recorded by the operator for compliance with this rule.





**MAP LEGEND**

	RETURN AIR		OVERCAST
	RETURN AIR		SIDE DOOR
	EMERGENCY		REGULATOR
	REGULATOR		BELT AIRLOCK
	CHECK CONTROL		TRACK
	LIFE CONTROL		BELT & TAIL
	TEMPORARY STOPPING		CASES (SOL)
	PERMANENT STOPPING		MAIN STREET
	SEAL		SECONDARY AIRLINE (UNREPORTED)
	MAIN DOOR		

Return

Intake



## Maps

Separate return, intake, and neutral air currents ( entries) with appropriate ventilation controls

Install overcast at all points where different types of air currents intersect (eg... return air intersecting intake air)

Install man doors as required, and locate them at consistent distances throughout your map.

Always have an equal number or more returns than intakes. **More returns are better.**

At least two regulators are install in each unit. One to regulate the amount of air entering the unit, and one to vent the neutrals to the return. ( **the regulator to vent the neutrals can be a hole knocked in a stopping on the return side**)

At each face or stub entry more than 15' deep install a wing or line curtain.

Indicate with arrows the direction of air flow. Blue for intake  
Red for return  
Yellow for neutral



Install stoppings to direct air currents, and two keep the air currents separate. Permanent stoppings are built in mains and submains. Temporary stoppings are for short term ventilation.

Isolate area between belt tail and last open cross cut with appropriate number of isolation curtains or check curtains.




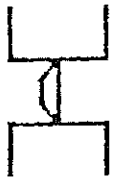
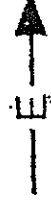
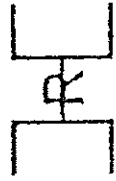
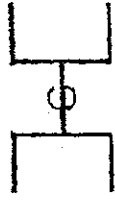
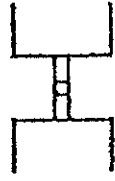


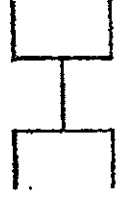
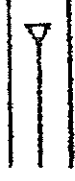

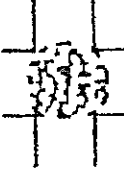
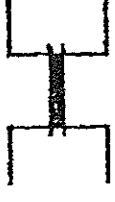

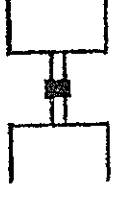

Generally put seals on the return side.

Worked out areas ( but not sealed ) ventilate completely and indicate with arrows direction of air flow





# LEGEND

	INTAKE AIR		OVERCAST
	RETURN AIR		MINE DOOR
	ESCAPEWAY		REGULATOR
	CHECK CURTAIN		BELT AIRLOCK
	LINE CURTAIN		TRACK (TRAVELWAY)
	TEMPORARY STOPPING		BELT & TAIL
	PERMANENT STOPPING		CAVED (GOB)
	SEAL		MINE SHAFT
	MAN DOOR		SECONDARY MINING (UNSUPPORTED)



## NOTES



# WEEK 2









## ARTICLE 24

### TRUE/FALSE

- \_\_\_\_\_ 1. In mines where conditions will not allow coal dust propagation, rock dusting to within 40 feet of faces is not required.
- \_\_\_\_\_ 2. In mines that are partially rock dusted, back entries do not have to be dusted either.
- \_\_\_\_\_ 3. When methane is found in mines requiring rock dusting, the incombustible content of the mixture must be raised by increasing the incombustible content 1% for each 1% of methane detected.

### MULTIPLE CHOICE

- \_\_\_\_\_ 4. The law requires that coal dust must be allayed at:  
a. all dump points  
b. any point coal is transferred  
c. its source
- \_\_\_\_\_ 5. The minimum level of incombustible content of coal/rock dust is:  
a. 85%  
b. 60%  
c. 65%
- \_\_\_\_\_ 6. The minimum level of incombustible content of coal/rock dust would be \_\_\_\_\_% if 1.8% of methane were also present.  
a. 68%  
b. 72%  
c. 83%  
d. none of the above
- \_\_\_\_\_ 7. 70% of all rock dust must pass through a:  
a. 70 mesh sieve  
b. 20 mesh sieve  
c. 200 mesh sieve  
d. 500 mesh sieve
- \_\_\_\_\_ 8. All rock dust must pass through a:  
a. 70 mesh sieve  
b. 20 mesh sieve  
c. 200 mesh sieve  
d. 500 mesh sieve

## VENTILATION (ARTICLE 31)

### TRUE/FALSE

- \_\_\_\_\_ 1. The ventilating current to the underground workings must not contain less than 20% oxygen, 5% CO<sub>2</sub>, and no harmful or noxious gases.
- \_\_\_\_\_ 2. In a gassy mine, there must be at least 150 cfm per person employed.
- \_\_\_\_\_ 3. The main fan must be inspected each shift.
- \_\_\_\_\_ 4. Mines with multiple fan installations must have fans installed with automatic closing doors.
- \_\_\_\_\_ 5. Fan houses must contain a pressure recording gauge.

### MULTIPLE CHOICE

- \_\_\_\_\_ 6. The main fan must be offset at least \_\_\_\_\_ feet from the shaft.
  - a. 25
  - b. 10
  - c. 15
  - d. 100
- \_\_\_\_\_ 7. A mine is classified gassy when a State Mine Inspector finds:
  - a. any amount of methane
  - b. 1% of methane
  - c. .25% of methane
  - d. any of the above
- \_\_\_\_\_ 8. The minimum amount of air reaching the last open crosscut is required to be at least:
  - a. 9000 fpm
  - b. 6000 fpm
  - c. both of the above
  - d. none of the above
- \_\_\_\_\_ 9. Normal atmospheric air contains:
  - a. 22% oxygen, 80% nitrogen, and .2% CO<sub>2</sub>
  - b. 21% oxygen, 78% nitrogen, and .3% CO<sub>2</sub>
  - c. 20.93% oxygen, 78.60% nitrogen, and .03% CO<sub>2</sub>
  - d. 20.93% oxygen, 78% nitrogen, and .03% CO<sub>2</sub>
- \_\_\_\_\_ 10. The purpose in having either larger or more return entries than intake entries is:
  - a. to allow more means of escape
  - b. to maintain high pressure in the returns and lower pressure in the intakes
  - c. to maintain lower pressure in the returns and high pressure in the intakes
  - d. none of the above
- \_\_\_\_\_ 11. When the atmospheric pressure increases, methane will:
  - a. likely increase
  - b. likely decrease
  - c. most likely stay the same

# Certification Exam

## Article 31

1. All active underground workings in a mine shall be ventilated by a current of air containing \_\_\_\_\_.
2. The volume and the velocity of the air current shall:
  - a. be sufficient to sweep smoke out of the mine
  - b. be sufficient to keep the coal dust accumulation to a minimum.
  - c. be sufficient to keep the mine cool
  - d. be sufficient to dilute so as to render and carry away flammable or harmful gasses.
3. The velocity of air reaching the last open crosscut shall not be less than
  - a. 9,000 cfm
  - b. 3,000 cfm
  - c. 9,000 fpm
  - d. none of the above
4. The minimum quantity of air in a mine is:
  - a. 200 cfm per person
  - b. 150 cfm per person
  - c. 9,000 cfm per person
  - d. enough to breath
5. What is the minimum quantity of air at your mine?
  - a. 200 cfm per person
  - b. 150 cfm per person
  - c. 9,000 cfm per person
  - d. enough to breath
6. Who determines if a mine is classified as a gassy mine? \_\_\_\_\_
7. Adjustments shall be made in the ventilation if the air contains more than
  - a. .5% methane
  - b. 1.5% methane
  - c. 1% methane
  - d. 2% methane
8. Excluding virgin coal, employees shall be withdrawn from active workings when the methane content reaches:
  - a. 1%
  - b. 2%
  - c. 2.5%
  - d. 1.5%

9. In virgin coal, employees will be withdrawn from active workings when the methane content reaches:
- 1%
  - 2%
  - 2.5%
  - 1.5%
10. The main current of air will be divided and subdivided as to give a separate split of air for every \_\_\_\_\_
11. List ventilation control devices:
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
12. T F All possible care and diligence shall be exercised in the examination of working places.
13. T F Any mine where the State Mine Inspector finds .52% or more of methane in an open workings of the mine shall classify the mine as gassy.
14. T F All doors used to direct air currents shall close automatically.
15. T F Ventilating fans may be shut down on non-coal producing shifts.
16. T F A \_\_\_\_\_ shall be attached to the ventilating fan at all times.
17. T F All ventilating fans shall be of fireproof construction and located on the surface.
18. T F All ventilating fans shall be equipped with an alarm system, and may be on the same power source as the mine.
19. T F The mine must be re-examined if the fan has been off a reasonable amount of time.
20. T F The ventilating fan shall be inspected each shift.
21. Permanent overcasts shall be constructed of
- masonry
  - concrete
  - concrete blocks
  - incombustible materials
22. T F Flame resistant brattice cloth shall be used in the construction of line brattices

23. T F Entrances to abandoned workings need not be posted.
24. T F In gassy mines. all abandoned workings shall be sealed.
25. T F No person shall obstruct, or cause any obstruction to, the air current without the permission of the mine manager



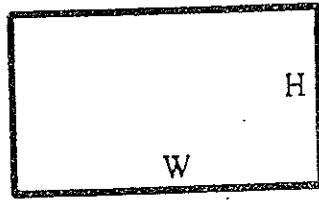
# FORMULA TERMS

- **a** = sectional area of airway, in square feet (ft.<sup>2</sup>)
- **l** = length of airway, in feet (ft.)
- **o** = perimeter of airway, in feet (ft.)
- **s** = rubbing surface, in square feet (ft<sup>2</sup>)
- **v** = velocity of air current, in feet per minute (fpm)
- **q** = quantity of air, in cubic feet per minute (cfm)
- **P** = total ventilating pressure, in pounds (lbs.)
- **p** = unit ventilating pressure, in pounds per square feet (lb./ft.<sup>2</sup>)
- **i** = inches of water gauge; also given as w.g.
- **k** = coefficient of friction

# COAL MINE VENTILATION EQUATIONS FOR FINDING AREA(S)

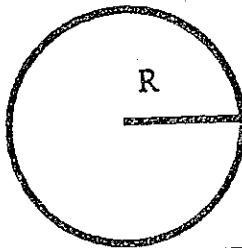
FOR A RECTANGULAR ENTRY

$$A = W \times H$$



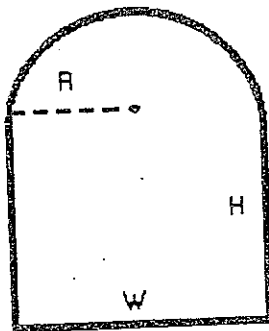
FOR A CIRCULAR ENTRY OR SHAFT

$$A = \pi \times R^2$$



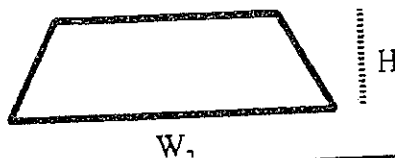
FOR AN ARCHED ENTRY

$$A = \frac{\pi \times R^2}{2} + W \times H$$



FOR A TRAPEZOID ENTRY

$$A = \frac{W_1 + W_2}{2} \times H$$



FOR FINDING QUANTITIES

$$Q = A \times V$$



Area

A = Area

$\pi = 3.1416$

r = radius

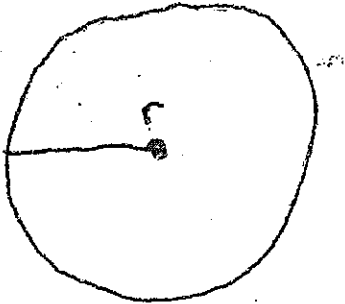
H = height

(half-circle)

W = Width

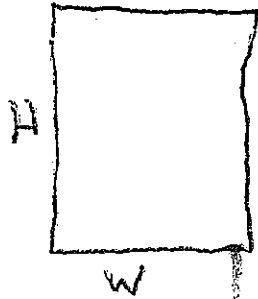
Circle

$$A = \pi r^2$$



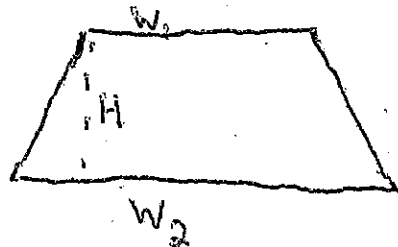
Square

$$A = HW$$



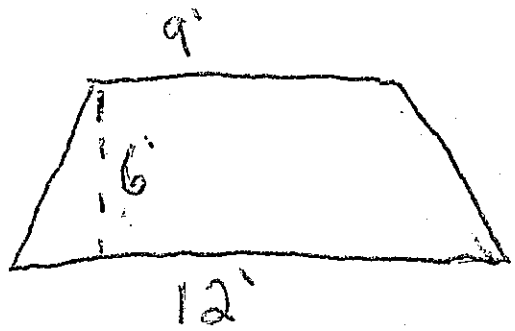
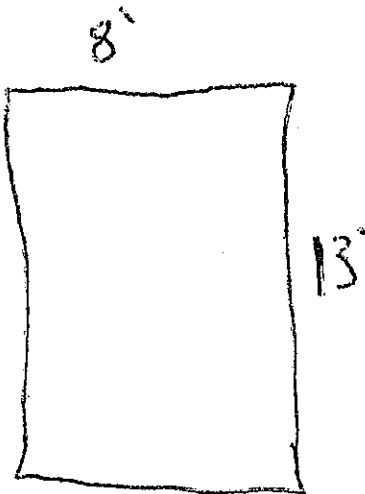
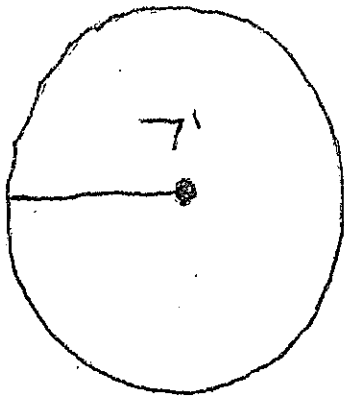
Trapezoid

$$A = \frac{W_1 + W_2}{2} \times H$$

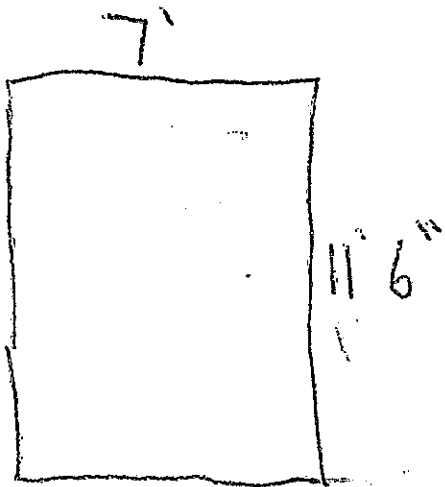


2.

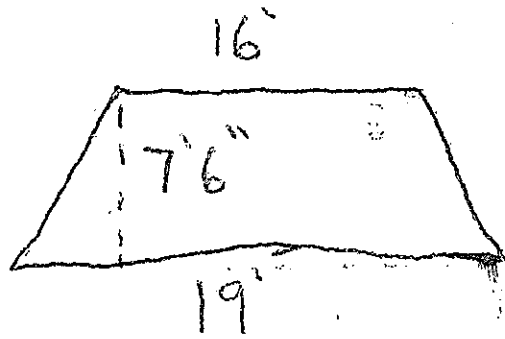
3.



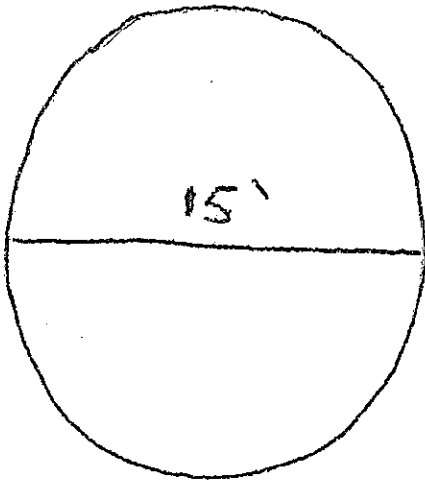
4.



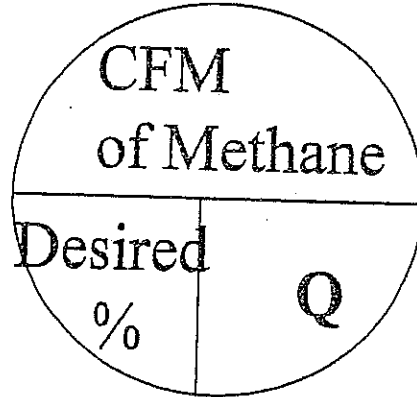
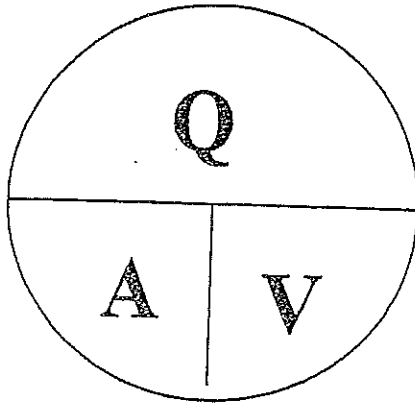
5.



6.



# Coal Mine Ventilating Formulas



Area formulas = Area Always in Square Feet (sq ft)

A = Width x Height

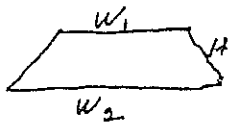


Formula for square or Rectangle

$$A = WH$$

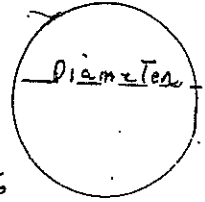


$$= \frac{(W_1 + W_2)(H)}{2}$$



Formula for TRAPAZOID

$$= \pi R^2$$



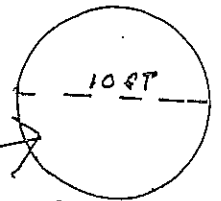
Formula for circle

$$\pi = \text{pi} = 3.1416$$

R = Radius = 1/2 Diameter

R<sup>2</sup> = Radius squared = Radius X itself

Example:



10 FT = Diameter

5 FT = Radius

$$5 \times 5 = R^2$$

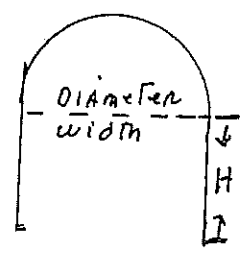
$$25 = R^2$$

Area for circle

$$A = 3.1416 \times 25$$

$$A = 78.54 \text{ sq ft}$$

$$A = \frac{\pi R^2}{2} + WH$$



Formula for Arched Airway

Figure AREA of circle  
Divid by 2. This gives you  
1/2 the circle (The Arch of the  
AIRWAY.

multiply width x Height (WH)  
This gives you the AREA of  
the square or Rectangle of the  
part of the airway.

Ventilation formulas - always in cubic feet per minute (CFM)

$$Q = AV \quad \text{OR} \quad \begin{array}{c} \text{Q} \\ \hline \text{A} \quad \text{V} \end{array}$$

Q = QUANTITY recorded in CFM - cubic feet

A = AREA recorded in sq ft - square feet

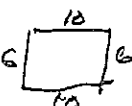
V = Velocity recorded in fpm - feet per minute

Velocity is the anemometer reading

Find the appropriate number put it in place of a letter & solve

---

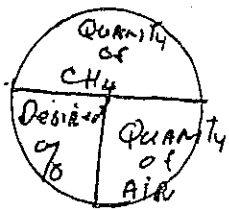
Perimeter + Rubbing Surface - linear feet

Perimeter = the sum of all the sides Example:   
perimeter =  $6 + 6 + 10 + 10 = 32$

Rubbing Surface = Perimeter  $\times$  length of the entry

---

Ventilation of Methane (CH<sub>4</sub>)



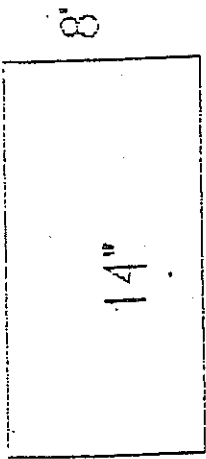
Quantity of CH<sub>4</sub> = Spotter Reading  $\times$  Quantity of Air

Always remember to use % sign on calculator or change % to decimal

Plug in number in correct spots & solve



1. What is the area of this rectangular way?

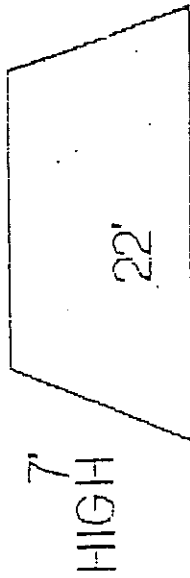


Formula for area -  $A = W \times H$

$$A = 14' \times 8'$$

$$A = 112 \text{ sq. ft.}$$

2



What is the area of this trapezoid entry?

Formula for area :  $\frac{\text{top width} + \text{bottom width}}{2}$  divide answer by 2

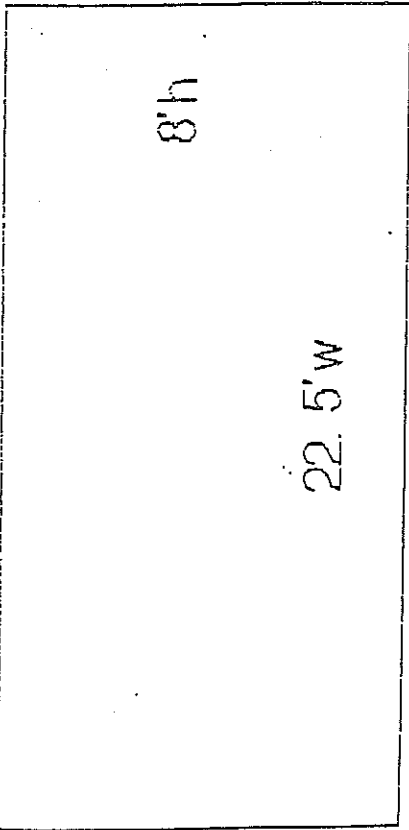
This gives an average width

now multiply the average width times the height.

Step 1. -  $18' + 22' = 40'$

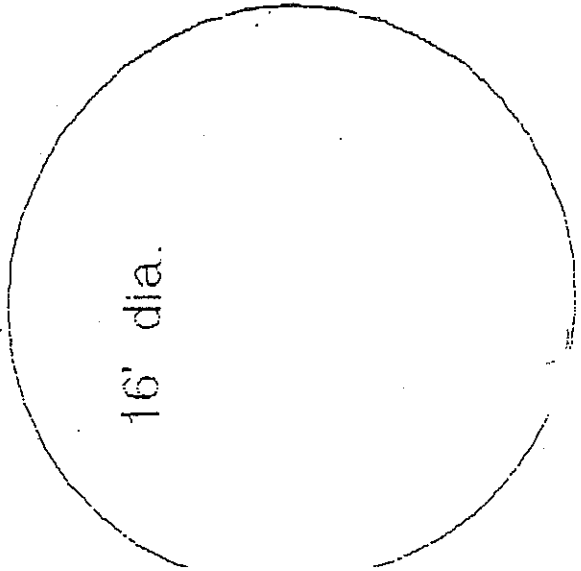
Step 2. -  $40'$  divided by 2 =  $20'$

Step 3.  $20' \times 7' = 140 \text{ sq. ft.}$



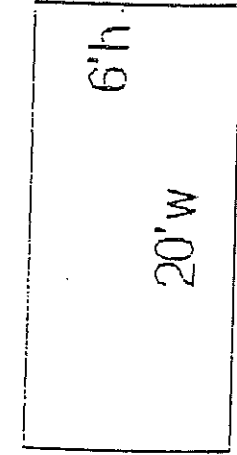
velocity is 135 fpm.  
spotter reads 1.4% Ch4.  
How much air is needed  
to reduce the Ch4 to .5%?

what is the Area of this cir. shaft?  
The velocity is 260 fpm.  
What is the Quantity of air?



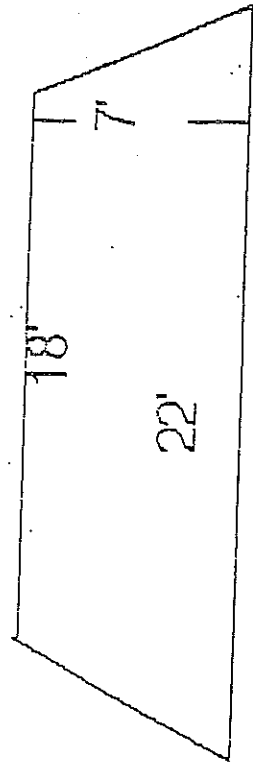
Your spotter shows .8% of Ch4.  
How much Ch4 passes this opening in 24 hrs?





What is Area of this rectangular airway?  
The annemometer reads 165 fpm.  
What is the total Quantity of air?

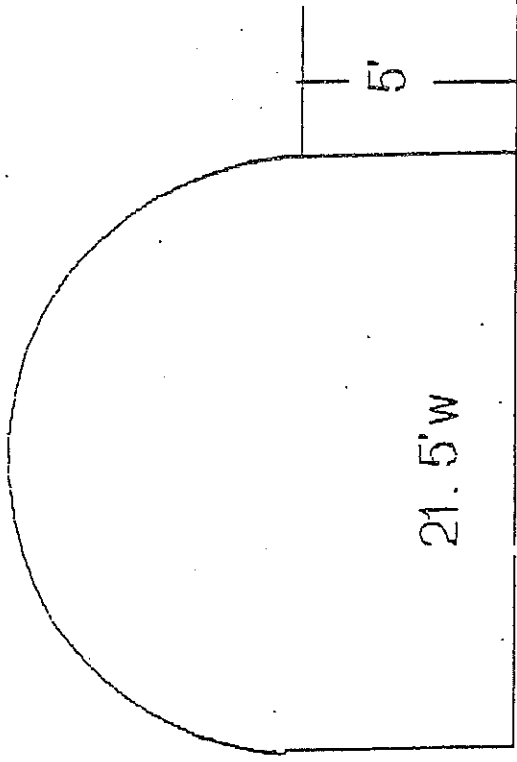
The methane measured in the entry is at .6%.  
What is the cfm of Ch4 in the entry?



What is the area of this entry?  
The velocity is 90 fpm.  
What is the quantity of air?

The methane content measures .6%.  
What is the cfm of Ch4 in the entry?

What is the area?  
Velocity is 140 fpm.  
What is total Quantity?



Spotter reads 1.6% of Ch<sub>4</sub>.

How much Ch<sub>4</sub> is liberated in a 24 hr period?

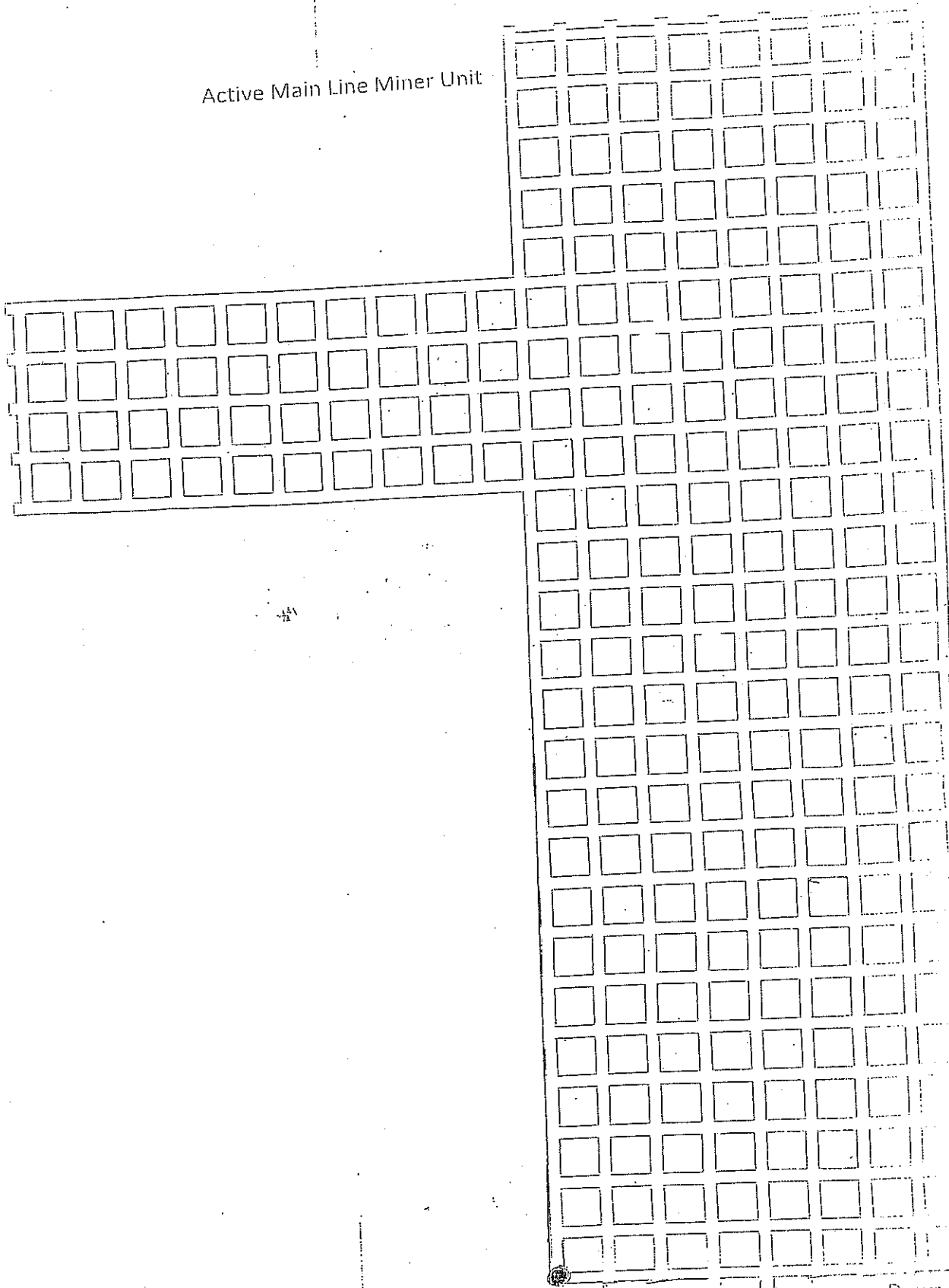
How much air must be added to reduce Ch<sub>4</sub> to .8%?

**BONUS QUESTION**

**NOW HOW MUCH CH<sub>4</sub> IS LIBERATED IN 24 HR. PERIOD?**

Active Main Line Miner Unit

Active Miner Unit



Upcast

Slope

Down



## NOTES



# WEEK 3





# Instruments—Thermometers, Hygrometers, Barometer, Water Gauge; Velocity—Anemometer Velometer

## Instruments

So far we have discussed the different characteristics of mine air; temperature, humidity, pressure, velocity, and the various gases that can be found. Now we turn to the instruments that measure these characteristics.

Some of these instruments are very simple to operate, some can be very complicated. It is important for the mine examiner to be able to use all of them, for it is with them that he can determine the safety of the mine. A mistake may endanger the safety of the men working underground—proper and accurate measurements are essential.

## Temperature

Almost everybody is familiar with the thermometer, used to measure temperature. It consists of a bulb, usually filled with liquid mercury, connected to a hollow tube. Liquid mercury expands as it heats and contracts as it cools. As the temperature increases, the mercury expands and flows up the hollow tube; as the temperature decreases, the mercury contracts and will flow down the tube into the bulb.

The amount of mercury in the tube is thus a measurement of the temperature. There is a scale alongside the tube to give a reading in degrees.

## Humidity

Humidity, the amount of moisture in the air, is measured by one of several types of hygrometers. Hygrometer comes from Latin: *hygro-* means water, and *meter* means measure.

One often found hygrometer uses two thermometers, one whose bulb is kept dry and another whose bulb is kept wet by a water-soaked cloth. As the water evaporates, it cools the "wet-bulb" thermometer; the more water that evaporates, the cooler will be the "wet-bulb."

## Pressure

Atmospheric pressure is measured by a barometer—usually an aneroid barometer. (There is also another type, a mercurial barometer). Changing atmospheric pressure causes one side of the instrument to move. This movement is shown as a change on the front dial which is marked off in equivalent inches of mercury (to give the same

mercury is equal to 49 pounds of pressure per square inch.

When we descend into a mine, there is a greater weight of air pushing down—the atmospheric pressure increases, and so does the reading on the barometer. The reverse happens when we ascend—the atmospheric pressure decreases, and so does the reading on the barometer.

A falling barometer means decreasing air pressure, which permits air to expand. This may permit gases in large abandoned areas to expand into active workings.

Ventilating pressure is measured by a water gauge, which is a glass U-shaped tube, partially filled with water, open at both ends. The water gauge actually measures differences in air pressure; it measures ventilating pressure when one end is held towards the fan and the other away from the fan. Each inch difference in the height of water in the two columns is equal to 5.2 pounds per square foot of pressure.

Water gauges may also be placed with the air intake end through adjustable openings in doors and stoppings to determine the pressure of the doors and stoppings.

The absolute pressure on air in the mine is the sum of atmospheric pressure plus ventilating pressure.

## Velocity

The velocity of the air current is measured by an anemometer. There are two commonly found types of anemometers—the "standard" rotating vane anemometer, and the velometer.

The standard anemometer resembles a small disc fan—a metal ring surrounding a set of rotating blades. The air current striking the blades causes them to rotate—the anemometer is geared so that one full rotation is equivalent to one foot of air travel. Holding the anemometer in the air current for sixty seconds will give you the velocity in feet per minute; for 120 seconds the velocity in feet per two minutes (divide by 2 to get the velocity in feet per minute), etc.

To operate, hold the anemometer away from your body so that the full current will enter it, with the back of the instrument towards the source of air (usually the fan). Use the reset lever so that all dials will be at zero, and release the brake to allow the blades to rotate freely. Expose the anemometer to the air for one full minute, timed with a stopwatch, moving about to obtain an average reading for the sectional area being measured. At the end of the minute apply the brake, and read the velocity from the dials.

Care must be taken in timing the exposure of the anemometer to the air current. If the reading was

ond off gives a reading error of 1/60 or 1.6%. If the velocity is fairly high, the error can be significant.

If the velocity is 500 feet per second, and the reading is accidentally taken for 63 (instead of 60 seconds), the reading will be in error by 5%, or 25 feet per second.

A second type of anemometer is known as a velometer. It is about the size of a pack of cigarettes, and gives direct velocity readings—no timing is necessary.

1. Select the "hi" or "lo" range by rotating the selector on the side of the velometer.

2. Hold the air inlet pointing towards the source of the current. Make sure you are not blocking either the air inlet or outlet.

3. Read the velocity from the appropriate scale.

1. What instruments are used to measure the following air characteristics?

Temperature, Pressure - Atmospheric, Humidity, Velocity, Pressure - Ventilating.

A. Thermometer; hygrometer; water gauge; barometer; anemometer (and velometer)

2. How do you read the above instruments?

A. Thermometer; barometer; hygrometer; anemometer; water gauge (and velometer)

Hygrometer—take the wet bulb and dry bulb readings; get the humidity from a table.

Water gauge—read the difference in height of the water columns; each inch difference means 5.2 pounds per square foot of pressure.

Barometer—read the pressure (in inches of mercury) from where the pointer rests on the scale in front.

Anemometer—read the dial in front after taking your measurements.

Velometer—see where the pointer rests, and read the velocity from the scale—using the proper range.

## MINE INSTRUMENTS

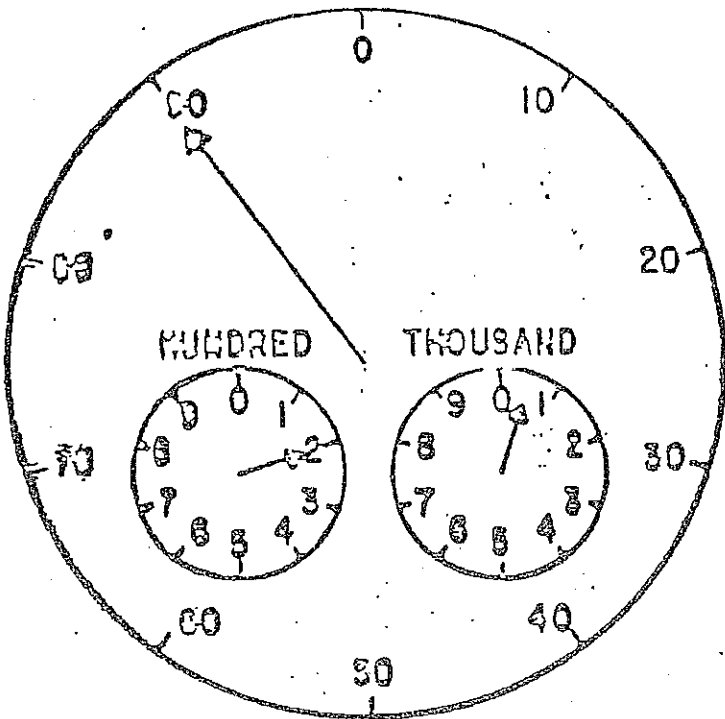
### WATER GAUGE

1. A water gauge is measured in
  - a. water per square inch
  - b. in inches of water
  - c. In atmospheres
  - d. in specific gravity
2. 1 inch of water gauge is equal to
  - a. 14.7 psi
  - b. 5.2 lbs. per sq. foot
  - c. 5 psi
  - d. 5.2 psi
3. A high water gauge will normally indicate
  - a. Abnormal resistance
  - b. A decrease in resistance
  - c. Failure of the fan
  - d. Both a and c
4. A water gauge indicates the
  - a. Atmospheric pressure
  - b. The atmospheric pressure in contrast to the temperature
  - c. The mine ventilating pressure
  - d. All of the above

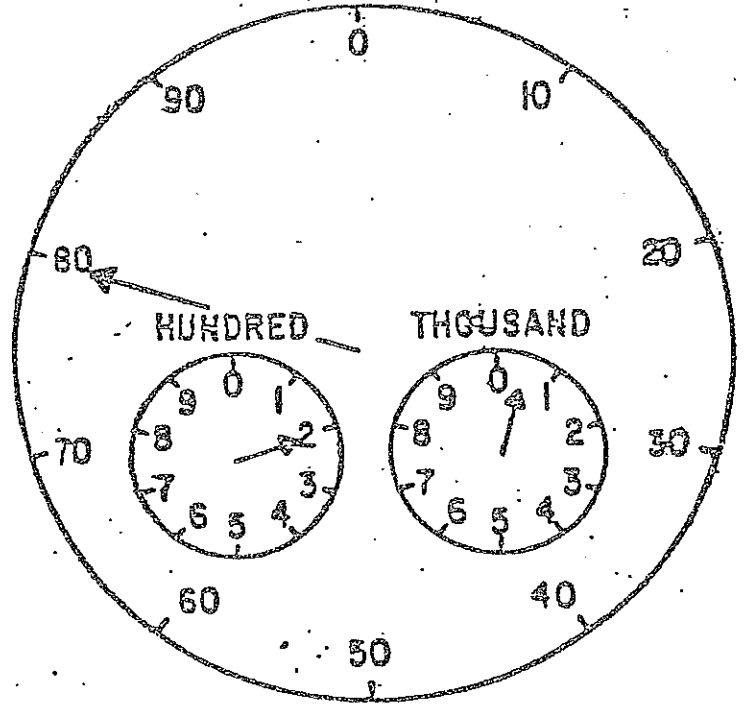
### ANNEMOMETER

1. The purpose of the brake on the annemometer is to
  - a. Stop the vane movement
  - b. Stop the dial movement
  - c. Both of the above
2. An annemometer measures air in
  - a. Feet per minute
  - b. In lineal feet
  - c. Feet per sec.
3. Air readings are generally taken for
  - a. 1 min.
  - b. 2 min.
  - c. 30 sec. X 2
  - d. 2 min divided by 2
4. The air current must pass through the
  - a. Back of the instrument
  - b. The front of the instrument
  - c. Front or back will both read correctly

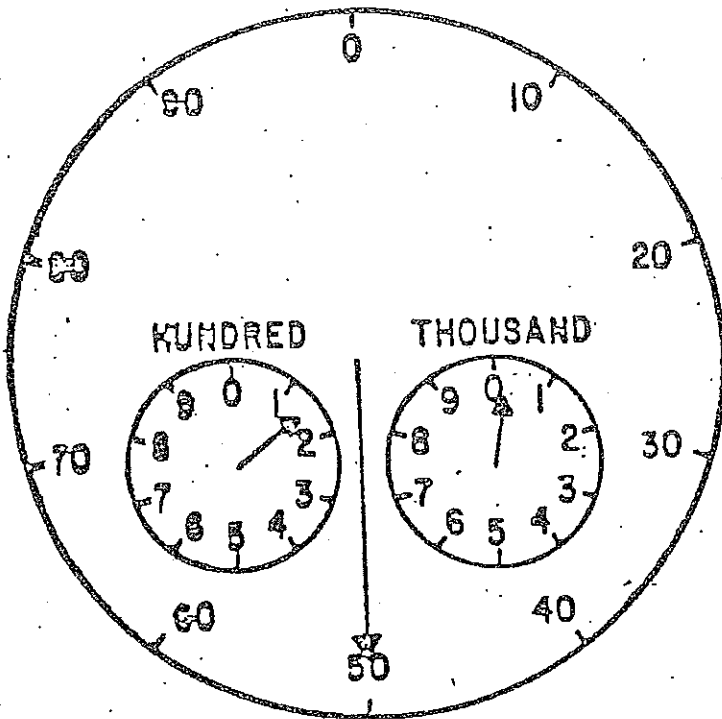
FIGURE B-2 ANEMOMETER READINGS



READING = 180  $\frac{\text{FEET}}{\text{MINUTE}}$



READING = 180  $\frac{\text{FEET}}{\text{MINUTE}}$



READING = 150  $\frac{\text{FEET}}{\text{MINUTE}}$

# Fan

- 1) on the surface
- 2) offset 15'
- 3) explosion doors
- 4) pressure gauge
- 5) separate power
- 6) incombustible housing
- 7) run continuously
- 8) audio / visual alarms
- 9) should be reversible
- 10) inspected daily



EXPLOSIVES (art. 20)

1. Why has adobe or mud capping been made unlawful?
  - a. The explosion would not be effective
  - b. The unconfined explosion would raise dust which might become ignited
  - c. Gas might become ignited
  - d. The unconfined explosion might damage timbers and cause a fall of roof
  
2. What is considered a dangerous percentage of methane when permissible explosives are to be fired?
  - a. .75 %
  - b. 1.00%
  - c. 1.50 %
  - d. .50%
  
3. What kind of explosive should be used in a dry and dusty mine?
  - a. Black powder, not in excess of one and one-half pounds
  - b. Pellet powder, not in excess of one and one-half pounds
  - c. Permissible explosives or other permissible blasting methods
  - d. Low strength dynamite, not in excess of one pound
  
4. What should be done before shots are fired in places adjacent to where men are working?
  - a. Test for gas should be made
  - b. Ample warning should be given and all persons should be in the clear
  - c. The foreman should be notified
  - d. The shot fireman should make certain that the cable is attached to the leg wire.
  
5. What is the danger of improper stemming?
  - a. The danger of premature explosion
  - b. The danger of a blown-out shot
  - c. The danger of a misfire
  - d. The danger of a fall of roof
  
6. What should be the minimum length of a shot firing cable?
  - a. 200 feet
  - b. 150 feet
  - c. Long enough for the shot fireman to be in a safe place around the corner
  - d. 80 feet
  
7. For what purpose are permissible explosives designed?
  - a. For positive action where the ventilation is poor
  - b. For safe use in gassy or dusty mines
  - c. To secure the maximum amount of lump coal
  - d. To provide for the shooting of the coal without disturbing the roof
  
8. Does the Office of Mines & Minerals have any legal authority over who is employed as a shot firer?
  - a. No, the superintendent is responsible
  - b. Only when the mine is classified as gaseous
  - c. Yes
  - d. No

9. How long should a person remain away from the face when a misfire has occurred when blasting with detonators?
- At least 60 minutes
  - At least 5 minutes
  - Until the place has been inspected for gas
  - At least 8 hours
10. How should explosives be carried into a mine?
- They should be carried in a separate car with the man-trip
  - All explosives should be carried into the mine by the shot firer
  - They should be carried separately from firing devices and enclosed in non-conducting boxes
  - They should be carried in explosion-proof receptacles by the tram motor crew
11. How should explosives be stored?
- In cool, moist, incombustible magazines
  - In warm, dry, insulated magazines
  - In cool, dry, and well ventilated magazines
  - In closely pack shipping cases on the section
12. What is a permissible explosive?
- One which does not liberate poisonous fumes
  - One which has passed certain tests conducted by the Bureau of Mines
  - One which will not fire in the presence of gas
  - One which is safe to use under any condition
13. What is considered a dangerous amount of methane when permissible explosives are to be fired?
- Any amount that can be detected with a methane test
  - One quarter of one percent is considered dangerous
  - Any amount within the 5 to 15 percent explosive range
  - There is no danger as permissible explosives are designed for gassy mines
  - None of the above
14. Upon shooting a place, how long should you wait until you examine the place, roof, ribs, and explosive gas?
- Three weeks
  - Ten (10) minutes
  - Not any
  - Long enough to let the smoke clear out
15. How many times should you yell "Fire in the hole" before touching off a shot?
- Two times
  - Three times
  - Six times
  - Not necessary to yell at all



CERTIFICATION EXAM  
ARTICLE 13

1. True False No person shall smoke, carry smoking materials, or carry lighters, matches, or any other spark or flame creating devices in gassy mines.
2. True False Every miner should be required to sound the roof of his working place only when he encounters loose roof or other dangerous conditions.
3. True False No person shall cross a danger signal without the permission of his section supervisor.
4. True False No person shall enter or leave a mine without recording the fact by some suitable check-in, check-out system.
5. True False No person shall enter or work in a mine or any such area or parts connected with a mine, while using drugs.
6. True False A person may be subject to dismissal or discharge for testifying in any hearing held under the Coal Mining Act.
7. True False The State Mine Inspector has the authority to enforce any mine roof control plan.
8. True False Bulletins, notices, or record books may be eliminated and/or destroyed after a period of six (6) months.
9. Working rules provided by a mine shall be complied with:
  - a. when it is convenient
  - b. it does not alter the day to day operations
  - c. always complied with
  - d. when a task is not made more difficult
10. Any mine roof control program or plan must be approved by:
  - a. the rank and file employer
  - b. the State Mine Inspector and the Mining Board
  - c. the State Examining Board
  - d. Mine Safety and Health Administration



## MISCELLANEOUS

### TRUE/FALSE

\_\_\_\_\_ 1. No coal shall be produced, nor shall any face equipment be operated, while there is an interruption in communication.

\_\_\_\_\_ 4. The two principles of roof bolting are the conventional and resin methods.

\_\_\_\_\_ 5. When timbering toward an area of poor roof conditions, the first row of timbers should be placed no closer to the bad top than within at least one row of bolts under good top.

\_\_\_\_\_ 6. Water and gas may be a contributing factor to poor roof conditions.

\_\_\_\_\_ 8. You are more likely to find gas in mines that are deep as opposed to those that are shallow.

\_\_\_\_\_ 10. The SCSR will last for a period of 2 hours.

\_\_\_\_\_ 11. The FSR will last for a period of 45 minutes.

\_\_\_\_\_ 13. Underground explosive magazines must be placed in the return, at least 10 feet from roadways or trolley wires.

\_\_\_\_\_ 14. No more than a four-day supply of explosives shall be stored underground.

\_\_\_\_\_ 15. A hygrometer measures the moisture content of the air.

- \_\_\_\_\_ 17. The SCSR will protect the wearer from any harmful or noxious gas.
- \_\_\_\_\_ 18. It is possible to have too much coal dust to have an explosion.
- \_\_\_\_\_ 19. The amount of coal dust sufficient to propagate an explosion is any amount that may become suspended in air.

## MISCELLANEOUS

### TRUE/FALSE

- \_\_\_\_\_ 1. No coal shall be produced nor shall any face equipment be operated while there is an interruption in communication.
- \_\_\_\_\_ 2. There must be at least 3 permissible lamps and 1 barometer at each mine.
- \_\_\_\_\_ 3. The two principles of roof bolting are the conventional and resin methods.
- \_\_\_\_\_ 4. When timbering toward an area of poor roof conditions, the first row of timbers should be placed no closer to the bad top than within at least one row of bolts under good top.
- \_\_\_\_\_ 5. Water and gas may be a contributing factor to poor roof conditions.
- \_\_\_\_\_ 6. You are more likely to find gas in mines that are deep as opposed to those that are shallow.
- \_\_\_\_\_ 7. The SCSR will last for about a period of 2 hours.
- \_\_\_\_\_ 8. The PSR will last for a period of 45 minutes.
- \_\_\_\_\_ 9. Underground explosive magazines must be placed in the return, at least 10 feet from roadways or trolley wires.
- \_\_\_\_\_ 10. No more than a four-day supply of explosives shall be stored underground.
- \_\_\_\_\_ 11. A hygrometer measures the moisture content of the air.
- \_\_\_\_\_ 12. A PSR will protect the wearer from 2% CO.



## LESSON D

### Oxygen, Nitrogen, Methane, Carbon Monoxide, Carbon Dioxide, Hydrogen Sulphide, Gas Chart

#### Gases

Atmospheric air, used to ventilate mines, consists of oxygen ( $O^2$ ) – 20.93%, by volume; nitrogen ( $N^2$ ) – 78.10%; carbon dioxide ( $CO_2$ ) – .03%; and other gases in small quantities – less than 1%. Mining operations release gases other than oxygen and nitrogen.

The specific gravity of a gas is its weight compared to that of the same volume of air. For example, if one cubic foot of a gas weighs twice as much as one cubic foot of air, its specific gravity is 2.0. One way of identifying a gas is by its specific gravity.

Oxygen, shown by the chemical symbol  $O^2$ , is essential for human life. It is tasteless, odorless, and colorless, and is detected with an  $O^2$  detector.

There is a deficiency of oxygen where there is less than 19.5% oxygen in the air. Breathing becomes faster and deeper as the deficiency increases, and it is more difficult to work. Atmospheres with less than 16% oxygen are dangerous, and persons in them should carry protection.

Oxygen supports combustion, and will combine with other gases to form explosives or inflammable mixtures. It is found naturally in the atmosphere, and as a specific gravity of 1.105.

Nitrogen ( $N^2$ ), specific gravity .967, makes up almost four-fifths of the natural atmosphere. It is tasteless, odorless, and colorless. Nitrogen is not combustible, nor will it support combustion. Therefore, it does not have an explosive threat. Excess nitrogen in the air leads to death by suffocation, as it replaces oxygen in the blood.

It is found naturally in the air, and is also a product of coal oxidation (oxygen in the air combining with coal). Thus, it is present in large quantities in the afterdamp of a mine fire; it remains when the oxygen is burned away.

Methane ( $CH^4$ ), also known as **Marsh Gas**, is a colorless, odorless, and tasteless combustible gas, released during the mining operations from coal and adjoining strata. Because it comes from the coal, and because it is much lighter than air—its specific gravity is 0.555—it is usually found along the roof, near working faces, in dead ends, and around falls.

Methane is not explosive itself; oxygen is needed to support combustion. While methane will burn (is combustible), it will not support combustion. Methane will combine with air to form an explosive mixture known as “fire damp”. Firedamp is not methane—firedamp is methane plus air. There is great danger of explosion when the methane content is between 5% and 15%. Where there is less than 5% methane, the heat of combustion is dispersed quickly enough to prevent flames. Where there is more than 15% methane, there is not enough oxygen for rapid combustion. Coal dust in the air reduces the lower explosive limit. It is possible to have an explosion with less than 5% methane if coal dust is present in the air.

Methane will ignite at approximately 1100 to 1380 degrees Fahrenheit.

Although not poisonous, methane will replace oxygen in the blood and cause death by suffocation if breathed in high concentrations. It can be detected by a methane detector, and by chemical analysis.

Carbon Monoxide ( $CO$ ), known as whitedamp, is a colorless tasteless, combustible and poisonous gas which results from incomplete combustion. This happens when there isn't enough oxygen for the burning to be completed. Carbon Monoxide is found after mine fires and explosions, for example and around internal combustion (such as gasoline and diesel) engines.

Carbon Monoxide is **extremely** poisonous—0.10% causes complete collapse. Carbon Monoxide combines with the blood and excludes oxygen. It has been shown that blood “prefers” carbon monoxide to oxygen by a factor of 300. This will lead to a shortage of oxygen in the body, and often rapid death. The effect of carbon monoxide is worsened because it is not easily thrown off. It builds up in the blood over time.

Carbon Monoxide is also explosive over a wide range—12.5% to 74%. It ignites at approximately 1100°F. While its explosiveness must not be forgotten, the most dangerous feature of carbon monoxide is its poisonous character.

Carbon Monoxide may be detected by a CO detector or chemical analysis. Its specific gravity is .967.

Carbon Dioxide (CO<sup>2</sup>), or blackdamp, results from **complete** combustion, and also from the breathing of men and animals. It is colorless and odorless, and is detected by a CO<sup>2</sup> detector or chemical analysis. The specific gravity is 1.529.

Carbon Dioxide is incombustible, it will not burn. Nor will it support combustion. Its danger is that it causes difficult breathing—5% causes breathing effort to increase 300%, for example, ½% will have a noticeable effect.

Hydrogen Sulphide (H<sub>2</sub>S), also known as “stinkdamp” because of its rotten egg odor, is an extremely poisonous gas even in small amounts. 0.07% will cause death in one hour, smaller doses will destroy olfactory (smelling) nerves.

The gas is combustible, and will ignite at 700 degrees F. It is also explosive over a wide range—4.3 to 46. Hydrogen sulphide is rarely found—occasionally in old pipe lines in poorly ventilated places. It is also the by-product of the burning of black powder—illegal in the mines of Illinois.

Hydrogen sulphide can be detected by a chemical analysis or by use of an H<sub>2</sub>S detector. Its specific gravity is 1.191.

The atmosphere following an explosion or mine fires is known as “afterdamp”. It consists of carbon dioxide, carbon monoxide, decreased oxygen, nitrogen, hydrogen, and smoke. It can be extremely dangerous to breathe, so it is important to use proper breathing protection.

### Problems

- 1. What gas (gases) make up the following:**  
Marsh Gas  
Firedamp  
Whitedamp  
Stinkdamp  
Blackdamp  
Afterdamp  
A. Methane; methane plus air; carbon monoxide; hydrogen sulphide; carbon dioxide, carbon monoxide, decreased oxygen, nitrogen, hydrogen, and smoke.
- 2. What is meant by the specific gravity of a gas?**  
A. The specific gravity of a gas is its weight compared to that of the same volume of air.
- 3. What is the importance of oxygen?**  
A. Oxygen (O<sub>2</sub>) is necessary for human survival. It is the oxygen in the air we breathe that keeps the human body alive. Also, while oxygen itself does not burn, it supports combustion. Without oxygen, there could not be mine fires.
- 4. What is meant by a deficiency of oxygen? What are the effects of an oxygen deficiency? Below what level of oxygen in the air is there said to be a deficiency?**  
A. Oxygen deficiency exists where there is not enough oxygen for men to normally carry on active work. Breathing becomes faster and deeper, and it is harder to work. A deficiency exists, according to the Mining Act, where there is less than 19.5% oxygen in the air.



5. **What is the importance of Nitrogen?**
  - A. Nitrogen is neither combustible, supporting of combustion, nor poisonous. However, generally the more nitrogen in the air, the less oxygen; therefore, excess nitrogen often means an oxygen deficiency.
6. **What is the importance of methane?**
  - A. Methane is combustible, and will mix with air to form "firedamp"; an extremely explosive mixture. When the methane content of air is between 5 and 15%, there is a great danger of explosion.
7. **What is the effect of oxygen on the dangers from methane?**
  - A. Oxygen is needed to support combustion of methane, and therefore causes "firedamp" to be explosive. The less oxygen present, the more methane required for a given explosive force.
8. **What is the effect of coal dust on the explosibility of methane?**
  - A. Coal dust too is explosive. Thus, the presence of coal dust increases the explosive potential, the possible explosive force, of a given mixture of "firedamp". In the same way, the presence of methane will increase the explosive potential of coal dust. The presence of coal dust will also lower the amount of methane that must be present for an explosion.
9. **What are the dangers of carbon monoxide?**
  - A. Not only is carbon monoxide combustible, but it is **extremely** poisonous. The blood prefers carbon monoxide to oxygen by a factor of 300, leading to death by a deficiency of oxygen. This effect is worsened because carbon monoxide is not easily thrown off.
10. **Where is carbon monoxide found?**
  - A. Carbon monoxide results from incomplete combustion—where there isn't enough oxygen for burning to be completed. It is found after mine fires and explosions, and near internal combustion engines.
11. **Where is carbon dioxide found?**
  - A. Carbon dioxide results from complete combustion, and also from the breathing of men and animals. Thus, small amounts are always found; larger amounts are found after mine fires and explosions. Because it is comparatively heavy, it would be found near the floor, in dip workings, and in poorly ventilated places.
12. **What is the danger of Carbon dioxide?**
  - A. There is no fire or explosive danger. However, it causes difficulty in breathing—if present in quantities greater than ½% of air, the effect will be noticeable.
13. **What is the danger of Hydrogen sulphide?**
  - A. Hydrogen sulphide is **extremely** poisonous—0.07% will cause death in one hour. Lesser amounts will destroy the sense of smell.
14. **What is afterdamp?**
  - A. Afterdamp is the atmosphere following an explosion or mine fire. It consists of carbon dioxide, carbon monoxide, nitrogen, hydrogen, decreased oxygen and smoke. It can be extremely dangerous.
15. **How may the following be detected:**
  - Methane**
  - Carbon Monoxide**
  - Hydrogen Sulphide**
  - Carbon Dioxide**
  - Nitrogen**
  - Oxygen**
  - A. CH<sup>4</sup>—Methane detector, chemical analysis.
  - CO—CO detector, chemical analysis.
  - H<sup>2</sup>S—H<sub>2</sub>S detector, odor, chemical analysis
  - CO<sup>2</sup>—CO<sup>2</sup> detector, chemical analysis.
  - N<sup>2</sup>—N<sup>2</sup> detector, chemical analysis.
  - O<sup>2</sup>—O<sup>2</sup> detector, chemical analysis.

## GAS CHART

	METHANE	CARBON MONOXIDE	HYDROGEN SULPHIDE	CARBON DIOXIDE	NITROGEN	OXYGEN
Chemical Symbol	CH <sup>4</sup>	CO	H <sup>2</sup> S	CO <sup>2</sup>	N	O <sup>2</sup>
Specific Gravity	.555	.967	1.191	1.5291	.967	1.105
Incidence in the air (%)	*	*	*	.03	78.10	20.93
Is it combustible?	Yes	Yes	Yes	No	No	No
Does it support combustion?	No	No	No	No	No	Yes
Is it poisonous?	No	Yes	Yes	No	No	No
How is it detected?	Safety Lamp Methane Detector Chemical Analysis	CO Detector Chemical Analysis	H <sup>2</sup> S Detector Chemical Analysis Odor	Chemical Analysis Safety Lamp	Chemical Analysis Safety Lamp	Chemical Analysis Safety Lamp
Explosive range percentage in air	5 to 15%	12.5 to 73%	4.3 to 46%	None	None	None
Ignition temperature Fahrenheit	1100 to 1380 deg.	1100 deg.	700 deg.	None	None	None
Origin	Occluded in Coal and Clay Veins; Decomposition of Vegetable matter in water	Incomplete combustion; Mine Fires; Explosions and Blasting	Rarely found; Old pipe line in poorly ventilated places	Complete combustion; small quantity found naturally in air	Found naturally in air; Coal oxidation frees Nitrogen	Found naturally in air
What is its effect of life:	Causes death by suffocation if breathed in high concentrations; effect passes off in fresh air	.10% in air causes complete collapse; Excludes Oxygen from the blood	.07% causes death in one hour; very poisonous; destroys olfactory (sense of smell) nerves	Causes death by suffocation; Excludes oxygen from the blood; labored breathing	Causes death by suffocation; Excludes Oxygen from the blood	Necessary for life

\*Less than 1%

## Gas test

- 1) What is the explosive range of  $O_2$ ?
- 2) What is the normal % of  $O_2$  in the atmosphere?
- 3) When  $O_2$  drops to 17%, what will be the effect on the human body?
- 4) Name the four main causes of Oxygen deficiency.
- 5) What is the specific gravity of  $N_2$ ?
- 6) What is the % of  $N_2$  in normal air?
- 7) What is the specific gravity of  $CO_2$ ?
- 8) What is the explosive range of  $CO_2$ ?
- 9) What is the specific range of CO?
- 10) What is the explosive range of CO?
- 11) When is CO found?
- 12) What does CO findings indicate?

13) What is the explosive range of  $\text{NO}_2$ ?

14) What is the specific gravity of  $\text{NO}_2$ ?

15) What would the findings of  $\text{NO}_2$  indicate

?

16) What is the specific gravity of  $\text{H}_2$ ?

17) What is the explosive range of  $\text{H}_2$ ?

18) What does  $\text{H}_2$  findings indicate?

19) What is the specific gravity of  $\text{H}_2\text{S}$ ?

20) What is the explosive range of  $\text{H}_2\text{S}$ ?

22) What is smoke?

23) Is smoke explosive?

24) Name the different damp.

25) Name the toxic gases we deal with in the mining industry

GAS CHART	METHANE	CARBON MONOXIDE	HYDROGEN SULPHIDE	CARBON DIOXIDE	NITROGEN	OXYGEN
Chemical Symbol	CH4	CO	H2S	CO2	N	O2
Specific Gravity	.55	.967	1.191	1.529	.967	1.105
Incidence in the air (%) *Trace amounts only	*	*	*	.03	78.10	20.93
Is it combustible?	YES	YES	YES	NO	NO	NO
Does it support combustion?	NO	NO	NO	NO	NO	YES
Is it poisonous?	NO	YES	YES	NO	NO	NO
How is it detected?	-Safety Lamp -CH4 Detector -Chemical Analysis	-CO Detector -Chemical Analysis	-H2S Detector -Chemical Analysis	-Chemical Analysis -Safety Lamp	-Chemical Analysis -Safety Lamp	-Chemical Analysis -Safety Lamp
Explosive Range (percent in air)	5% to 15%	12.5% to 73%	4.3% to 46%	NONE	NONE	NONE
Ignition Temperature	1100 to 1380 deg.	1100 deg.	700 deg.	NONE	NONE	NONE
Origin	Occluded in coal and clay veins Decomposition of vegetable matter in water Causes death by suffocation if breathed in high concentrations Effect passes off quickly in fresh air	Incomplete combustion Mine fires Explosions & Blasting	Rarely found Old pipe lines in poorly ventilated places	Complete combustion small quantity found naturally in air	Found naturally in air frees Nitrogen	Found naturally in air
What is its effect on life?		.10% in air causes complete collapse Excludes Oxygen from the blood	.07 causes death in one hour Very poisonous Destroys olfactory nerves (Sense of smell)	Causes death by suffocation Excludes Oxygen from the blood Labored breathing	Causes death by suffocation Excludes Oxygen from the blood Labored breathing	Necessary for LIFE

\* Less than 10%



## ESCAPEMENTS (ARTICLE 19)

### TRUE/FALSE

- \_\_\_\_\_ 1. One of the designated escapeways may be the return.
- \_\_\_\_\_ 2. One of the escapeways must be the intake airway.
- \_\_\_\_\_ 3. Platform landings are not required when a circular stairway is used in the escapement shaft.
- \_\_\_\_\_ 4. In square or rectangular shaft escapements, a landing must be provided. This landing must be at least 4 feet wide and 4 feet long.
- \_\_\_\_\_ 5. If a mine is equipped with a stairway in the main shaft, no stairway is required in the escapement shaft.
- \_\_\_\_\_ 6. The escape shafts and roadway leading to them must be examined at least once in a 24-hour period.

### MULTIPLE CHOICE

- \_\_\_\_\_ 7. In mines employing more than 10 men, the distance between the mine shaft and the escapement shaft shall not be less than:
- a. 500 feet nor more than 1500 feet
  - b. 500 feet nor more than 1000 feet
  - c. 500 feet nor more than 2000 feet
  - d. 250 feet nor more than 500 feet
- \_\_\_\_\_ 8. If a slope being more than 45 degrees is a designated escapeway, it shall be equipped with:
- a. a stairway
  - b. handrails
  - c. a walkway with cleats
  - d. both b and c
- \_\_\_\_\_ 9. Escapement passageways should be maintained to at least \_\_\_\_\_ whenever possible.
- a. 5 feet high by 5 feet wide
  - b. 4 feet high by 5 feet wide
  - c. 6 feet high by 5 feet wide
  - d. 5 feet high by 6 feet wide
-

## ARTICLE 21

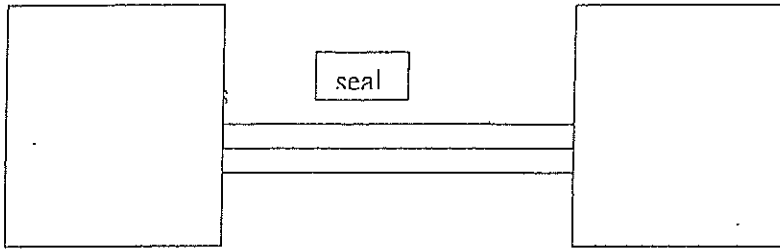
### TRUE/FALSE

- \_\_\_\_\_ 1. All firefighting operations shall be under the direct supervision of the mine manager or his designated assistants.
- \_\_\_\_\_ 2. In all mines classified as gassy mines by the State Mine Inspector, it shall be compulsory to use electric lamps.
- \_\_\_\_\_ 3. Supplies of rockdust, water lines and hose, water or chemical trucks, or fire extinguishers are suitable fire-fighting equipment.

### MULTIPLE CHOICE

- \_\_\_\_\_ 4. Underground storage places for lubricating oil and grease in excess of \_\_\_\_\_ days shall be of fireproof construction.
- a. 2
  - b. 3
  - c. 4
- \_\_\_\_\_ 5. Before welding, cutting and soldering with arc or flame underground, the area must be tested for:
- a. carbon monoxide
  - b. carbon dioxide
  - c. methane





The Barometric pressure is 28.8 inches of mercury. The seal is 16' wide and 9' high what is the pressure exerted upon the seal?

One inch = .5 lbs per square inch of mercury

$.5 \times 28.8 = 14.9$  lbs per sq inch

$A = 16 \times 9$

$A = 144$  sq ft

One Square foot = 144 square inches

$144 \times 144 = 20736$  sq inches

$20736 \times 14.9 = 308,966.4$  lbs ~~per square inch~~ on the seal

$308,966.4 / 144 = 2145.6$  lbs per sq foot



## NOTES



# WEEK 4



## Article 11

- 1) When and to whom should a fire or an explosion be reported?
- 2) An operator must require each person underground to carry an SCSR Device. T/F
- 3) If a person does not carry an SCSR, what is the maximum footage the SCSR can be from the person?
- 4) How many SCSRs are required on a mantrip or mobile equipment carrying people in and out of the mine?
- 5) What is the minimum footage requirement between SCSR caches?
- 6) Where are these caches to be located?
- 7) Who approves the SCSR storage plan?
- 8) Where are rescue chambers located?
- 9) What is the maximum distance an emergency sled can be located from the working face?
- 10) List the supply requirement for an emergency sled.

## CERTIFICATION EXAM

### ARTICLE 13

1. True False No person shall smoke, carry smoking materials, or carry lighters, matches, or any other spark or flame creating devises in gassy mines.
2. True False Every miner should be required to sound the roof of his working place only when he encounters loose roof or other dangerous conditions.
3. True False No person shall cross a danger signal without the permission of his section supervisor.
4. True False No person shall enter or leave a mine without recording the fact by some suitable check-in, check-out system.
5. True False No person shall enter or work in a mine or any such area or parts connected with a mine, while using drugs.
6. True False A person may be subject to dismissal or discharge for testifying in any hearing held under the Coal Mining Act.
7. True False The State Mine Inspector has the authority to enforce any mine roof control plan.
8. True False Bulletins, notices, or record books may be eliminated and/or destroyed after a period of six (6) months.
9. Working rules provided by a mine shall be complied with:
  - a. when it is convenient
  - b. it does not alter the day to day operations
  - c. always complied with
  - d. when a task is not made more difficult
10. Any mine roof control program or plan must be approved by:
  - a. the rank and file employer
  - b. the State Mine Inspector and the Mining Board
  - c. the State Examining Board
  - d. Mine Safety and Health Administration



## Ventilation Test

- 1) Name 10 requirements for a main ventilating fan. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- 2) By Illinois Law what is the minimum amount of oxygen required in a ventilating air current.  
\_\_\_\_\_
- 3) Define the following ventilation tools.  
Regulator \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
overcast \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
line curtain \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- 4) Describe intake air. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- 5) what is the maximum amount of methane allowed in the return? \_\_\_\_\_
- 6) What is ventilating air current required to do? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- 7) What is the minimum amount of air required at the last open crosscut? \_\_\_\_\_
- 8) What does an anemometer measure? \_\_\_\_\_
- 9) How many mines in Illinois are classified as gassey? \_\_\_\_\_
- 10) How long must a ventilating fan be down before a full exam must be made? \_\_\_\_\_



## LESSON D

### Oxygen, Nitrogen, Methane, Carbon Monoxide, Carbon Dioxide, Hydrogen Sulphide, Gas Chart

#### Gases

Atmospheric air, used to ventilate mines, consists of oxygen (O<sub>2</sub>) - 20.93%, by volume; nitrogen (N<sub>2</sub>) - 78.10%; carbon dioxide (CO<sub>2</sub>) - .03%; and other gases in small quantities - less than 1%. Mining operations release gases other than oxygen and nitrogen.

The specific gravity of a gas is its weight compared to that of the same volume of air. For example, if one cubic foot of a gas weighs twice as much as one cubic foot of air, its specific gravity is 2.0. One way of identifying a gas is by its specific gravity.

Oxygen, shown by the chemical symbol O<sub>2</sub>, is essential for human life. It is tasteless, odorless, and colorless, and is detected with a safety lamp. If the oxygen content of the air is less than approximately 16%, the flame of the lamp will go out.

There is a deficiency of oxygen where there is less than 19.5% oxygen in the air. Breathing becomes faster and deeper as the deficiency increases, and it is more difficult to work. Atmospheres with less than 16% oxygen are dangerous, and persons in them should carry protection.

Oxygen supports combustion, and will combine with other gases to form explosive or inflammable mixtures. It is found naturally in the atmosphere, and has a specific gravity of 1.105.

Nitrogen (N<sub>2</sub>), specific gravity .967, makes up almost four-fifth of the natural atmosphere. It is tasteless, odorless, and colorless. Nitrogen is not combustible, nor will it support combustion. Therefore, it does not have an explosive threat. Excess nitrogen in the air leads to death by suffocation, as it replaces oxygen in the blood.

Because it does not support combustion, nitrogen can be detected by a flame safety lamp or chemical analysis. It is found naturally in air, and is also a product of cool oxidation (oxygen in the air combining with the coal). Thus, it is present in large quantities in the afterdamp of a mine fire; it remains when the oxygen is burned away.

Methane (CH<sub>4</sub>), also known as Marsh Gas, is a colorless, odorless, and tasteless combustible gas, released during mining operations from coal and adjoining strata. Because it comes from the coal, and because it is much lighter than air—its specific gravity is 0.555—it is usually found along the roof, to the rises, near working faces, in dead ends, and around falls.

Methane is not explosible itself; oxygen is needed to support combustion. While methane will burn

(is combustible), it will not support combustion. Methane will combine with air to form an explosive mixture known as "firedamp" ~~which is not methane—firedamp is methane plus air.~~ There is great danger of explosion when the methane content is between 5% and 15%. Where there is less than 5% methane, the heat of combustion is dispersed quickly enough to prevent flames. Where there is more than 15% methane, there is not enough oxygen for rapid combustion. Coal dust in the air reduces the lower explosive limit. It is possible to have an explosion with less than 5% methane if coal dust is present in the air.

Methane will ignite at approximately 1100 to 1380 degrees Fahrenheit.

Although not poisonous, methane will replace oxygen in the blood and cause death by suffocation if breathed in high concentrations. It can be detected by a flame safety lamp, a methane detector, and by chemical analysis.

~~Carbon Monoxide (CO) known as whitedamp, is a colorless, tasteless, combustible and poisonous gas which results from incomplete combustion.~~ This happens when there isn't enough oxygen for the burning to be completed. Carbon Monoxide is found after mine fires and explosions, for example, and around internal combustion (such as gasoline and diesel) engines.

Carbon Monoxide is extremely poisonous—0.10% causes complete collapse. Carbon Monoxide combines with the blood and excludes oxygen. It has been shown that blood "prefers" carbon monoxide to oxygen by a factor of 300. This will lead to a shortage of oxygen in the body, and often rapid death. The effect of carbon monoxide is worsened because it is not easily thrown off. It builds up in the blood over time.

Carbon Monoxide is also explosive over a wide range—12.5% to 74%. It ignites at approximately 1100°F. While its explosiveness must not be forgotten, the most dangerous feature of carbon monoxide is its poisonous character.

Carbon Monoxide may be detected by a CO detector or chemical analysis. Its specific gravity is .967.

~~Carbon Dioxide (CO<sub>2</sub>), or blackdamp, results from complete combustion and also from the breathing of men and animals. It is colorless and odorless, and is detected by a Safety Lamp or Chemical Analysis. The specific gravity is 1.529.~~

Carbon dioxide is incombustible, it will not burn. Nor will it support combustion. Its danger is that it causes difficulty in breathing—5% causes breathing effort to increase 300%, for example. 1/2% will have a noticeable effect.

~~Hydrogen Sulphide (H<sub>2</sub>S), also known as "stinkdamp" because of its rotten egg odor, is an extremely poisonous gas even in small amounts. 0.07% will cause death in one hour, smaller doses~~

penetrating the coal seam or seams being mined, rivers and other bodies of water which might affect mining shall be shown on the map. All shafts or other openings to the surface or into other mines,

all active workings, all abandoned places, seals, and the general areas where pillars have been extracted, the locations of pumping stations, transformer and motor-generator stations and seam out-cropping, if any shall be shown on the map. If the surface buildings, roads, and rail roads are so extensive that they can't be drawn on the underground map, then a separate map for the surface must be made.

Should any operator of any mine not furnish mine maps as required by law, then the state mine inspector can order a survey made and the expenses incurred are to be paid by the operator. If the inspector of the state mining board deems a map to be materially inaccurate, then the inspector may order a different survey made; if no serious inaccuracies are found the state must pay for the re-survey, otherwise the operator bears the expenses incurred.

**Final Maps to be Made of Abandoned Mine.** A final map shall be made of all mines about to be permanently closed. A copy of such maps shall be furnished the department of mines and minerals and county recorder within 90 days after such mine is closed.

**Maps of Mines Sold or Transferred.** Within 30 days after the title of a mine has been transferred two copies of a correct map shall be filed with the county recorder of the county where the mine is located and one copy with the state department of mines and minerals. Both the seller and the purchaser must certify on each map as to its correctness; such maps may be used in courts of law.

**All Mine Openings of Abandoned Mines are to be Permanently Enclosed. Sealed or Filled.** All abandoned mine shafts or openings to the surface shall be filled, sealed or kept permanently enclosed.

**How a State Mine Inspector Proceeds to Inspect a Coal Mine.** Before an inspector goes to a coal mine to make his first inspection, he should procure a copy of the mine map and make a study of it, the mine's location, the system of mining practiced, the ventilating system, etc. Then he should go unannounced, introduce himself, show his credentials, and make an acquaintance with the mine officials. After this, perhaps one of the first things he'd do would be make a careful study of the different examiners' reports and if he finds anything about these reports which he needs to question, discuss this with the proper mine official. After this he would make an inspection of the surface buildings, the hoisting room and hoisting equipment, the cages, ropes, and the posted code of hoisting signals. He would then check the fan equipment, the recording pressure gages and take measurements of the intake and return air at these shafts. After he had completed his surface inspection, he would take a cage and go underground; for his own safety and convenience he should have either a company official or someone assigned by the management to accompany him on his underground inspection. He should carefully inspect all of the active working places, belt lines, and travelways, stopping to converse with each workman as he makes his "rounds", getting acquainted and listening to what they have to say; most generally it is better if he talks to the workmen while by himself so as to make the conversation confidential. He should take special notice, the practices of the different workmen and observe if the mining laws are being obeyed. He should take all of the necessary air readings and compare these with those of the examiners which he made note of, he should examine the escapeways, make the "gas" test, take air and dust samples as he deems necessary and when finished underground return to the surface. When he has completed his inspection, he should make an inspection report; post an inspection notice on the mine bulletin board, reporting his findings and any recommendations he deems need be made.

## **MINE GASES**

**1. Name the common gases found in coal mines following a mine fire or explosion?**

Carbon monoxide, carbon dioxide, and methane, oxygen, nitrogen, hydrogen, and other hydrocarbons.

**2. What is a dangerous mine atmosphere?**

A dangerous mine atmosphere is one that is or is likely to become poisonous to breathe, deficient in oxygen, or explosive.

**3. What is the principle combustible gas found in coal mines?**

Methane (CH<sub>4</sub>) is the principle combustible gas found in coal mines.

**4. What is the explosive range of methane-air mixtures?**

5 to 15 percent of methane in air is explosive.

**5. To what extent must the oxygen content be reduced before an explosion of methane and air is impossible?**

For a mixture of strictly methane and air, the oxygen content must be 12 percent or less. It is however, significant to note that there is a combination of combustible gases following explosions and during fires, so the maximum allowable oxygen will vary according to variations in the combustible and inert gases.

**6. What is the explosive range of carbon monoxide-air mixtures?**

12.5 to 74 percent carbon monoxide in air.

**7. What is the explosive range of hydrogen-air mixtures?**

4 to 74 percent carbon hydrogen in air.

**8. To what extent must the oxygen content be reduced before an explosion of hydrogen is impossible?**

5 percent or less.

**9. Name the inert gases found in coal mines?**

Carbon dioxide (CO<sub>2</sub>) and nitrogen (N<sub>2</sub>).

**10. State where you would generally find methane, carbon monoxide, and hydrogen sulfide?**

Methane may be found anywhere, but is most likely to be encountered in virgin coal, roof cavities, high places, abandoned workings, and places that are improperly ventilated.

Carbon monoxide may be found in small quantities after blasting and will be found after an explosion or in the return from a mine fire and use of diesel equipment underground. Hydrogen sulfide may be found in old pipelines, stagnant water, fire areas and occasionally in active workings, usually associated with broken bottom.

**11. What gas or gases support combustion?**

Only oxygen.

**12. How are persons affected by breathing the various gases found in coal mines?**

1. A deficiency of oxygen in the air being breathed deprives the body of the oxygen required for normal life support. Noticeable symptoms such as faster and deeper breathing, dizziness, rapid heart beat, and headache occur when the air contains as little as 15 percent oxygen unconsciousness may occur when the air contains 9 percent oxygen and life is greatly endangered when the air contains 7 percent oxygen. A flame safety lamp will no longer burn when the oxygen content is below 16.25 percent.

2. Carbon monoxide breathed in air reduces the capacity of the blood to carry sufficient oxygen, which deprives the brain and body tissues of the oxygen they require for normal functioning. The generally accepted maximum allowable concentration for an 8-hour exposure with normal oxygen is .005 percent. Somewhat higher concentrations may be considered allowable for short periods of exposure. For example, .04 percent can be inhaled for one hour without appreciable effect but .15 percent is dangerous to life after exposure of one hour, and .4 percent will cause death in less than an hour.

3. Hydrogen sulfide in very small amounts will cause irritation of the eyes and respiratory passages, including the lungs, concentrations as low as .07 percent will cause rapid unconsciousness, cessation of respiration, and death.

## ***FIGHTING AND SEALING COAL MINE FIRES***

**13. What are the major causes of fires in coal mines?**

Electricity, open flame, ignition of gas, explosives, cutting and welding, smoking and smokers= articles, spontaneous ignitions, friction, and surface fires communicated to underground workings.

**14. What are the usual methods of controlling or extinguishing mine fires?**

1. Direct attack with water, chemicals, rock dust, or sand. 2. Foam. 3. Enclosing fire area with tight seals. 4. Flooding affected area 5. Flushing enclosed area with silt or other material. 6. Enclosing fire area with inert barriers. 7. Inundating with inert gases.

**15. When should you decide to seal a fire area or mine?**

When it is no longer reasonably safe or feasible to fight the fire directly because of a build up of combustible gases, bad roof due to heat, insufficient firefighting materials, too large an area engulfed by fire, etc..

**16. What is the objective of sealing?**

The object is to control and extinguish the fire by cutting off the oxygen supply so as to reduce the oxygen below that which will support a flame or combustion; also, to minimize or eliminate the possibility of an explosion.

**17. What are the principle hazards in sealing a mine fire?**

When coal burns, explosive and asphyxiating gases are liberated or produced and the heat from fires causes roof falls. Therefore, the installation of seals, the roof falling, or other firefighting activity may cause an explosive mixture of gases to reach the fire causing an explosion. In addition, there is a potential for workmen to be overcome by asphyxiating gases because of the need to work in the return airways and because of roof falls changing the pattern of ventilation. It is important that the air returning from the fire area be monitored for explosibility.

**18. Should the intake or return be sealed first, or both together?**

No fixed rule should be established for sealing, but the procedure must be governed by the conditions surrounding each fire. It is, however, preferable to erect both intake and return seals simultaneously. It may even be advisable to devise a method of having doors in the seals closed after all workmen have returned to the surface.

19.Q. What distance should seals be from a fire?  
Conditions govern this. As the objective in sealing is to cut off the air so that oxygen will be consumed to the point that there is not enough oxygen to support combustion, the smaller the area sealed, the quicker this will be accomplished. Roof conditions, amount of combustible gases being given off, the intensity of the fire, and the number of seals required are the principle factors to be considered when selecting seal locations.

**20. Should temporary seals be erected first?**

Not necessarily. Circumstances surrounding each fire will determine whether or not temporary seals should be erected. Factors to be considered when making this determination are the availability of permanent sealing material, the rate of rise of combustible gases, the rapidity of the spread of the fire, the accessibility of the seal locations, etc..

**21. What materials should be used for temporary seals?**

The most common and practical materials are those normally used within the mine such as brattice material, brattice boards, and other sealing materials. Whatever the materials used, the edges should be sealed with urethane foam or other material to make them as air tight as possible.

**22. Should work continue in the mine after seals are completed?**

Emphatically, no! The main hazard after sealing a mine fire is the possibility of an explosion within the sealed area. All men should be removed as quickly as possible after completion of work on the seals. Normally, no one should enter the mine when it is known that there is an explosive atmosphere within the sealed area. Samples to determine whether

or not the atmosphere is explosive should be collected through boreholes from the surface whenever possible. Analysis of collected samples will determine when it is safe to re-enter the mine and continue work. Otherwise, the first trip into the mine after sealing should be for the purpose of collecting samples from the sealed area. The number of people making this trip should be limited to as few as necessary and how soon the trip should be made after seals are completed will depend to a large extent upon the size of the sealed area, the amount of combustible gases in the area when the seals were constructed, and the normal methane liberation in the area.

**23. What are the main factors to be considered in erecting permanent seals?**

All permanent seals shall be designed to comply with Title 30 Code of Federal Regulations.

**UNSEALING FIRE EXPLOSION AREAS IN COAL MINES**

**24. What does the presence of carbon monoxide in sealed areas indicate?**

The presence of carbon monoxide is an indication of an active or recently active fire.

**25. How much oxygen is considered reasonably safety before attempting to unseal a fire?**

The amount of oxygen under these circumstances is critical because of the possibility of explosion when unsealing a fire area. Ideally, the oxygen content should be such that the atmosphere in the sealed area is not explosive and cannot become explosive when air is added. Where this is not possible, the procedure for recovery should insure that men are not in the mine when an explosive mixture exists in the sealed area unless the area has been examined and there is no fire. 26.Q. What are the principle factors that govern the amount of time a fire area must be sealed before being reopened?

Some principle factors are: Tightness of seals and enclosed area, influence of barometric pressure on enclosed area; character of burning material and overlying strata; extent and intensity of fire; location of seals with respect to mine ventilation; the extent of the area under seal; composition of gases in the sealed area.

**27. How would you determine when it is safe to reopen a sealed fire area?**

Trends of several gases provide a better indication of whether or not a fire is Aout@. The levels of carbon monoxide may never reach zero even though it may be safe to re-enter the mine. Stability of the sealed atmosphere provides a good indication of the status of the fire.

**28. What effect, if any, does the presence of carbon dioxide that is produced in the sealed area have on the fire?**

The amount of carbon dioxide present under these circumstances would have very little effect on the fire, but is a factor to be considered in determining whether or not the atmosphere is or may become explosive. Carbon dioxide may be introduced into a sealed area to help control the fire and help create an inert atmosphere.

**29. What are some of the preparations that should be made before unsealing a fire area?**



A complete and detailed plan should be prepared and agreed to by various interested parties. Necessary adjustments should be made in the ventilation to assure that an ample quantity of air will be available and that the air that passes by or through the sealed area is conducted in such a manner that it will not pass over power wires or any other potential ignition source and shall be directed by the shortest means to the surface. The area adjacent to the seals should be heavily rock dusted.

**30. Briefly describe two methods that have been successfully employed for the recovery of a fire/explosion area.**

There are, in general, two systems that may be employed: 1. Recovering the fire area in successive blocks by means of air locks. 2. Reventilation of the fire area after there is conclusive evidence that the fire has been extinguished, or that the atmosphere is not explosive and will not become explosive with the addition of air.

**31. Describe the method of recovering a sealed fire/explosion area by the use of air locks.**

The purpose of air locking is to recover portions of the sealed fire/explosion area or the entire area in a manner that will prevent increasing the oxygen content in unexplored areas to avoid an explosive atmosphere or rekindling or intensifying the fire.

When a suitable air lock has been erected, an oxygen breathing apparatus crew, fully equipped for the work at hand and supported by a fully equipped reserve crew, should enter the air lock through a man door and remove the seal.

After the seal has been removed, an oxygen breathing apparatus crew, with another crew in reserve, should advance and explore to the point where the next air lock is to be erected. General conditions should be observed by the exploring crew, temperature readings taken, an air sample collected to check previous analysis.

**32. Describe the method of recovering a sealed fire/explosion area by direct ventilation.**

When a decision has been made to recover a sealed area by direct ventilation, an air lock should preferably be constructed near the intake seal. A rescue crew fully equipped for the work at hand breaks the seal, enters, observes conditions, takes temperature readings and air samples, returns to the fresh-air base. If the observations and examinations of the affected region have shown that conditions are favorable, the return seal should be broken by an apparatus crew, then the air lock opened to admit air. While the area is being ventilated, the combustible gases in the main return should, if feasible, be kept below explosive limit. If this method of recovering a fire area is employed, it is advisable that all the men be out of the mine before the air is actually directed into the sealed area, unless it has been determined that the atmosphere in the sealed area is not explosive and cannot become explosive by adding air. Some automatic arrangements should be employed which would give sufficient time for all persons to reach the surface before the fire gases were actually moved. A reasonable period should be given for the fire gases to be removed and frequently determinations should be made of the return from the mine, and the time for any person to enter should be governed by the quality of the air. If the workings under seal are of an extensive nature it will probably be advisable for crews equipped with oxygen breathing apparatus to reenter the mine and clear out pockets of standing fire gases that may be present.

## *Mine Explosions*

### **33. What are the principal causes of mine explosions?**

Ignition of methane or coal dust or both by electric arc open flame (including mine fires), misuse of explosives friction, lightning strikes, smoking articles, etc.

### **34. How can mine explosions be prevented or their effects minimized?**

By adequate ventilation, rock dusting, mine dust control permissible electrical equipment and proper use of permissible explosives.

## *Procedures and Duties At Fires and Explosions*

### **35. In case of a mine fire or explosion, who should notified?**

Notify as soon as possible, higher company officials state mining agency, federal mining agency, and representatives of the mine workers. Each of these groups/agencies should have an up-to-date Mine Emergency Response plan that addresses assigned areas of responsibility in the event of a mine emergency. Also, any adjoining mines that are connected to the affected mine should be notified.

### **36. What are some factors that must be considered early to assure a well organized operation?**

Periodically conduct mine emergency drills and frequent training on the mine emergency response plan.

### **37. What one factor is most critical to insure the safety of survivors in the mine?**

The mine ventilation. The fan or fans should be examined and repaired as necessary, then attended or other action taken to assure continued operation. Ventilation should not be prematurely changed.

### **38. A major factor to be concerned with during recovery following an explosion is the possibility of another explosion. List the methane ignition sources which are the most likely to be encountered in the affected areas that have not been explored and ventilated?**

1. Fire that was started by the explosion.
2. Electrical arc that may be created by the short-circuited batteries or power wires that have not been de-energized.

### **39. In addition to assuring that the fan or fans are operating, what is another important step to be taken in the attempt to save survivors?**

Endeavor to communicate with survivors and direct them to the best means of escape from the mine.

### **40. What are the main objectives of the rescue and recovery work after a mine explosion?**

1. Safety of the persons involved in Rescue/Recovery.
2. Rescue live persons and recovery bodies.
3. Recover the mine.

**41. While fighting a mine fire, what type of major accident should the firefighter be most concerned with?**

An explosion is the major accident that is likely to occur during firefighting operation.

**42. How should mine firefighters protect against the occurrence of an Explosion?**

The air returning from the fire should be monitored for explosibility, and ventilation should be controlled closely and maintained over the fire constantly.

**43. Should one man be in charge of the rescue or recovery work?**

Yes, generally a representative of the company.

**44. Should there be a advisory committee to the man in Charge?**

Yes. The committee should be composed of representatives of the State mining agency, Federal mining agency, the miners, and others.

**45. Should there be a plan made for specific phases of firefighting rescue and recovery procedures such as sealing or unsealing mine fires or recovery of miners following an explosion?**

Yes. The man in charge and the advisory committee should devise a plan of operation which should be followed closely.

**46. What are some factors that may be critical to the safe firefighting or explosion recovery activities, and which would not normally be known or readily available to planners?**

Location of all energized power wires or equipment; location of all battery equipment or equipment on which batteries are installed; location of diesel equipment; location of pressurized containers, such as acetylene or oxygen cylinders; and the location and description of any other equipment or supplies that may influence the planner.

**47. How should the work be divided?**

Work shifts should be determined by the persons in charge and should be determined by the need of the recovery operation.

**48. Should there be a man in charge of the underground work on each shift?**

Yes, generally a company representative with experience in such work.

**49. Should there be a advisory committee to the man in charge on each shift underground?**

Yes. A committee should be composed of representatives of State mining agency. Federal mining agency, and others as appropriate.

**50. Should there be any restrictions on the number of people permitted underground?**

Yes. Only those people necessary to insure the suitable progress and safety of the operation which would include supply men, backup workers, supervisors, etc.\

**51. After entering a mine following an explosion, what examination should be made?**

Examine return airways for smoke or other indications of active fire.

**52. Following an explosion, how is the location of the first fresh-air base determined?**

Exploration is continued in intake air to the point where normal ventilation controls have been destroyed and ventilation is short circuited. At this point, the first fresh- air base should be established.

**53. Describe a fresh- air base?**

The place to which fresh air has been conducted, and at which stoppings (seals) or other ventilation controls including an air lock have been installed in a manner that will prevent reventilation of any area that has not been explored and examined.

**54. When should the fresh-air base be advanced?**

Only when an area inby the present fresh-air base has been examined and the stoppings installed to permit the explored area to be reventilated without disturbing the inby area that has not been explored.

**55. Should exploration trips be made ahead of the fresh- air base or in other areas where an irrespirable atmosphere is or may be present?**

Yes. Crews wearing self-contained breathing apparatus should make such trips for gathering information, reestablishing ventilation, rescuing workmen, searching for bodies, etc.

**56. What should be the distance of trips ahead of fresh air?**

The object of the exploration, the type of communication used; conditions (such as height) of travel way, etc, will govern the distance to be traveled; always keeping in mind the time limitations of the apparatus.

**57. Under what conditions is it not advisable for breathing apparatus crews to make trips ahead of fresh air?**

1. Such exploration trips should not be taken under the following conditions:
2. In dense smoke, except with life line attached to each member and then only for very short trips to save life, turn valves, or to open or close doors essential to the operation.

3. When an explosion is probable.
4. In dangerously high temperature with high humidity.
5. When apparatus not adequately charged or in unsafe condition.
6. When the reserve crew has less members than the advance crew.

**58. What kind of material should be used to build temporary stoppings?**

Workmen wearing breathing apparatus should install temporary stoppings with brattice material, pogo sticks, inflatable stoppings, etc. Such stoppings should be replaced as soon as possible with more substantial such as cement block, wood-framed brattice sealed with rigid foam, or other more permanent type structure.

**59. What should be done by breathing apparatus crew when fires are found during exploration?**

Every effort should be made to reach and extinguish all fires discovered. If this is not possible, the crew should return to the fresh air-base.

**60. Should there be a telephone or other means of communication between the fresh-air base and the outside?**

Yes, so that men and material can be provided without delay and that instruction and information can be relayed promptly between the person in charge underground and the person in charge on the surface.

**61. Should the man in charge of each shift have a map of the mine?**

Yes, so that he can follow progress, make plans, give relay information accurately.

**62. Should information be relayed to relatives of possible victims and to the news media?**

Yes. Normally one spokesman should be selected to relay factual information about the operation

**63. What should the engineering department be responsible for during firefighting or recovery operations after an explosion?**

1. Provide up-to-date maps of the mine showing normal ventilation and ventilation controls (stoppings, overcasts, etc.)
2. Keep map current by recording progress, changes in ventilation, and other pertinent information such as location of bodies, equipment, etc.

**64. Following a mine explosion what early action should the electrical department take?**

1. Disconnect and lock out all electric power entering the mine or affected portions when authorized to do so, and lock out all other de-energized circuits.

2. Notify the electric company that under no circumstances should the electric power be "cut off" without notifying the mine.
3. If is a shaft or slope mine, examine and service necessary hoists and elevators.

**65. What are some of the duties of the safety department during the early stages of firefighting or explosion recovery operation?**

Make arrangements for rescue teams including facilities and maintenance of equipment, food and lodging. Arrange for medical or first-aid treatment for injured persons or handling of bodies if necessary.

**66. What main types of workers should be on each shift?**

Crews with breathing apparatus, crews to build stoppings and crews to transport and handle supplies.

**67. What attributes should a person have before being selected as a mine rescue team member?**

The person selected should be cool, competent person who has demonstrated in his past work a willingness to be a good "team" member. The person should also possess extensive knowledge of mining and should be mentally sound and physically fit.

**68. What training should a mine rescue team member have before being qualified to participate in mine rescue work?**

They should be trained and retrained in accordance with Federal or State requirements for qualification.

**69. How many people constitute constitute a rescue team?**

At least five and preferably six men should compose a rescue team with the same number fully equipped at the fresh-air base. A crew of less than five may make short explorations for special purposes when a similar number of apparatus men are in reserve at the fresh-air base.

**70. What equipment should rescue parties have with them?**

In addition to the standard equipment such as electric cap lamps and self-rescuers, they should be equipped with approved self-contained breathing apparatus that have been properly tested and inspected under the supervision of a competent person. They should have all the pertinent background information, a copy of the latest map of the mine workings, and at least an approved and tested methane detector, carbon monoxide detector, oxygen detector and thermometer.

**71. What should the captain of an apparatus crew confirm before leaving the fresh-air base?**

Make sure that all apparatus are operating properly and check to see that all material necessary for the exploration is on hand and working. The captain should consult with the man in charge relative to the purpose of the trip and extent of travel; also be sure that a

back-up rescue team with all necessary equipment is in readiness at the fresh-air base.

**72. How should the exploration ahead of the fresh-air base be conducted?**

Exploration ahead of the fresh-air base should be determined by the advisory committee after evaluation of conditions encountered by the rescue teams.

**73. What communications should be maintained with rescue team and fresh-air base?**

They must be in contact with the fresh-air base at all times using sound system.

**74. What action should be taken if a communication failure occurs between teams and the fresh-air base?**

Teams should retreat to the fresh-air base.

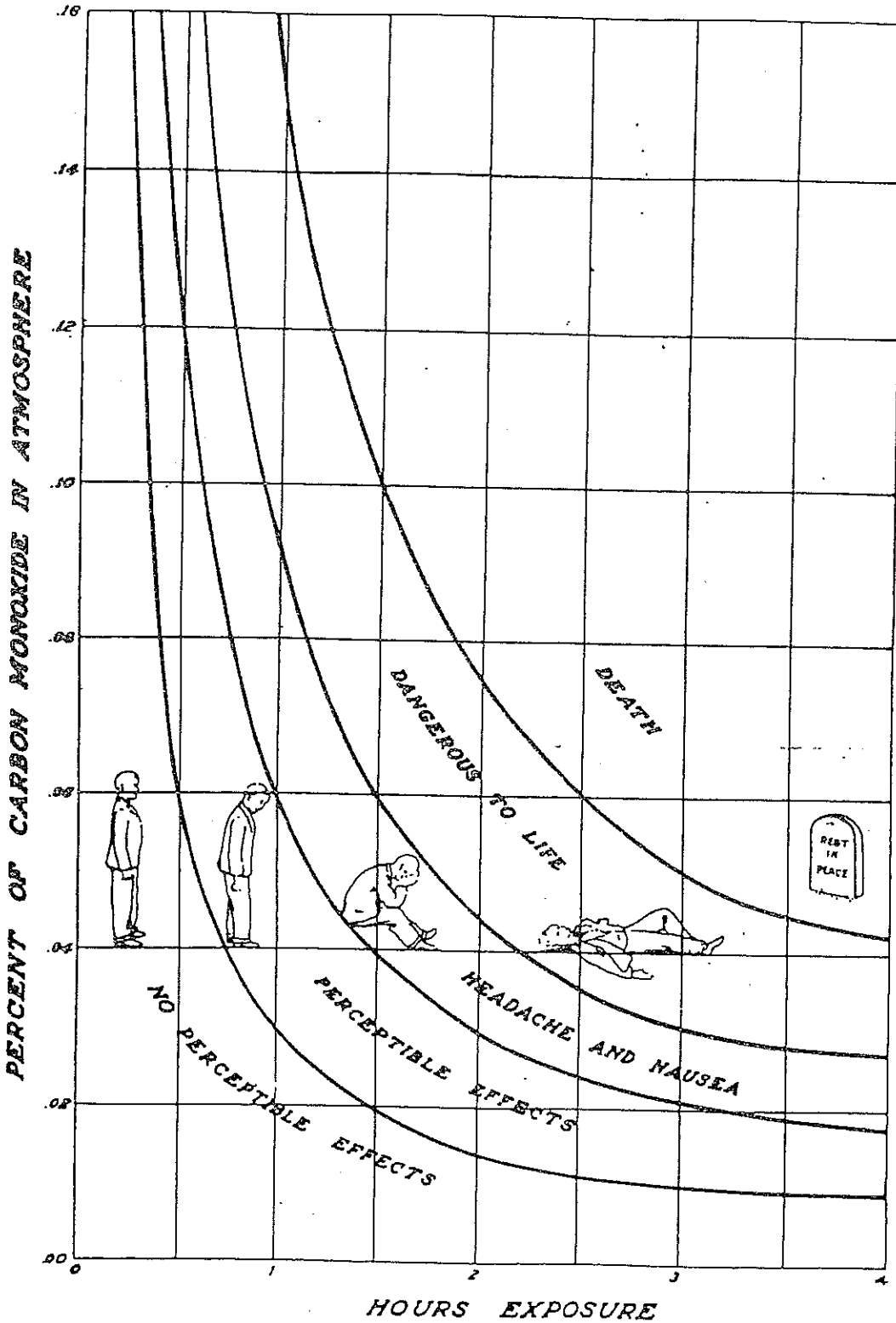
**75. Should apparatus crews recover bodies from unventilated areas?**

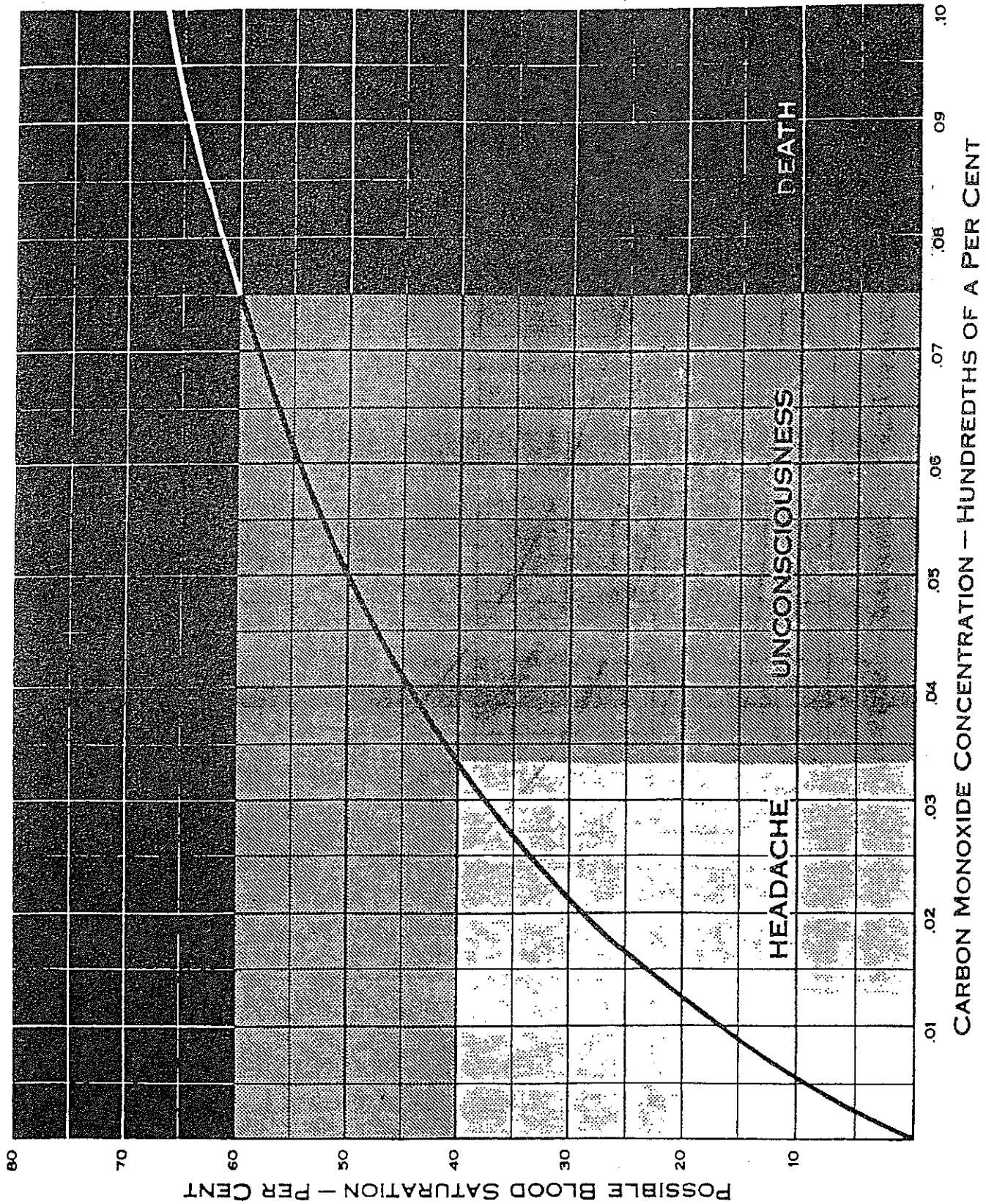
Ordinarily, men encumbered with apparatus should not exhaust their strength in carrying bodies any great distance to fresh air.





**EFFECTS OF CARBON MONOXIDE  
FOR A GIVEN TIME ON HUMAN BEINGS**  
DATA FROM BUREAU OF STANDARDS TECH. PAPER 212



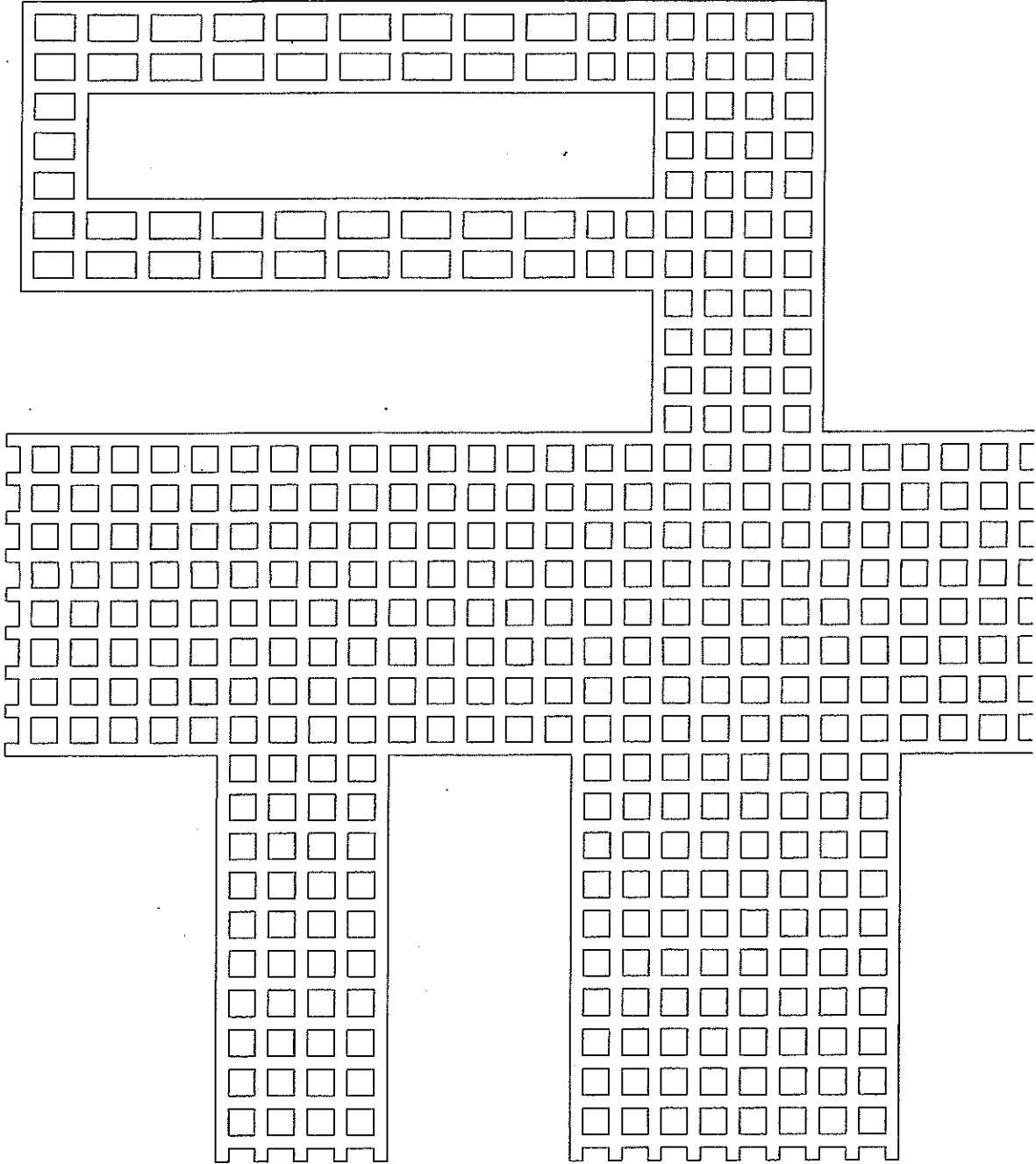


## Mine Rescue

- 1) The primary duties of a mine rescue team are \_\_\_\_\_
  - A) fight fires in the mine
  - B) search for missing people
  - C) gather information for rescue operations
  - D) B & C
  
- 2) To be considered for membership for a mine rescue team, each person must have been employed for a minimum of one year within the last 5 years. T F
  
- 3) A Fresh Air Base (FAB) is \_\_\_\_\_
  - A) The Command Center
  - B) The Underground base of operations
  - C) The farthest point explored
  - D) All the above
  
- 4) Mine Rescue team members must be certified as emergency medical technicians (EMT) T F
  
- 5) Mine Rescue team members must be trained in mine ventilation, mine gases, exploration and first aid. T F
  
- 6) Who is in charge of all fire fighting operations?
  - A) State
  - B) Federal
  - C) Captain of the mine rescue team
  - D) Mine Manager
  
- 7) What is the number of people needed to make up a rescue team/ \_\_\_\_\_
  - A) 4
  - B) 8
  - C) 6
  - D) 10
  
- 8) Encountering heavy smoke would be an immediate withdrawal for a mine rescue team. T F
  
- 9) How many teams are required at a mine emergency?
  - A) 1
  - B) 2
  - C) 4
  - D) As many as possible
  
- 10) A mine Rescue team consists of a captain, map man, two gas men, communication man, and the fresh air base man. T F



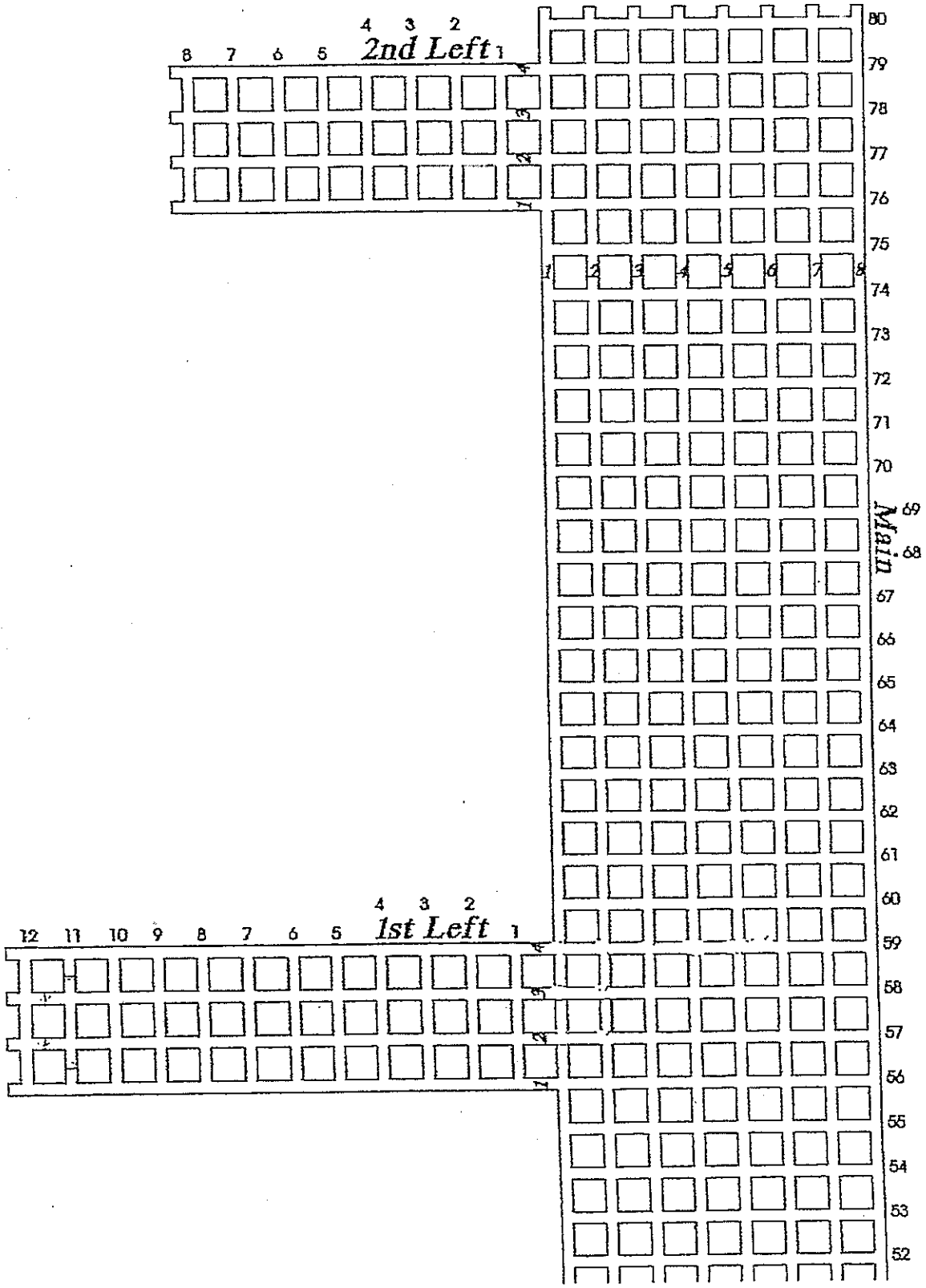
ACTIVE WORKING FACES



ACTIVE WORKING FACES

ACTIVE WORKING FACES









SOLID

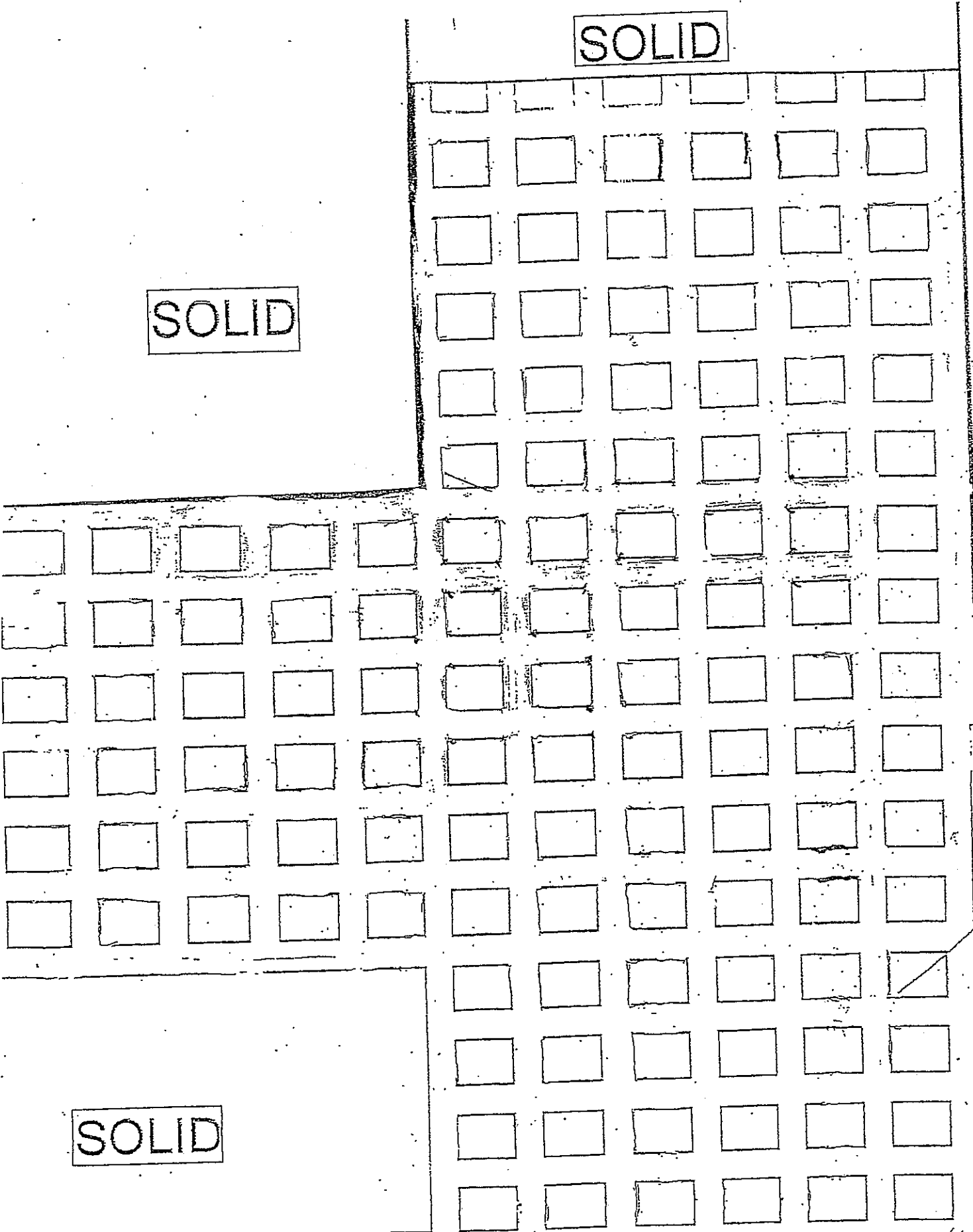
SOLID

SOLID

RETRACT

EXHAUST FAN

INTAKE





## NOTES



# WEEK 5



## PRACTICE TEST 2

- T F 1. The chemical symbol for methane is CH<sub>4</sub>.
- T F 2. The specific gravity of hydrogen sulfide is 1.919.
- T F 3. Methane can only be detected by laboratory analysis.
- T F 4. The explosive range of methane is 5 % to 15 %
- T F 5. The explosive range of carbon dioxide is 4.3 % to 46 %
- T F 6. Methane is poisonous
- T F 7. Methane supports combustion.
- T F 8. The explosive range of carbon dioxide is 12.5 % to 73 %
- T F 9. Carbon Monoxide is poisonous.
- T F 10. The ignition temperature of methane is 1100 to 1380 degrees.
- T F 11. Methane is not combustible.
- T F 12. The incidence of carbon monoxide in air is .03 %.
- T F 13. The specific gravity of carbon monoxide is .967.
- T F 14. Hydrogen sulfide is poisonous.
- T F 15. The explosive range of carbon dioxide is 12.5 % to 73 %.
- T F 16. The ignition temperature of carbon dioxide is 700 degrees.
- T F 17. Carbon monoxide originates from burning material, mine fires and explosions.
- T F 18. The ignition temperature of carbon monoxide is 1100 degrees.
- T F 20. An odor can be used to detect carbon monoxide.
- T F 21. The ignition temperature of hydrogen sulfide is 700 degrees.

- T F 22. Breathing high concentrations of methane will cause death by poisoning of the respiratory system.
- T F 23. Breathing even small amounts of hydrogen sulfide may destroy the sense of smell.
- T F 24. Carbon dioxide causes death by suffocation.
- T F 26. If carbon dioxide levels are high, then the oxygen levels will be low.
- T F 27. The maximum methane that is allowed before adjustments are made is 1.0 % in active working faces.
- T F 28. The oxygen content of air in any area of the mine shall be no lower than 19.5%.
- T F 29. The amount of air reaching the last open cross-cut in a working section is 9000 CFM
- T F 30. If a split of air in a return of an active section reaches 1.5 % of methane, then the unit must be evacuated and power to that section de-energized until the percent of methane is reduced to less than 1.5 %
- T F 31. The limit of methane allowable before a mine is classified as gassy is .5 % as determined by the State Mine Inspector.
- T F 32. It is suggested that all ventilating doors be adjusted to close automatically.
- T F 33. If the Inspector finds men working without the legal amount of air, he shall immediately order the mine evacuated.
- T F 34. Ventilating fans shall be operated continuously.
- T F 35. Ventilating fans shall be inspected each shift.
- T F 36. Ventilating fans shall have alarms that indicate when the fan stops.
- T F 37. Abandoned workings not yet sealed need not be ventilated if they are properly barricaded against entry by employees.
- T F 38. When the ventilating fan stops, the people must be evacuated immediately.



- T F 39. After a fan stoppage of 20 minutes, the workers may resume work immediately without the need of an examination.
- T F 40. After a fan stoppage of 10 minutes, only the immediate work area needs to be examined by competent persons for work to resume.
- T F 41. In any workings of a mine, methane is to be tested at a point not less than 12 inches from the roof, face and rib.
- T F 42. A State Mine Inspector can order a separate current of air for a smaller group or groups of men working in the mine.
- T F 43. All active underground working places in a mine shall be ventilated by a current of air containing not more than 0.8 % of carbon dioxide.
- T F 44. Booster fans may be used in mines if the mine has special permission from the State Mining Board.
- T F 45. Non-flame resistant brattice cloth shall be used in the construction of line brattice.
- T F 46. Ventilating fans shall be operated on a separate power circuit, independent of the mine circuit.
- T F 47. In all mines starting operation after July 1, 1947 the ventilating fan shall be installed on the surface in a fire proof building.
- T F 48. No person shall obstruct or cause an obstruction in any air current.
- T F 50. As evidence of his examination he shall inscribe his initials and the date with chalk in some suitable place as doors, roof, or walls of rooms, roadways, and the face.

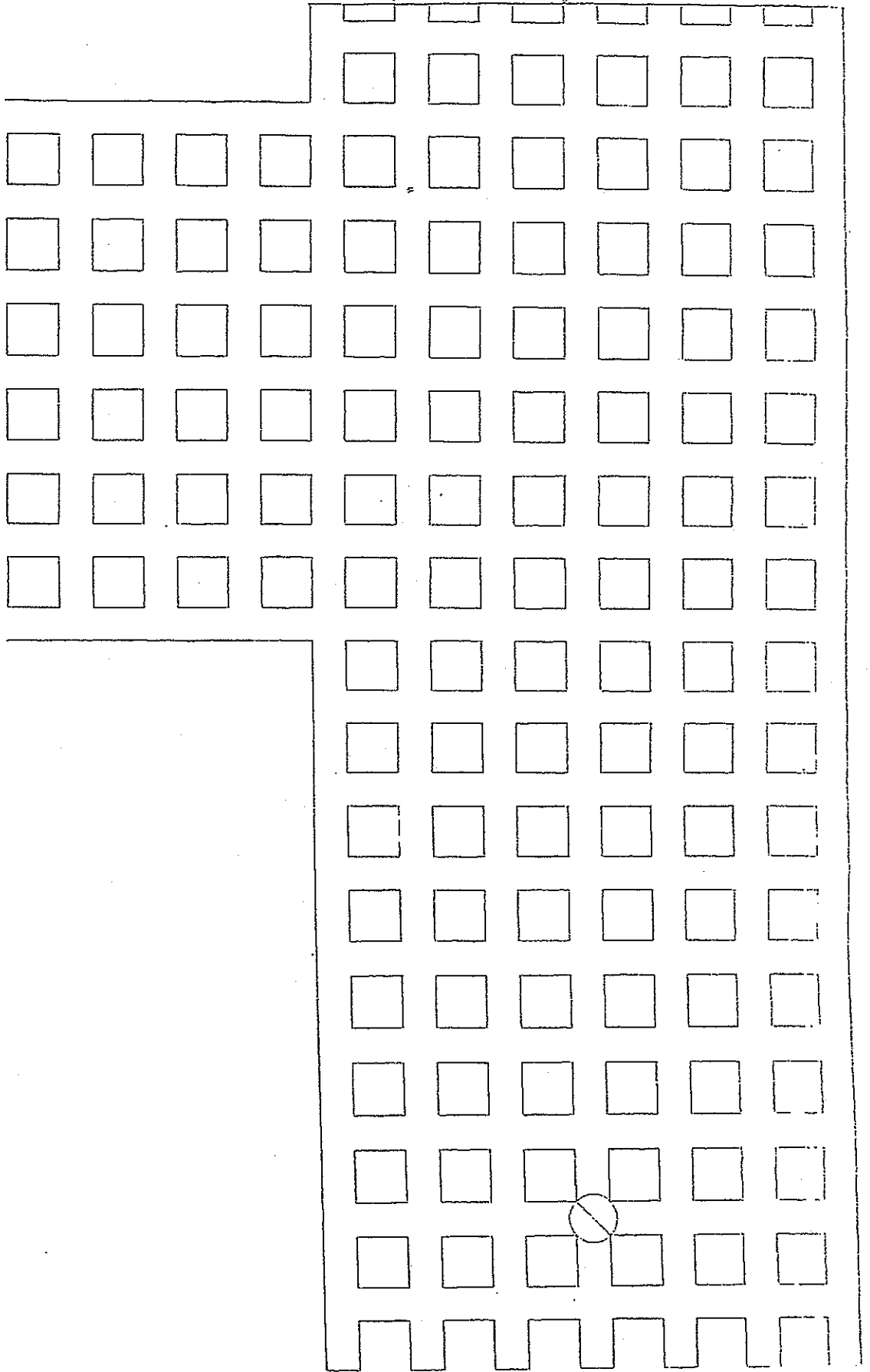


Article 29 & 30

- 1) In all mines adequate communication systems shall be established at
  - A) Top
  - B) Bottom to working section
  - C) Top and Bottom
  - D) All the above
  
- 2) T F Telephone lines other than cables shall be carried on insulators.
  
- 3) T F Repairs of the telephone line shall be up to the discretion of the mine foreman.
  
- 4) The operator of every mine shall see that necessary and proper support are provided in all \_\_\_\_\_ where men are required to work.
  
- 5) T F Timbers removed by mining machinery need not be replace.
  
- 6) T F Every employee exposed to hazards from falls of coal or rock shall examine roof, ribs and faces before starting to work.
  
- 7) T F Loose top and overhanging or loose face shall be removed or supported.

- T F 2. After damp is a combination of carbon monoxide, carbon dioxide, nitrogen, hydrogen, and decreased oxygen and smoke.
- T F 3. Hydrogen sulfide is extremely poisonous. .07% causes death in one hour and will destroy the sense of smell.
- T F 4. The possibility of a mine explosion is greater when there is a low barometer.
- T F 5. The pressure recording gauge on the fan house measures the atmospheric pressure.
- T F 6. Ventilating pressure can be measured at the fan house with a water gauge.
- T F 7. A barometer is legally required at every underground coal mine and daily readings taken and recorded when men are in the mine.
- T F 8. A mine is considered properly ventilated when it meets the legal requirements of the mine law.
- T F 9. Regulators on an exhausting system are normally placed on the return air entry.
- T F 10. All overcasts are required to have a mandoor.
- T F 11. The mine superintendent is the person who is legally responsible for the ventilation of the mine.
- T F 12. After a main fan failure in a gassy mine in which ventilation has not been restored in a reasonable time (15 minutes), all underground employees shall be removed from the mine.
- T F 13. The maximum percentage of methane allowable in active working places is 1.5%.
- T F 14. The maximum percentage of carbon dioxide allowable in active working places is 1.0%.
- T F 15. The volume of air in which an auxiliary fan may operate is two (2) times the manufacturer's maximum rated capacity of the fan.

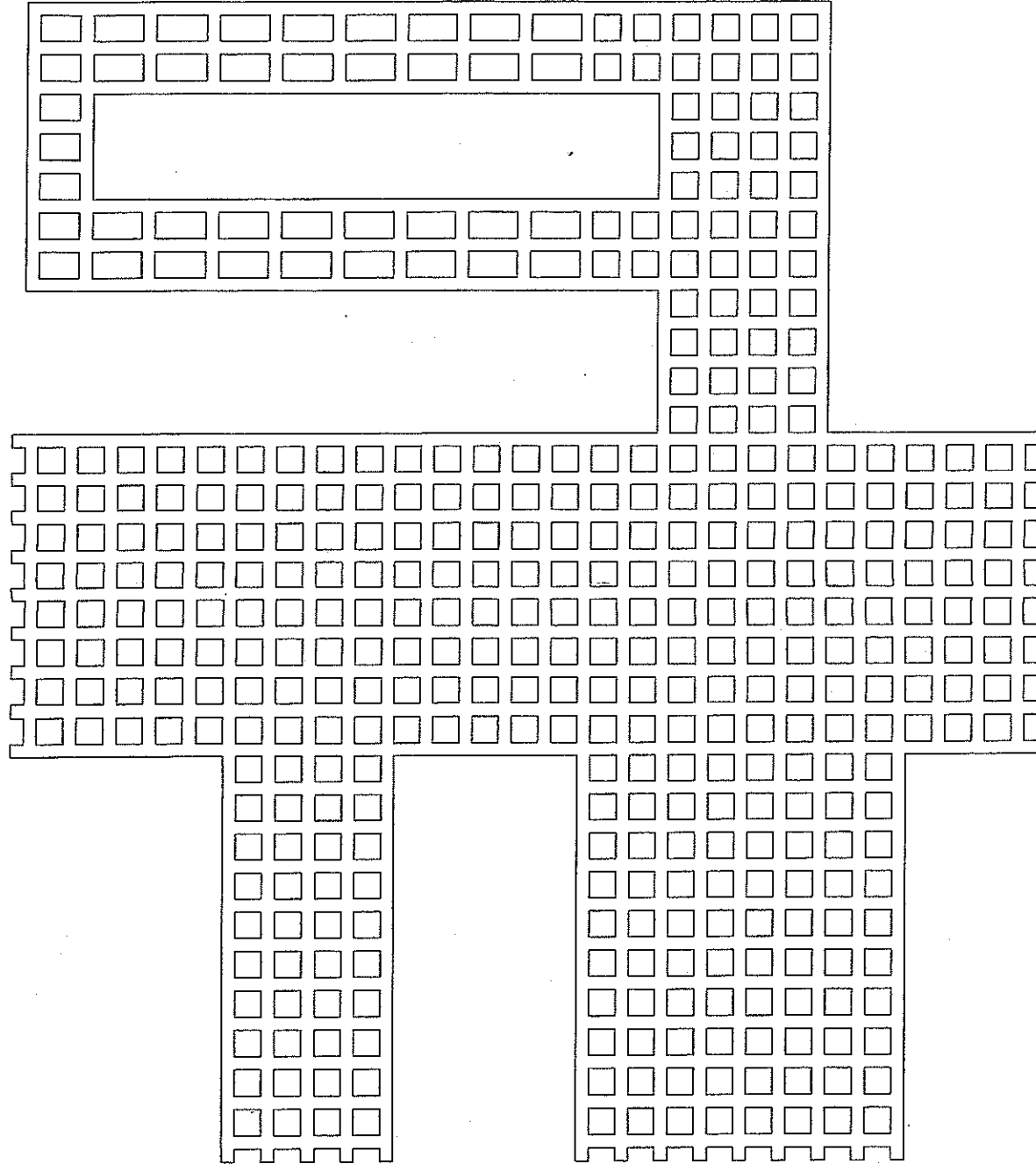
Active workings



Active workings



ACTIVE WORKING FACES



ACTIVE WORKING FACES

ACTIVE WORKING FACES





## NOTES



# WEEK 6



FIRST AID

1. Use of pressure points are the most reliable method of controlling bleeding  
True False
2. A person who has been knocked unconscious should be treated as if s/he has a neck or back injury  
True False
3. Any moderate or serious injury to a joint should be treated as if the joint were fractured.  
True False
4. A person who has an obstructed airway should be given four back blows.  
True False
5. Second degree burns should be treated with burn ointment and covered with a sterile dressing.  
True False
6. Psychological shock can make shock from loss of blood worse.  
True False
7. The \_\_\_\_\_ of an unconscious patient should be evaluated before first aid treatment is begun.  
1. Condition  
2. Name  
3. Airway  
4. None of the above
8. A sharp stabbing pain in the chest is not a sign of \_\_\_\_\_.  
1. Gall bladder attack  
2. Heart attack  
3. Indigestion  
4. None of the above
9. Anyone with first aid training can tell if a patient is \_\_\_\_\_.  
1. Diabetic  
2. Hypertensive  
3. Not breathing  
4. Faking

10. When splinting a suspected fracture of a joint you should \_\_\_\_\_.
1. Gently straighten the extremity
  2. Splint the extremity in the position found
  3. Splint the extremity in the position of function
  4. None of the above
11. Patients with extensive burns should always be evaluated for \_\_\_\_\_.
1. Excessive thirst
  2. Burns to the eyes
  3. Airway problems
  4. Neck injuries
12. Puncture wounds to the chest wall should \_\_\_\_\_.
1. Make a sucking noise
  2. Be covered with a sterile dressing
  3. Be covered with an airtight seal
  4. Be covered with merthiolate to prevent infection
13. After a person is struck by a falling object s/he should \_\_\_\_\_.
1. Be removed from the dangerous area
  2. Be asked questions about where he is
  3. Be evaluated for fractures
  4. None of the above
14. The most obvious sign of a skull fracture in an unconscious patient is \_\_\_\_\_.
1. A lump on the head
  2. Teeth missing from the mouth
  3. Bleeding or fluid leaking from the ears and nose
  4. None of the above
15. A person who is in shock should be \_\_\_\_\_.
1. Transported to the hospital as fast as possible
  2. Positioned with his feet elevated at least 12 inches
  3. Covered with a blanket
  4. All of the above
  5. None of the above
16. Maintenance of the patient's airway is always the first priority in first aid treatment.
- True False
17. Second degree burns can be life threatening.
- True False
18. Electrical shock is a form of physiological shock.
- True False

19. Giving an injured person fluids to drink will prevent her or him from going into shock.

True

False

20. Severe bleeding is best controlled by \_\_\_\_\_.

1. Tourniquet
2. Direct pressure
3. Pressure points
4. Elevation

21. A person who has been exposed to a hot environment for a long period of time and who has been found unconscious with hot, dry skin is in \_\_\_\_\_.

1. Heat exhaustion
2. Heat stroke
3. Heat cramps
4. Prostration

22. A person who has been exposed to a very cold environment and has developed a suspected case of frostbite should \_\_\_\_\_.

1. Have snow rubbed on the affected area
2. Be immersed in warm water
3. Be transported to the hospital
4. Be sent home

23. Shivering is the first sign of a dangerous condition known as \_\_\_\_\_.

1. Hypotension
2. Frostbite
3. Hypothermia
4. Frostnip
5. None of the above

24. A person who is a known diabetic and who is acting strangely or as if they are drunk should be given \_\_\_\_\_.

1. Oxygen
2. Sugar
3. Water
4. Aspirin

25. When a person has a seizure the most important treatment is \_\_\_\_\_.

1. Move objects, like chairs or tables, away from the patient
2. Hold the patient down so they won't hurt themselves
3. Insert something into their mouth so they don't bite their tongue
4. Maintain their airway in case they choke on vomit
5. 1 and 4
6. 2 and 4
7. 2 and 3
8. None of the above

## FIRST AID TEST

1. The most effective way to control bleeding is:

- a. Tourniquet
- b. Pressure points
- c. Direct pressure
- d. Do not get cut

2. Always wrap a 2<sup>nd</sup> degree burn with a wet dressing.  
True or False

3. Bright red blood spurting from a wound is what type of bleed?

\_\_\_\_\_

4. When splinting, it is important to:

- a. Splint above the break
- b. Splint below the break
- c. Set the break before splinting
- d. A & B

5. Name the types of burns:

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_

6. How are burns described?

\_\_\_\_\_

7. Shocks occur in every accident.

True or False

8. List the treatment for shock.

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_

9. What is the second best method to control bleeding?

\_\_\_\_\_



10. How many pressure points are in the body?

\_\_\_\_\_

11. Name the types of bleeds.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

12. When treating for shock in a sunstroke victim, always elevate the feet.

True or False

13. Splints need not be padded.

True or False

14. To which burn/burns may Aloe Vera lotion be applied?

- a. 1<sup>st</sup> degree
- b. 2<sup>nd</sup> degree
- c. 3<sup>rd</sup> degree
- d. All the above

15. List the symptoms of shock:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_



## NOTES



# WEEK 7



## Certification Exam

### *Article 18*

1. True False Overhead power lines on the surface, carrying greater than 600 volts, shall be installed on insulators.
2. True False Any permanent surface transformers, not enclosed in a transformer house, must be surrounded by fencing not less than 5 feet high.
3. True False High voltage signs need only to be placed on all high voltage cables.
4. True False High voltage cables and or trolley wires shall be safely guarded and protected in areas where people may cross under or come in contact with.
5. True False Main power circuits entering the mine are required to have one disconnecting device or switch at the mouth of the working section.
6. At all transformer stations, a sufficient amount of \_\_\_\_\_ will be kept in a suitable location for the purpose of extinguishing fires.
  - a. sand
  - b. rock dust
  - c. fire extinguishers
  - d. any or all the above
7. Casings of transformers.
  - a. shall be grounded
  - b. insulated so people can touch them
  - c. painted with non-conductive paint
  - d. covered with ½" of rock dust.
8. At each switch board or power control switch there must be.
  - a. metal grating to keep your feet clean
  - b. wood platforms
  - c. rubber mats
  - d. B & C

### *Article 19*

1. True False Every coal mine in the State of Illinois shall have at least one escapement opening to the surface.
2. True False A separation of not less than 500 feet and not more than 2,000 feet will be a distance between the main shaft and an escapement shaft if 10 or more people are employed.
3. True False Every shaft, for the purpose of escapement, will be equipped with some form of substantial stairway.

# Certification Exam

## *Article 17*

1. True False From the mine bottom, crosscuts between entries shall not be made more than 65 feet apart unless otherwise given permission to do so by the Mining Board.
2. True False When entries or rooms are going to be abandoned, a cross cut shall be made near or at the face area before it is abandoned.
3. True False All stoppings, whether permanent or temporary, shall be constructed of masonry, concrete or other incombustible materials.
4. Any new method of mining that requires the driving of entries without cross cuts must notify and get permission from:
  - a. the State Mine Inspector
  - b. an Illinois Congressman
  - c. the Governor
  - d. the State Mining Board
5. Permanent stoppings must be constructed of:
  - a. masonry or concrete or other incombustible materials
  - b. concrete only
  - c. a good grade of wood or fabric that resists heat
  - d. all the above



# Certification Exam

## Article 16

1. True False Any cage used for hoisting men shall have adequate steel bonnet, enclosed sides, safety gates and chains, and bars or gates across the end of the cage when hoisting men.
2. True False The floor of the cage shall be constructed so it can carry the load and have a minimum of 8" X 8" openings so air can pass through when traveling in the shaft.
3. True False Cages shall be inspected each shift:
4. True False Cages, while lowering or hoisting men, shall not exceed a speed of 600 ft. per minute.
5. True False No person shall carry tools, timbers, etc. on the cage, except those materials he is immediately working with.
6. True False Socketed ropes will be cut off and re-socketed at least once each year.
7. Cages shall be inspected:
  - a. each shift
  - b. 2 times a day
  - c. every 4 hours
  - d. daily
8. A cage, while men are riding, shall not be lifted or lowered at a rate of speed greater than:
  - a. 200 feet per minute
  - b. 400 feet per minute
  - c. 600 feet per minute
  - d. 800 feet per minute
9. Workers may have with them on the cage, for the purpose of doing their assigned duties:
  - a. the necessary equipment or tools to do their job.
  - b. no more than 100 lbs of materials or tools
  - c. only such things like timbers, etc that will lay flat
  - d. no materials or tools

# Certification Exam

## Article 15

1. True False When using compressed air underground, the air lines shall be grounded and ran along other grounded devices such as tracks, water lines, belt lines, etc.
2. True False Where compressed air lines are being used, shut off valves shall be installed at every 1,000 foot interval.
3. True False Air lines can be repaired with a minimal amount of pressure in the lines if done by a qualified person.
4. True False Failure of compressed air tube to discharge, indicates that it will need to be pulled out of the hole and put into another hole and try again.
5. True False All persons shall re removed from adjoining working places where there is danger of breaking through while shooting or mining.
6. True False Air compressors may be used underground if they are equipped with permissible motors.
7. True False The shooting down of coal by compressed air shall not be done while men are at the working face.
8. When compressed airlines are new and first installed, they shall be tested to withstand an approximate minimum pressure of \_\_\_\_\_ per square inch.
  - a. 20,000 lbs
  - b. 10,000 lbs
  - c. 50,000 lbs
  - d. need not be checked when new
9. Blow-down valves or filling valves on compressed air lines at the face shall be located:
  - a. 2 cross cuts out-by the face
  - b. just around the corner of a coal pillar
  - c. shall not be installed in the line
  - d. none of the above

# Certification Exam

## Article 14

1. True False Buildings built within 100 feet of any mine opening shall be constructed of metal, cement, or fire-proof wood.
2. True False All explosive material stored on the surface shall be not less than 300 feet from all other mine buildings.
3. True False All explosive materials shall be stored in fireproof magazines on the surface.
4. True False Any building housing a hoisting engine or boiler, shall be constructed of fireproof construction such as metal, or fire retardant wood.
5. True False Any hoisting engine building shall be no closer than 60 feet to shaft openings.
6. No oils or flammable material shall be stored within \_\_\_\_\_ feet of hoisting and escapement shafts.
  - a. 100
  - b. 50
  - c. 200
  - d. 150
7. Buildings that are housing the hoisting engine shall be within \_\_\_\_\_ of a shaft or other mine openings.
  - a. not less than 100 feet
  - b. not more than 100 feet
  - c. not less than 60 feet
  - d. not less than 50 feet

# Certification Exam

## Article 13

1. True False No person shall smoke, carry smoking materials, or carry lighters, matches, or any other spark or flame creating devices in gassy mines.
2. True False Every miner should be required to sound the roof of his working place only when he encounters loose roof or other dangerous conditions.
3. True False No person shall cross a danger signal without the permission of his section supervisor.
4. True False No person shall enter or leave a mine without recording the fact by some suitable check-in , check-out system.
5. True False No person shall enter or work in a mine, or any such area or parts connected with a mine, while using drugs.
6. True False A person may be subject to dismissal or discharge for testifying in any hearing held under the Coal Mining Act.
7. True False The State Mine Inspector has the authority to enforce any mine roof control plan.
8. True False Bulletin, notices, or record books may be eliminated and/or destroyed after a period of six (6) months.
9. Working rules provided by a mine shall be complied with:
  - a. when it is convenient
  - b. it does not alter the day to day operations
  - c. always complied with
  - d. when a task is not made more difficult
10. Any mine roof control program or plan must be approved by:
  - a. the rank and file employee
  - b. the State Mine Inspector and the Mining Board
  - c. the State Examining Board
  - d. Mine Safety and Health Administration

### Practice problems

1) We have an airway that is 7 ft. high and 10 ft. wide, and the anemometer shows that 500 ft. is the velocity per minute. What is the quantity of air passing per minute?

2) If the velocity of an air current is 75 ft per minute in an airway  $6\frac{1}{2}$  ft by  $18\frac{1}{2}$  ft, what is the quantity of air passing per minute?

3) The large hand on the anemometer goes around  $4\frac{1}{2}$  in an airway 6 ft. high and 12 ft. wide. What would be the velocity of the air current? What would be the quantity of air passing through the airway?

4) An airway 7 feet by 6 feet, is passing 28,000 cubic feet per minute through it. How much air will pass through an airway 5 feet by 5 feet if the velocity is the same in each airway?

5) If 15,400 cubic feet of air is passing through an entry which is 5 feet 6 inches high and 14 feet wide, what is the velocity of the air current?

6) The anemometer shows 150 feet per minute in an airway that measures 10 feet six inches at the top and 12 feet six inches at the bottom and is six feet high, find the quantity of air passing per minute.

### Practice Problems

7. The velocity of an airway 6 ft. by 12 ft. is 500 fpm. What will the velocity where the airway is constricted to an area of 5 ft. by 12 ft?
8. The hand of an anemometer turns 3.75 in a minute. The airway is 9 ft high and 4 ft wide at the top and 6 ft wide at the bottom. Find the velocity of the air current.

9. An airway measures 20 ft wide and 4 ft high. The anemometer has a reading of 250 fpm for one minute. What is the quantity of air passing through the entry?

In the same airway your methane spotter gives you a reading of .8% CH<sub>4</sub>. What is the total cfm of methane in the airway?

How much air is needed to dilute the methane to .3%?

How much air must be added to accomplish this?

10. We have an arched airway which is 18 ft wide and 6 ft high from floor level to the beginning of the arch. From floor level to the top of the arch it is 15 ft. What is the area of this airway?

In this same airway we have an anemometer reading of 250 fpm, what is the quantity of air passing through this airway?

If we take a methane reading in this same airway, and find we have .5% methane in the airway, what is the cfm of methane?

In this same airway, how much air must be added to dilute the methane to .2%?

## NOTES





# WEEK 8



## MISCELLANEOUS

### TRUE/FALSE

- \_\_\_\_\_ 1. No coal shall be produced, nor shall any face equipment be operated, while there is an interruption in communication.
- \_\_\_\_\_ 2. There must be at least 3 permissible lamps and 1 barometer at each mine.
- \_\_\_\_\_ 3. The mine manager designates who will clean and maintain the lamps.
- \_\_\_\_\_ 4. The two principles of roof bolting are the conventional and resin methods.
- \_\_\_\_\_ 5. When timbering toward an area of poor roof conditions, the first row of timbers should be placed no closer to the bad top than within at least one row of bolts under good top.
- \_\_\_\_\_ 6. Water and gas may be a contributing factor to poor roof conditions.
- \_\_\_\_\_ 7. You are more likely to find gas in mines where the roof conditions are good rather than poor.
- \_\_\_\_\_ 8. You are more likely to find gas in mines that are deep as opposed to those that are shallow.
- \_\_\_\_\_ 9. The purpose of the gauzes in a lamp are to prevent any foreign materials from entering the lamp.
- \_\_\_\_\_ 10. The SCSR will last for a period of 2 hours.
- \_\_\_\_\_ 11. The FSR will last for a period of 45 minutes.
- \_\_\_\_\_ 12. It is legal to remove the FSR from your person at any time for any reason, as long as it is kept within 25 feet of you.
- \_\_\_\_\_ 13. Underground explosive magazines must be placed in the return, at least 10 feet from roadways or trolley wires.
- \_\_\_\_\_ 14. No more than a four-day supply of explosives shall be stored underground.
- \_\_\_\_\_ 15. A hygrometer measures the moisture content of the air.
- \_\_\_\_\_ 16. A FSR will protect the wearer from 2% CO.

- \_\_\_\_\_ 17. The SCSR will protect the wearer from any harmful or noxious gas.
- \_\_\_\_\_ 18. It is possible to have too much coal dust to have an explosion.
- \_\_\_\_\_ 19. The amount of coal dust sufficient to propagate an explosion is any amount that may become suspended in air.

## Practice Exam

version 1

1. T \_\_\_ F \_\_\_ The Mine Manager is responsible for all activities at the mine
2. The Mine Manager will visit each working place in the mine at least \_\_\_\_\_
3. A suitable \_\_\_\_\_ whereby the entrance into and departure from the mine of each employee shall be positively indicated.
4. When the mine is to be operated, the prescribed work places shall be examined \_\_\_\_\_ to the beginning of next shift.
5. T \_\_\_ F \_\_\_ On non-coal producing shifts, the mine shall be examined in it's entirety the same as for coal producing shifts, except where persons are to work only in the shaft, slope, drift or on the immediate bottom.
6. An examination is good for \_\_\_\_\_ hours.
7. T \_\_\_ F \_\_\_ The mine will be examined at least once during each coal producing shift.
8. A \_\_\_\_\_ shall be required at all coal mines.
9. T \_\_\_ F \_\_\_ An anemometer measures the quantity of air.
10. Where shall examinations be made? \_\_\_\_\_
11. Chalk markings shall be made in any suitable place except for \_\_\_\_\_
12. T \_\_\_ F \_\_\_ When dangerous conditions are found, the first thing the examiner shall do is report the findings to the Mine Manager.
13. T \_\_\_ F \_\_\_ A daily record shall be kept of each examination.
14. T \_\_\_ F \_\_\_ The Mine Manager can act as an examiner at anytime.
15. T \_\_\_ F \_\_\_ The certificate of any mine examiner may be revoked by the State Mine Inspector.
16. T \_\_\_ F \_\_\_ Accidents shall be reported to the Mine Examiner.
17. By law, there shall be \_\_\_\_\_ Mine Rescue Stations in the State.
18. T \_\_\_ F \_\_\_ No person shall cross a danger signal without the permission of the mine manager or his assistant.
19. No flammable material shall be stored within \_\_\_\_\_ feet of any hoisting or escapement shaft.
20. All explosive material shall be stored in a \_\_\_\_\_ located on the surface not less than \_\_\_\_\_ feet from other buildings.

21. Cages and cars used for handling workers shall be equipped with \_\_\_\_\_
22. T \_\_\_ F \_\_\_ Cages shall be inspected once a shift.
23. Cages on which workers are lowered or lifted shall not exceed a speed of \_\_\_\_\_
24. T \_\_\_ F \_\_\_ Cross cuts between entries shall never exceed 60 feet.
25. Permanent stoppings shall be constructed of \_\_\_\_\_
26. Permanent stoppings shall be erected within \_\_\_\_\_ feet of the face.
27. \_\_\_\_\_ shall be kept in places at each switchboard and power control switch when shock hazards exist.
28. There shall be \_\_\_\_\_ distinct and available means of egress.
29. The distance between the main shaft and the escapement shaft shall not be less than \_\_\_\_\_ feet and no more than \_\_\_\_\_ feet.
30. T \_\_\_ F \_\_\_ Platforms in stairways shall be 5 feet by 5 feet.
31. T \_\_\_ F \_\_\_ There shall be 2 travelable passageways to the surface and one of these must be return air.
32. T \_\_\_ F \_\_\_ Every magazine shall be provided with a metal floor kept free of grit and dirt.
33. T \_\_\_ F \_\_\_ All detonators and blasting caps will be kept apart from the explosives.
34. The area surrounding a magazine shall be kept free from rubbish for not less than a distance of \_\_\_\_\_ feet.
35. Individual containers used to carry permissible explosives shall be constructed of \_\_\_\_\_
36. Explosives and detonators kept near the face shall be stored not less than \_\_\_\_\_ from power lines.
37. Not more than a \_\_\_\_\_ supply of explosives shall be stored underground.
38. T \_\_\_ F \_\_\_ Only one type of explosive may be stored in a magazine.
39. How long should one wait after a misfire before anyone returns to the shot? \_\_\_\_\_
40. \_\_\_\_\_ shall be provided and placed at substations, transformers and permanent pump stations.

41. T \_\_\_ F \_\_\_ All fire fighting operations are under the direct supervision of the State Mine Inspector.
42. T \_\_\_ F \_\_\_ Underground storage places for lubricating oil and grease in excess of two days shall be of fireproof construction.
43. T \_\_\_ F \_\_\_ All persons in an underground workings of a gassy mine are prohibited from creating any arc, spark or open flame, except those that cannot be avoided in the normal performance of work.
44. T \_\_\_ F \_\_\_ Test of CH<sub>4</sub> in normal cutting and welding operations shall be made before and during the operation.
45. Timbers removed by mining machinery, blasting operations or for any other reason, shall be \_\_\_\_\_.
46. T \_\_\_ F \_\_\_ All flammable fluids shall be contained in portable, closed, metal containers.
47. T \_\_\_ F \_\_\_ Coal dust and other combustible materials shall be allowed to accumulate in dangerous quantities only in specific areas designated by the State Mine Inspector.
48. All underground mines shall be rock dusted to within \_\_\_\_\_.
49. All rock dust shall pass through a \_\_\_\_\_ and at least 70% shall pass through a 200 mesh sieve.
50. Every vertical shaft in which workers are hoisted and lowered shall be equipped with a \_\_\_\_\_ and \_\_\_\_\_ running from top to bottom.
51. All active underground workings places shall be ventilated by a current of air containing \_\_\_\_\_.
52. The minimum quantity of air reaching the last open cross cut is \_\_\_\_\_.
53. In an Illinois coal mine, what is the minimum amount of air required per person? \_\_\_\_\_.
54. What does the CH<sub>4</sub> content need to reach before adjustments will be made to dilute the methane? \_\_\_\_\_.
55. When the CH<sub>4</sub> content reaches \_\_\_\_\_, workers will be withdrawn from the portion of the mine endangered.
56. T \_\_\_ F \_\_\_ In virgin territory where large volumes of CH<sub>4</sub> is liberated and permissible equipment is used, it shall be necessary to withdraw and cut off power when the CH<sub>4</sub> content exceeds 2%.
57. The main current of air shall be so split to separate currents of air for every \_\_\_\_\_ men at work.

58. T \_\_\_ F \_\_\_ The State Mine Inspector shall have the authority to have separate currents of air for smaller groups.
59. A mine is considered gassy if a State Mine Inspector \_\_\_\_\_
60. T \_\_\_ F \_\_\_ Doors will be adjusted to close automatically.
61. Ventilating fans need only run to keep air movement in the mine.
62. What is the recording device which measures ventilating pressure? \_\_\_\_\_
63. Where is this device located? \_\_\_\_\_
64. T \_\_\_ F \_\_\_ All ventilating fans shall be equipped with audio and visual warning devices.
65. T \_\_\_ F \_\_\_ Ventilating fans shall have a separate power source.
66. T \_\_\_ F \_\_\_ The ventilating fan shall be inspected each shift.
67. T \_\_\_ F \_\_\_ Rock dust can be used to prevent a possible explosion from being propagated by coal dust.
68. T \_\_\_ F \_\_\_ Permanent stoppings must be made of non-combustible materials.
69. T \_\_\_ F \_\_\_ Oxygen is not supportive of combustion.
70. T \_\_\_ F \_\_\_ Supplies of rock dust, water lines and hose, water or chemical trucks or fire extinguishers are suitable fire-fighting equipment.
71. T \_\_\_ F \_\_\_ The amount of smoke is not always an indication of how much CO a fire is generating.
72. T \_\_\_ F \_\_\_ Water and gas may be contributing factors to poor roof conditions.
73. T \_\_\_ F \_\_\_ Atmosphere containing 19% O<sub>2</sub> is considered deficient.
74. T \_\_\_ F \_\_\_ An increase in temperature causes gas to contract.
75. T \_\_\_ F \_\_\_ H<sub>2</sub>S has a recognizable odor. similar to rotten eggs
76. T \_\_\_ F \_\_\_ The main requirement of airways are that they be of sufficient area and kept free from obstructions.
77. T \_\_\_ F \_\_\_ Splitting a ventilating current is dividing the main current into separate individual currents.
78. T \_\_\_ F \_\_\_ Two systems of ventilation are force and exhaust.



79. T \_\_\_ F \_\_\_ A respirable atmosphere is one that cannot sustain life.
80. T \_\_\_ F \_\_\_ Low barometric pressure will not affect gas in the mine.
81. T \_\_\_ F \_\_\_ Carbon monoxide can be detected with safety lamp, CO detector and chemical analysis.
82. T \_\_\_ F \_\_\_ Only .10% of CO in air causes complete collapse.
83. T \_\_\_ F \_\_\_ CO<sub>2</sub> causes death by suffocation by excluding oxygen from the blood stream.
84. T \_\_\_ F \_\_\_ The explosive range of CO<sub>2</sub> is 4.37% to 12.5%
85. T \_\_\_ F \_\_\_ Nitrogen is found naturally in air.
86. T \_\_\_ F \_\_\_ When the oxygen content is below 10% a methane explosion cannot occur.
87. T \_\_\_ F \_\_\_ Methane is an explosive gas, but does not support combustion.
88. T \_\_\_ F \_\_\_ The specific gravity of H<sub>2</sub>S is 1.191
89. T \_\_\_ F \_\_\_ A barometer measures atmospheric pressure
90. Name the types of external bleeds. \_\_\_\_\_
91. What is the best way to control bleeding? \_\_\_\_\_
92. T \_\_\_ F \_\_\_ A severe head injury changes the way you treat for shock.
93. Describe a secondary burn. \_\_\_\_\_
94. Name the 3 types of burns and how they are classified. \_\_\_\_\_  
\_\_\_\_\_
95. What is the compression ratio compared to ventilations when doing CPR on an adult. \_\_\_\_\_
96. T \_\_\_ F \_\_\_ If a victim is bleeding severely and the dressing becomes saturated with blood. it is best to remove the soaked dressing and apply fresh sterile dressing.
97. T \_\_\_ F \_\_\_ Air quality in which diesel equipment is operated shall be sampled to determine if the air is within limits in respect to CO, NO, and CO<sub>2</sub>.
98. T \_\_\_ F \_\_\_ A filter self rescuer is designed to give oxygen independent of outside air.
99. What is meant by rubbing surface? \_\_\_\_\_
100. List all area formulas and ventilating formulas. \_\_\_\_\_  
\_\_\_\_\_



## NOTES

