

Mine Foreman Training

Ventilation

Unit 7 – Part 2

Ventilating A Mine

**Program developed by
Wayne Collett
Office of Mine Safety & Licensing
2006**



The purpose of mine ventilation is to provide a safe and productive working environment for men and equipment in underground mines.



As a mine foreman, you must be able to ventilate a mine according to state and federal regulations.



**Many of you have you
been involved with the
ventilation process at a
mine, whether at the face
or outby the section.**



You have already been working with ventilation controls such as: curtains, stoppings (also called brattices), regulators, bleeders, doors, overcasts and undercasts, and fans.



Ventilation controls are used to bring fresh air from outside the mine, direct it to all working places in the mine, and then return it to the surface.



However, you have to know how these ventilation controls are used and shown on mine maps.

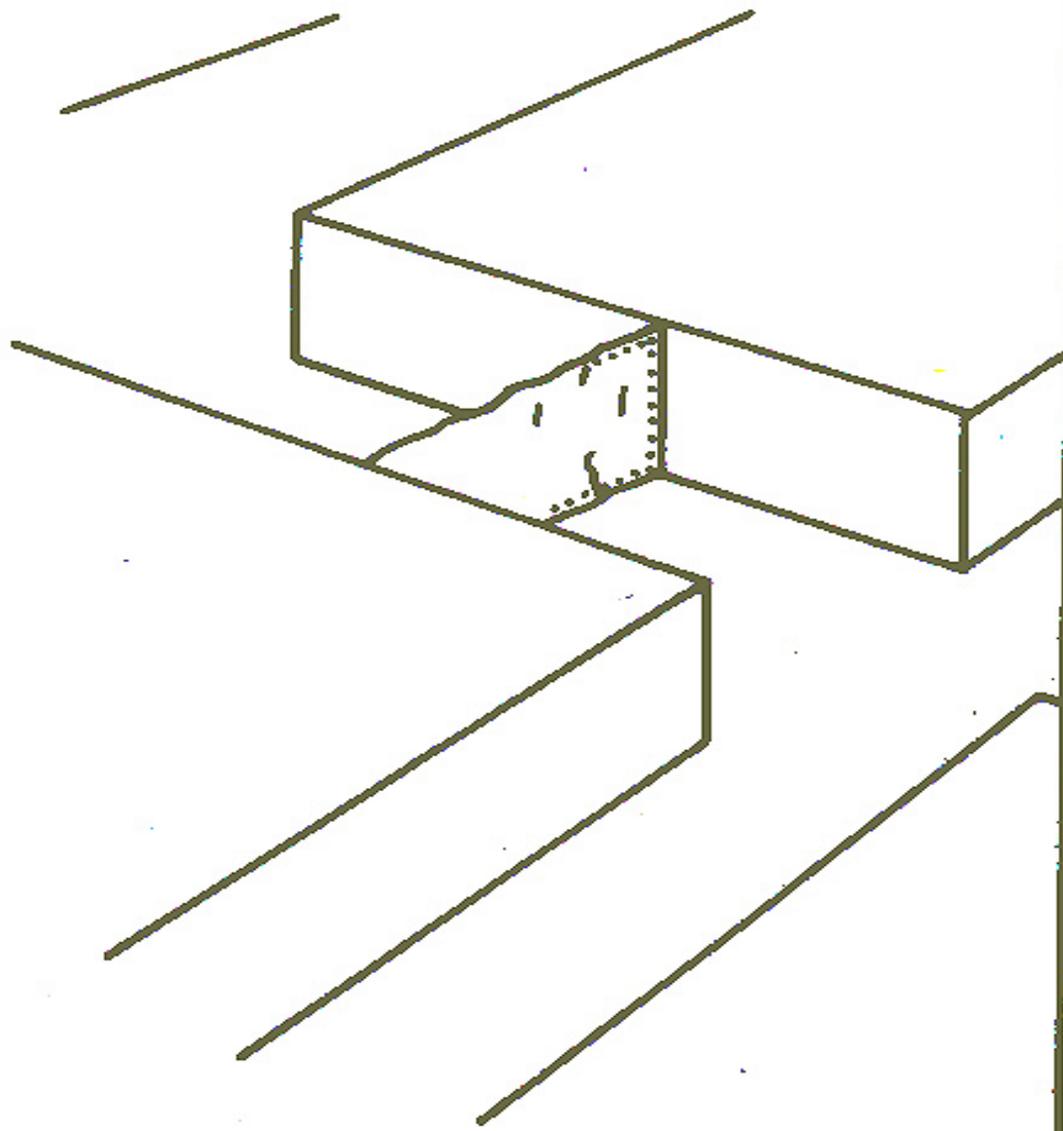


The following slides show how ventilation controls are used in a mine and shown on map.



curtains

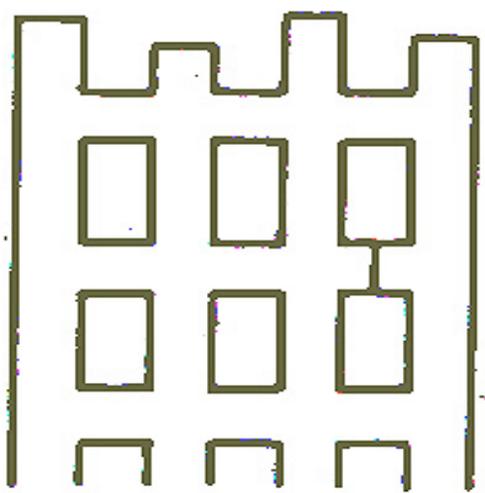
IN THE MINE . . .



THE SYMBOL . . .

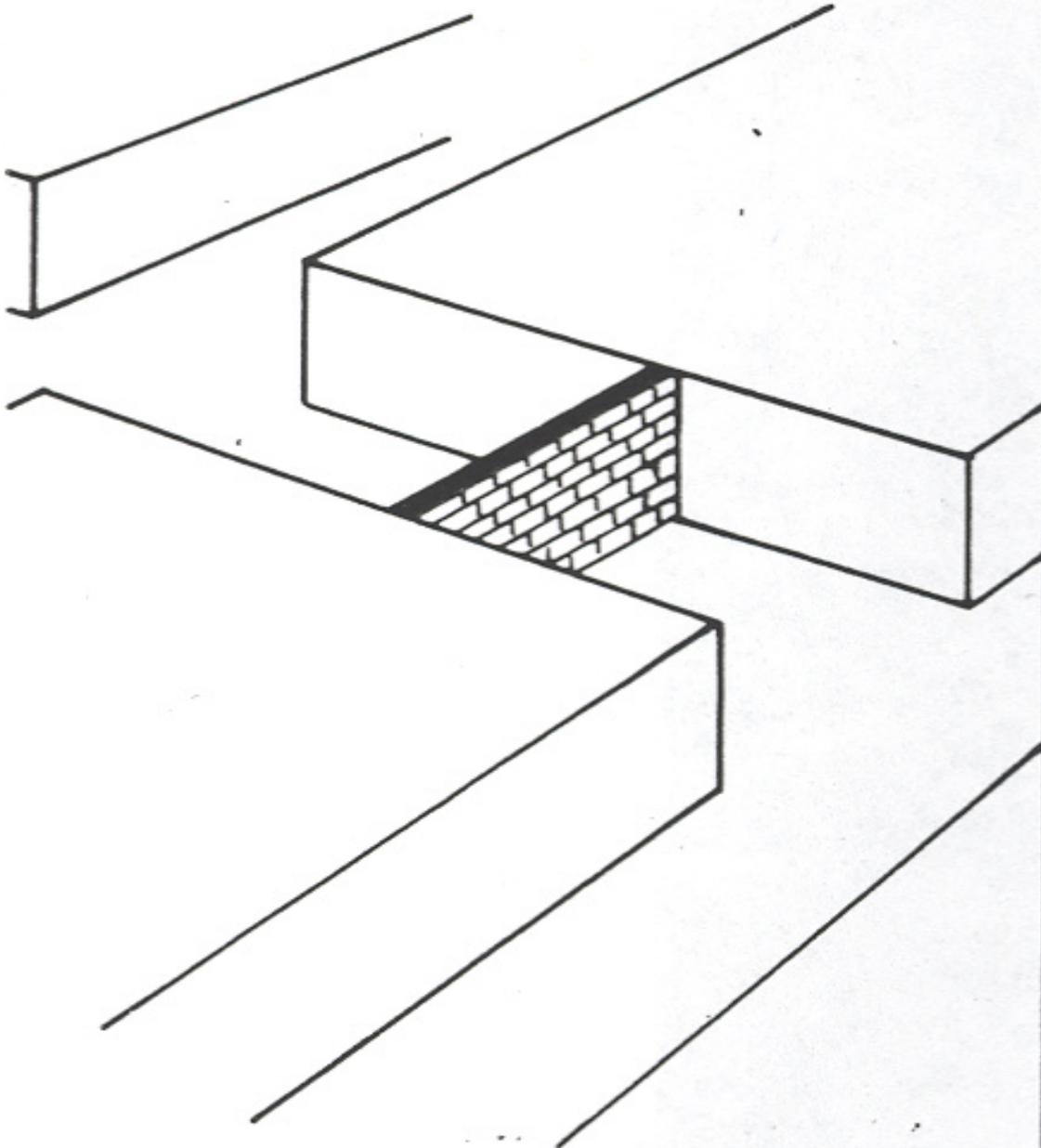


ON THE MAP . . .



Permanent Stoppings

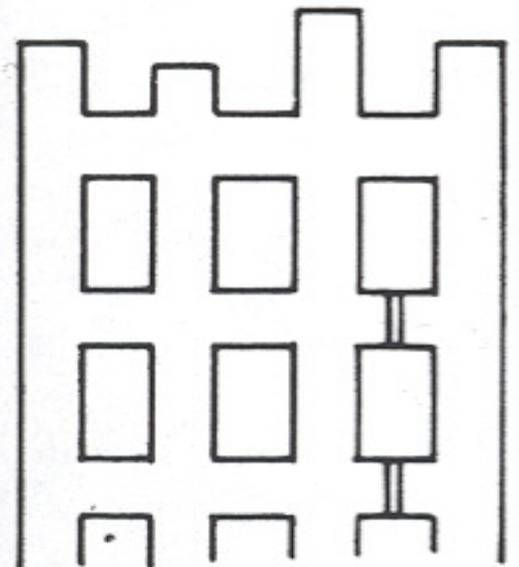
IN THE MINE . . .



THE SYMBOL . . .

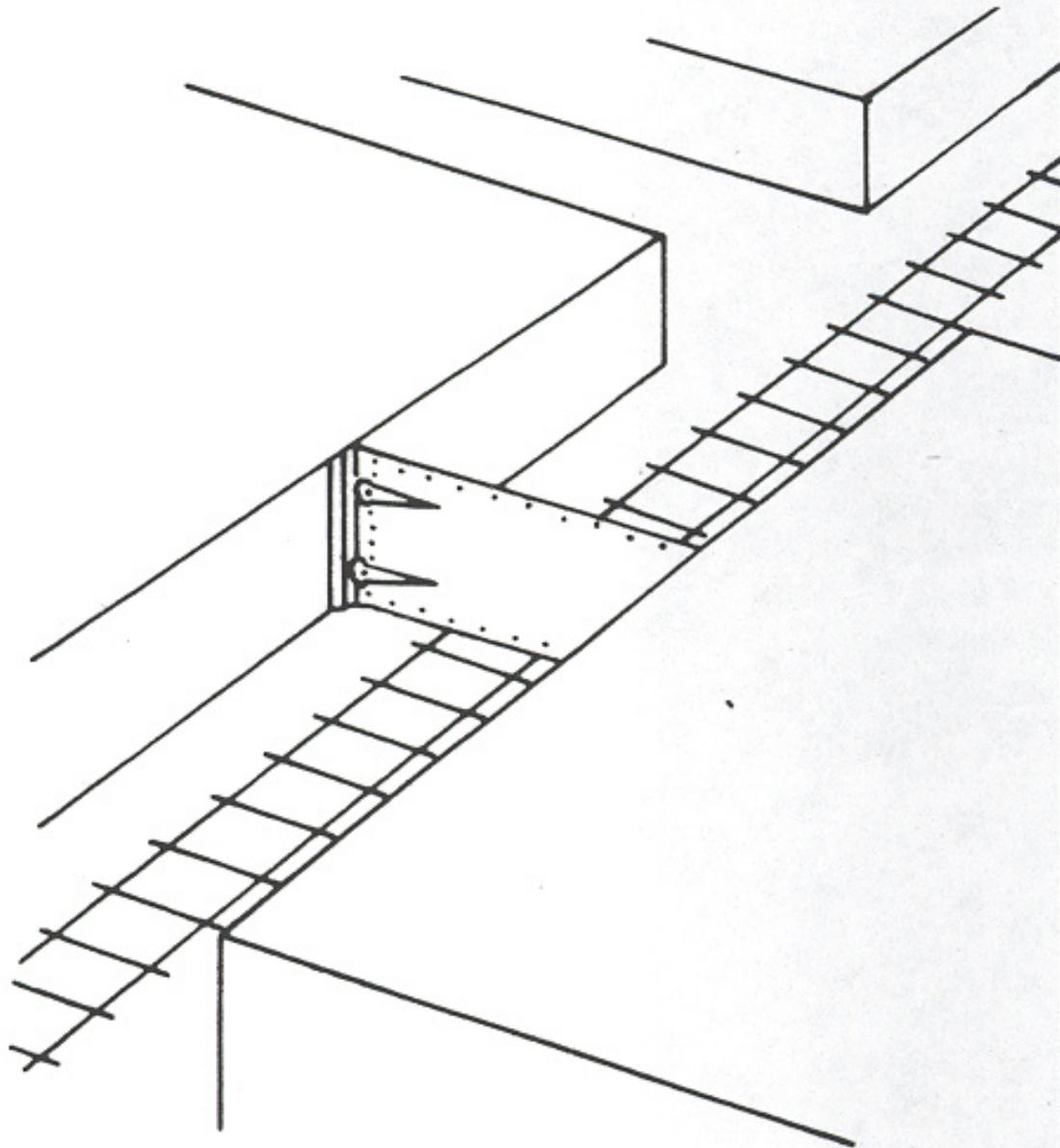


ON THE MAP . . .

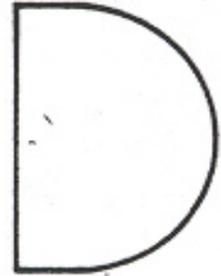


Door

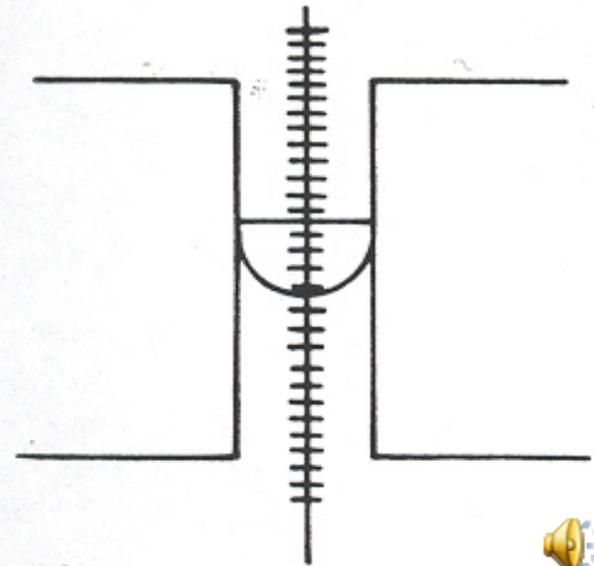
IN THE MINE . . .



THE SYMBOL . . .

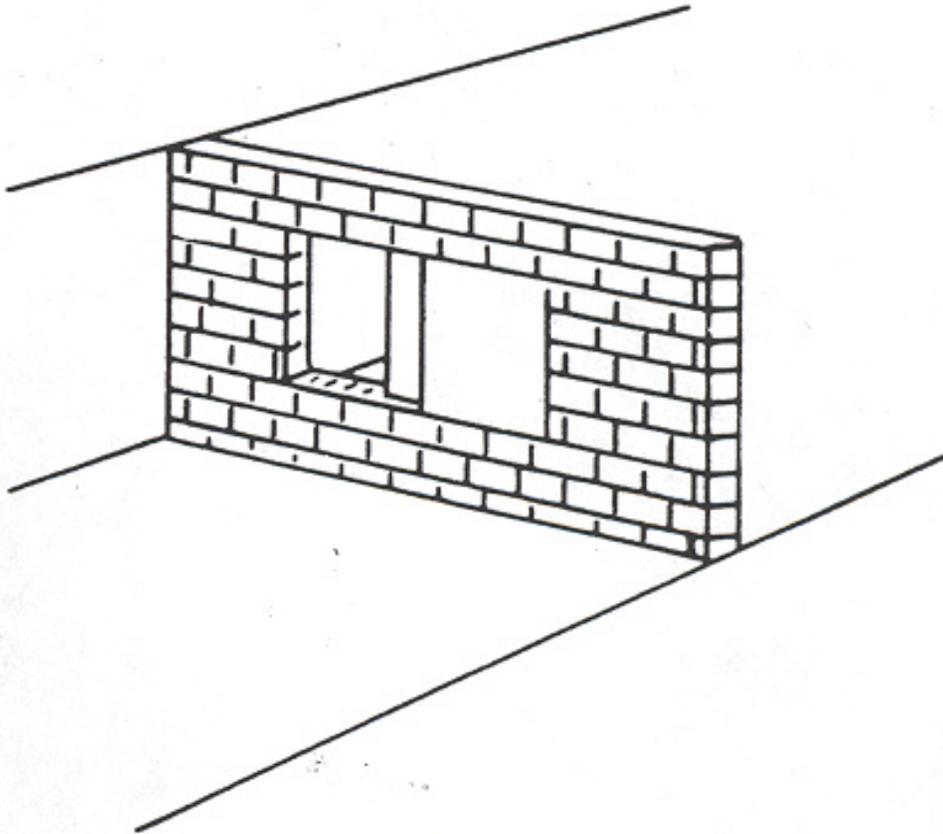


ON THE MAP . . .



Regulator

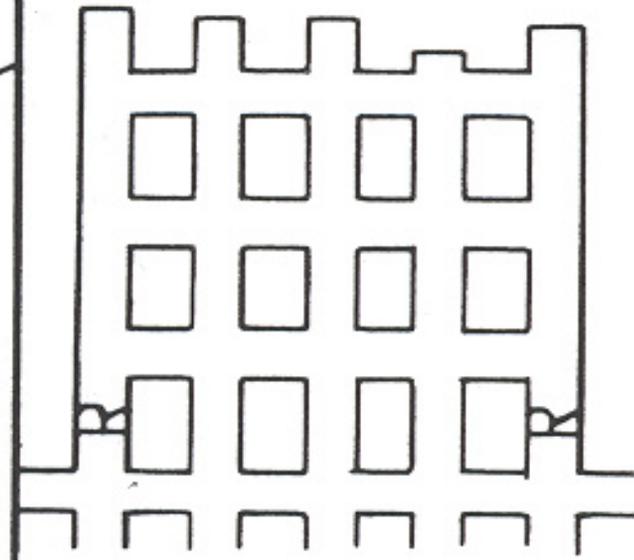
IN THE MINE . . .



THE SYMBOL . . .

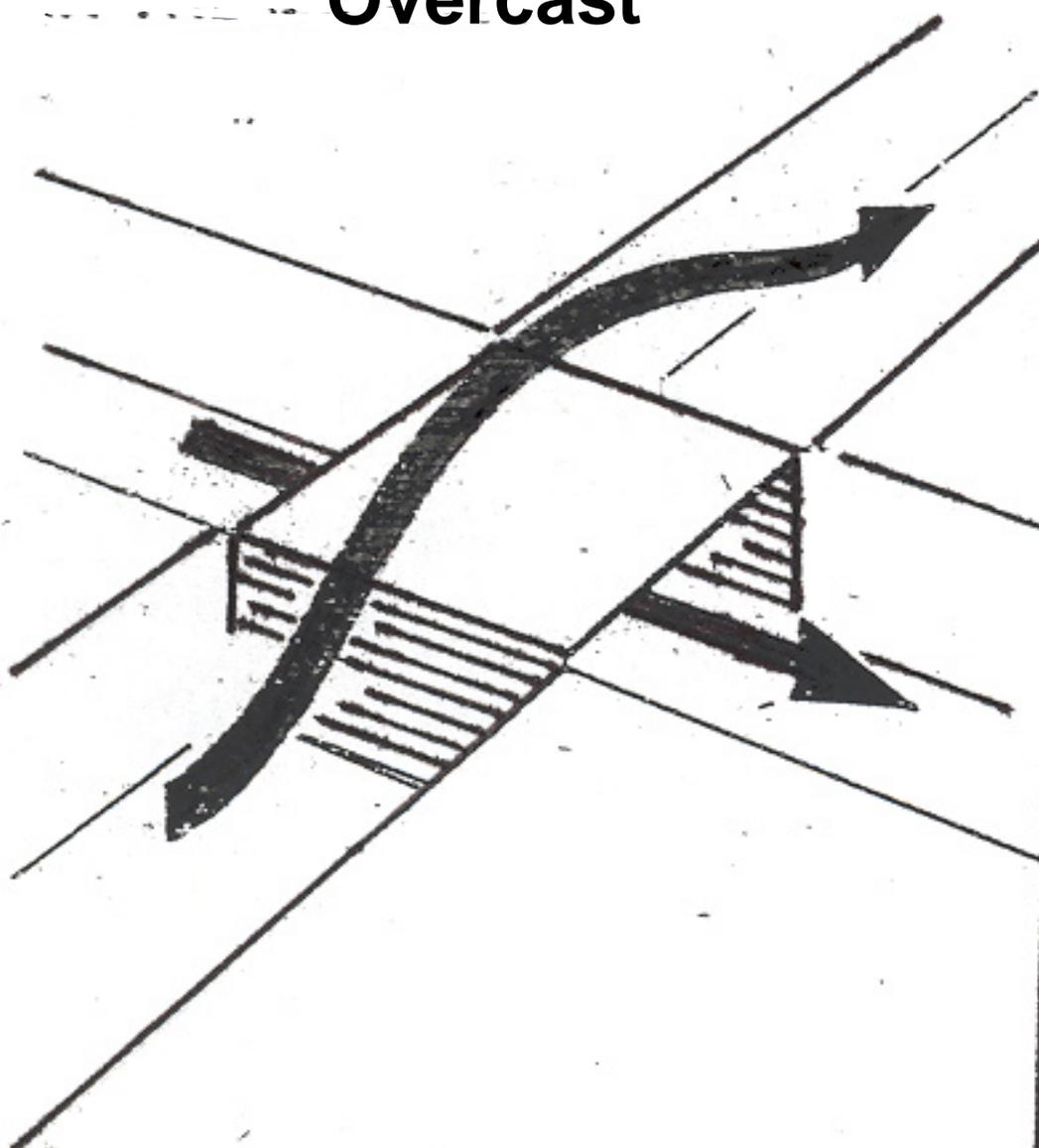


ON THE MAP . . .

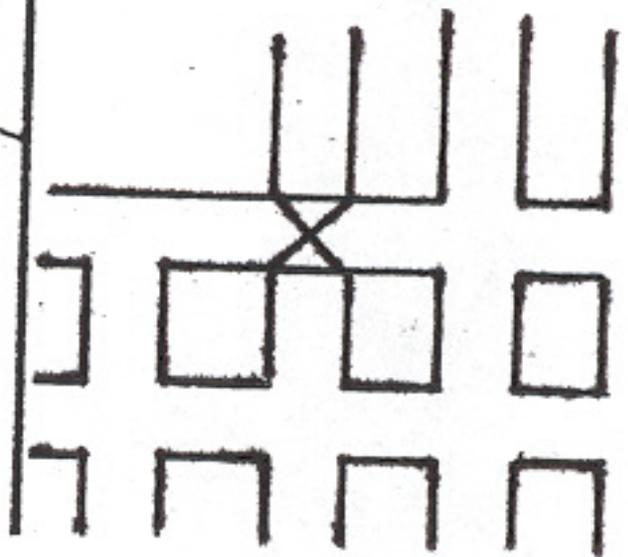


Overcast

The Symbol



ON THE MAP ...

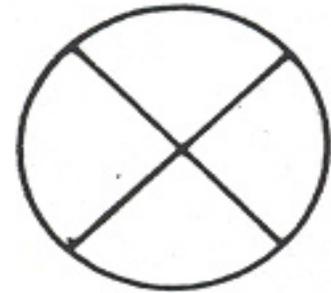
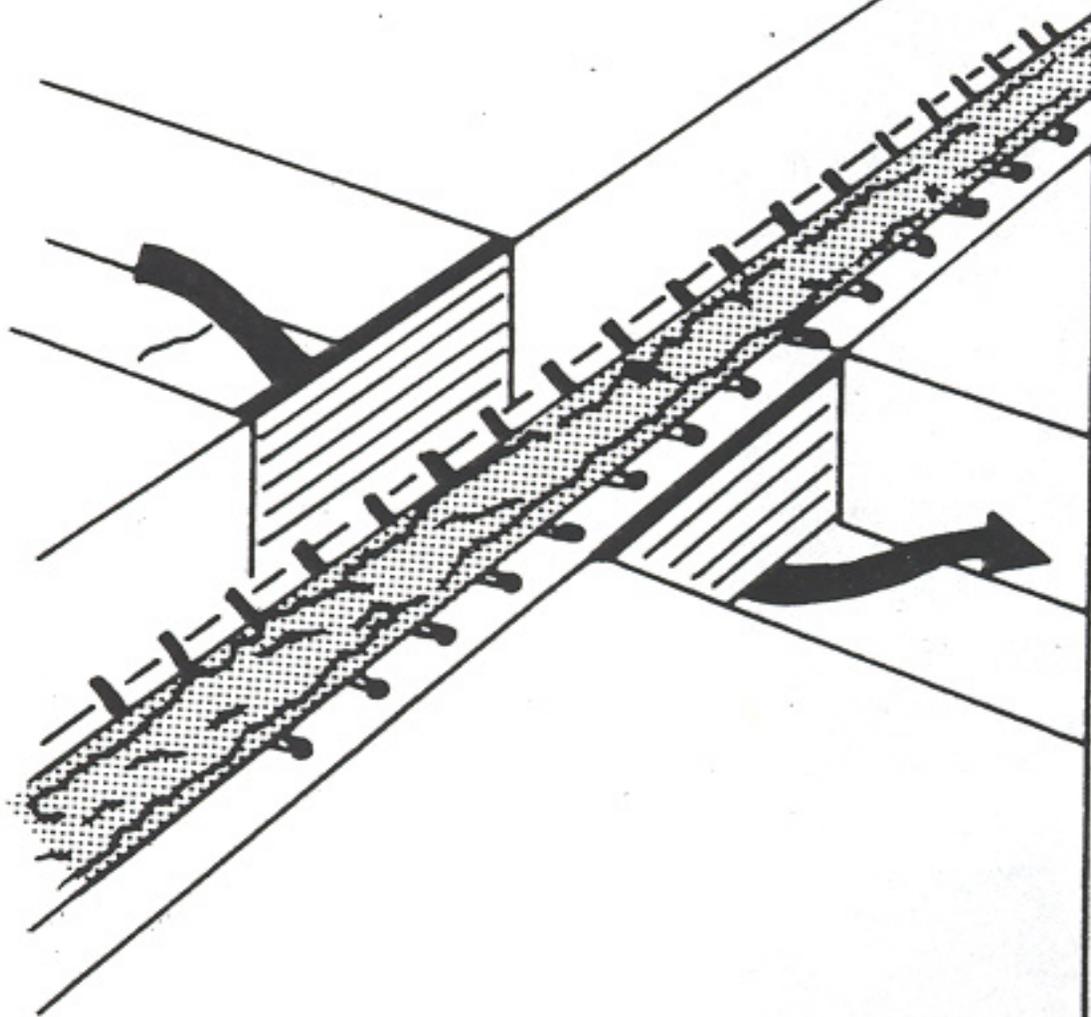


IN THE MINE

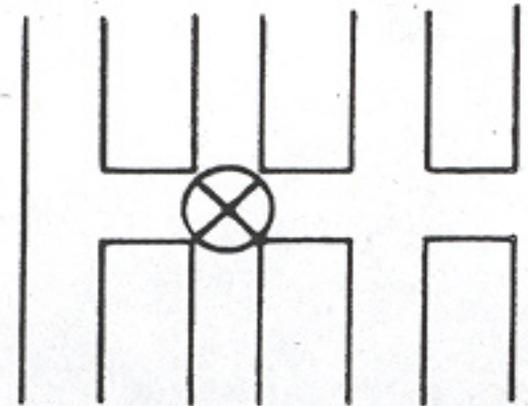


IN THE MINE . . .

THE SYMBOL . . .



ON THE MAP . . .



Undercast



As part of your mine foreman certification exam, you will be required to ventilate a map, using ventilation controls to course the air from the surface to all underground mine workings and return the air to the surface without “short circuiting or mixing” return air with intake air.



Let's review some maps that have been properly ventilated, using ventilation controls to course the air from the surface to all mine workings and then back to the surface.



When you first see these maps, they will look complicated to you. But after completing this course you will realize that they are not.



Also, remember that these maps can be ventilated in more than one way.

(Instructors will briefly review the maps with the class)



PROPERTY LINE

"V"

"V"
"V"
"V"

"V"

PROPERTY LINE

NORTH MAINS

SECOND EAST

SECOND WEST

FIRST WEST

FIRST EAST

GAS WELL

"V"

VENTILATE ACCORDING TO KENTUCKY MINING LAW

- | | | | |
|---|--------------------|-----|---------------|
| ▨ | PILLARED OUT AREA | --- | LINE BRATTICE |
| ⊥ | TEMPORARY STOPPING | ⊥ | DOOR |
| ⊥ | PERMANENT STOPPING | ⊥ | CHECK CURTAIN |
| ⊥ | OVERCAST | ⊥ | MEN |
| R | REGULATOR | ⊥ | BELT |
| B | BLEEDER | ⊥ | TRACK |
| → | AIR CURRENT | ⊗ | FAN |
| S | SUB-STATION | | |

NAME _____

INSTRUCTIONS

1. VENTILATE NORTH MAINS SO THAT #1, #2, AND #3 ENTRIES ARE RETURN AIR.
2. THE #1 ENTRY OF FIRST EAST SECTION SHALL BE INTAKE AIR.
3. USE #4 ENTRY OF SECOND EAST SECTION AS A BLEEDER ENTRY.
4. VENTILATE SECOND WEST SECTION ACCORDING TO STATE MINING LAW.
5. THE TRACK ENTRY IN FIRST WEST SECTION SHALL BE IN INTAKE AIR.
6. MARK VIOLATIONS OF STATE MINING LAW WITH A "RED V".
7. SHOW FAN INSTALLATION ACCORDING STATE MINING LAW.

EXPLOSION
DOORS OR
WEAK

Map No. 1

SCALE: 1" = 100' 1"

Map drawn by
Bill Morgan
5/97

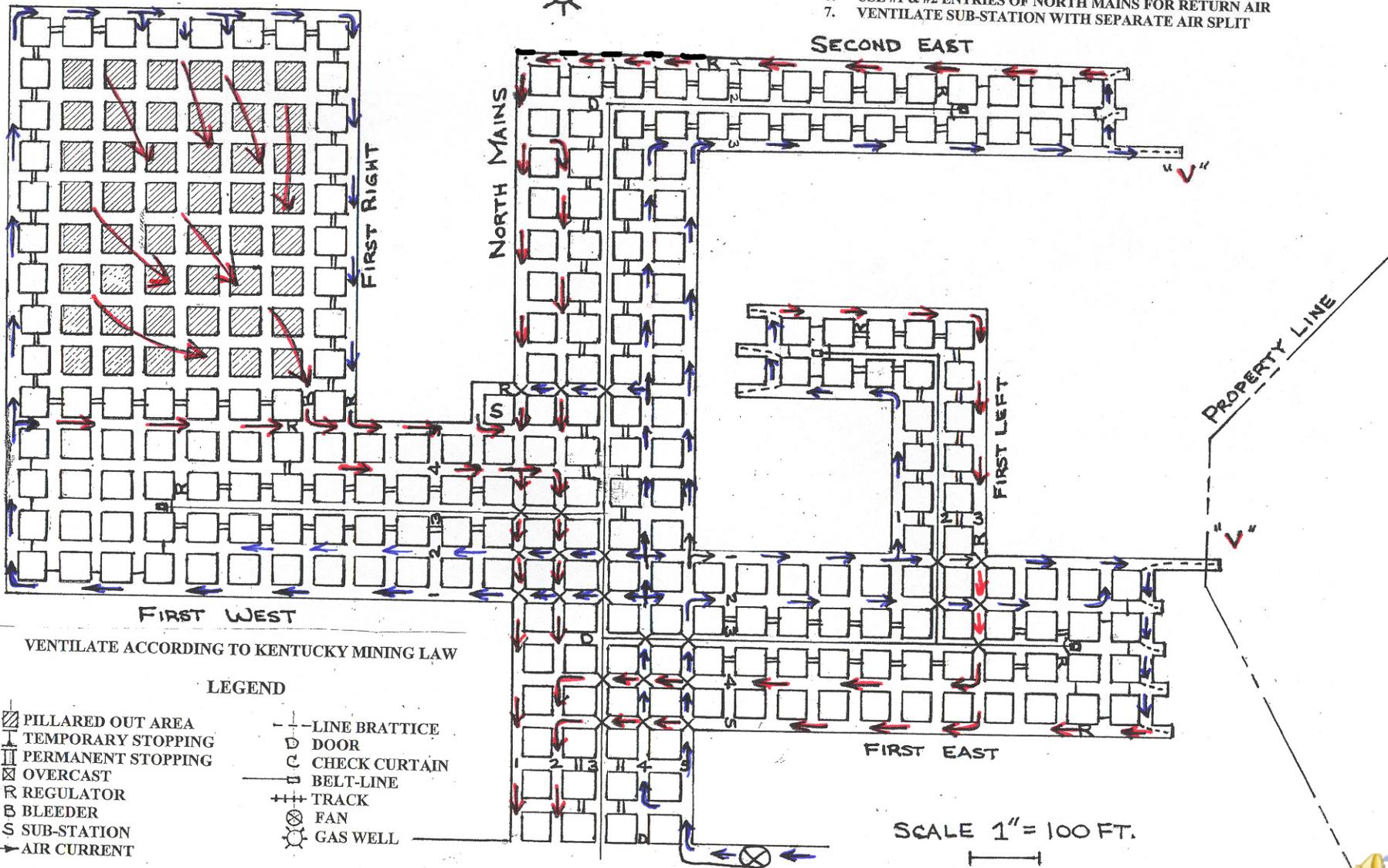


Map drawn by
Wayne Collett
1/98

Map No. 2

INSTRUCTIONS

1. MARK ALL VIOLATIONS
2. VENTILATE FIRST EAST & FIRST LEFT WITH SEPARATE AIR SPLITS
3. VENTILATE SECOND EAST ACCORDING TO STATE LAW
4. VENTILATE FIRST WEST USING #1 & #2 FOR INTAKE AIR
5. USE BLEEDER FOR FIRST RIGHT OFF FIRST WEST
6. USE #1 & #2 ENTRIES OF NORTH MAINS FOR RETURN AIR
7. VENTILATE SUB-STATION WITH SEPARATE AIR SPLIT



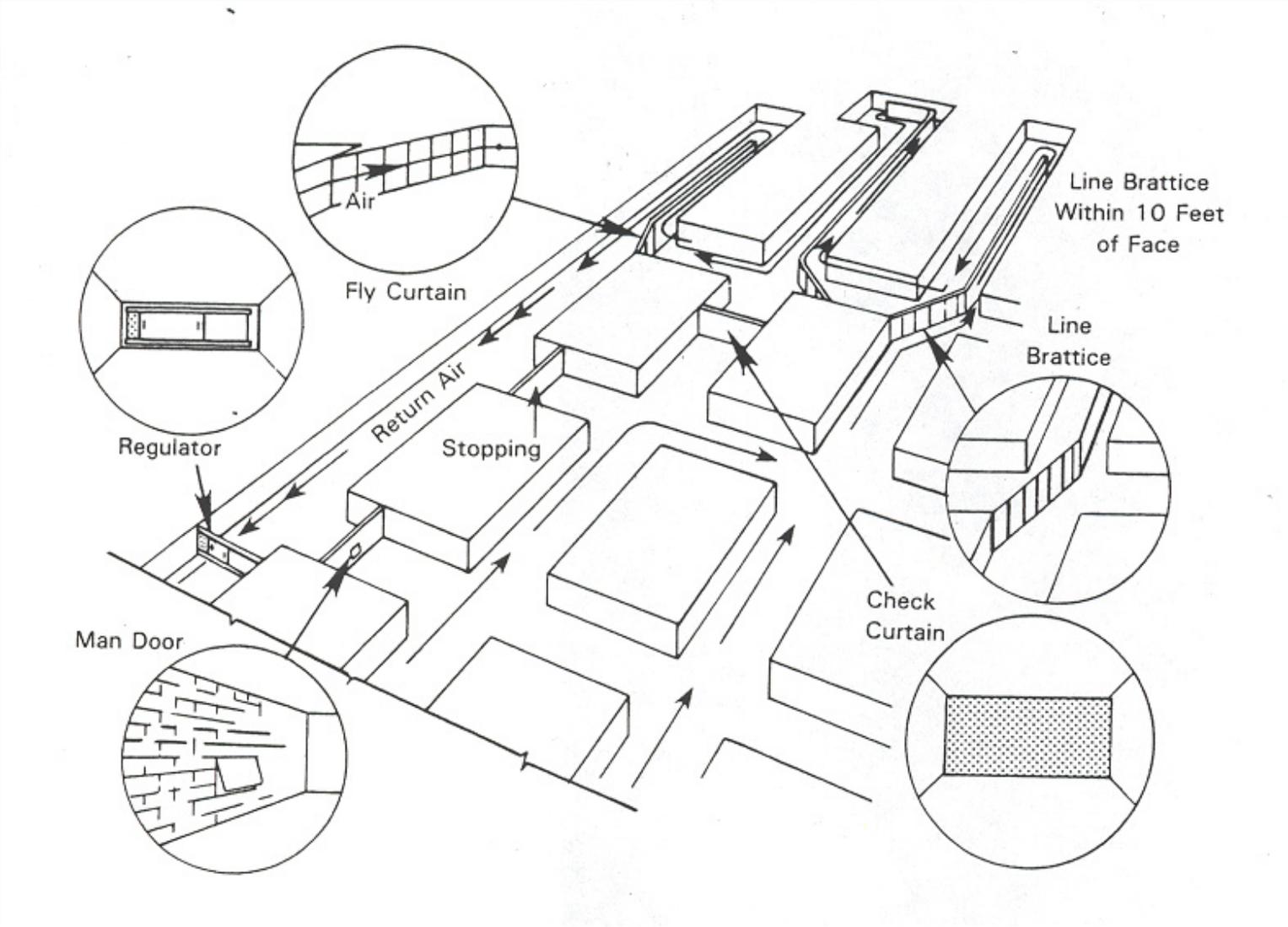
In order to learn how to ventilate mines similar to the ones you have just seen, you must first learn how to ventilate a mine with only one (1) section.



The next slide will help you understand how the ventilation controls are used on a section and how they may appear on a map.



Instructors: Review this with the class.

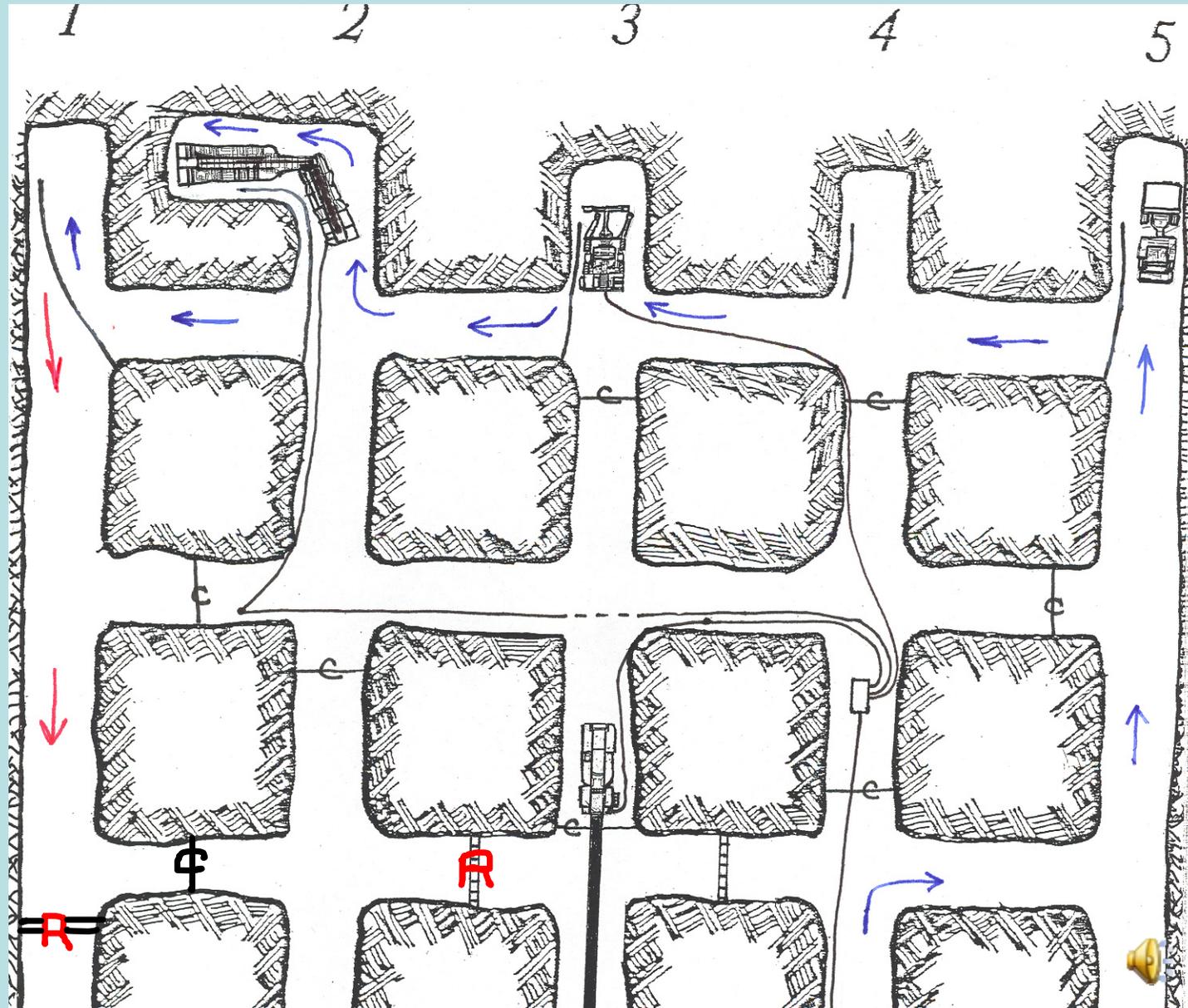


The following slide is a face area of a typical five-entry mine that utilizes a continuous miner for the production of coal.



TYPICAL FACE AREA OF A FIVE ENTRY COAL MINE

Map No. 3



Continuous miner and shuttle car in #2

Roofbolter in #3

Battery scoop in #5

Shuttle car dumping coal on to feeder in #3

Map drawn by
Wayne Collet
11/05

The instructor should now pass out copies of the preceding map (map #3) to each class participant for review and discussion.

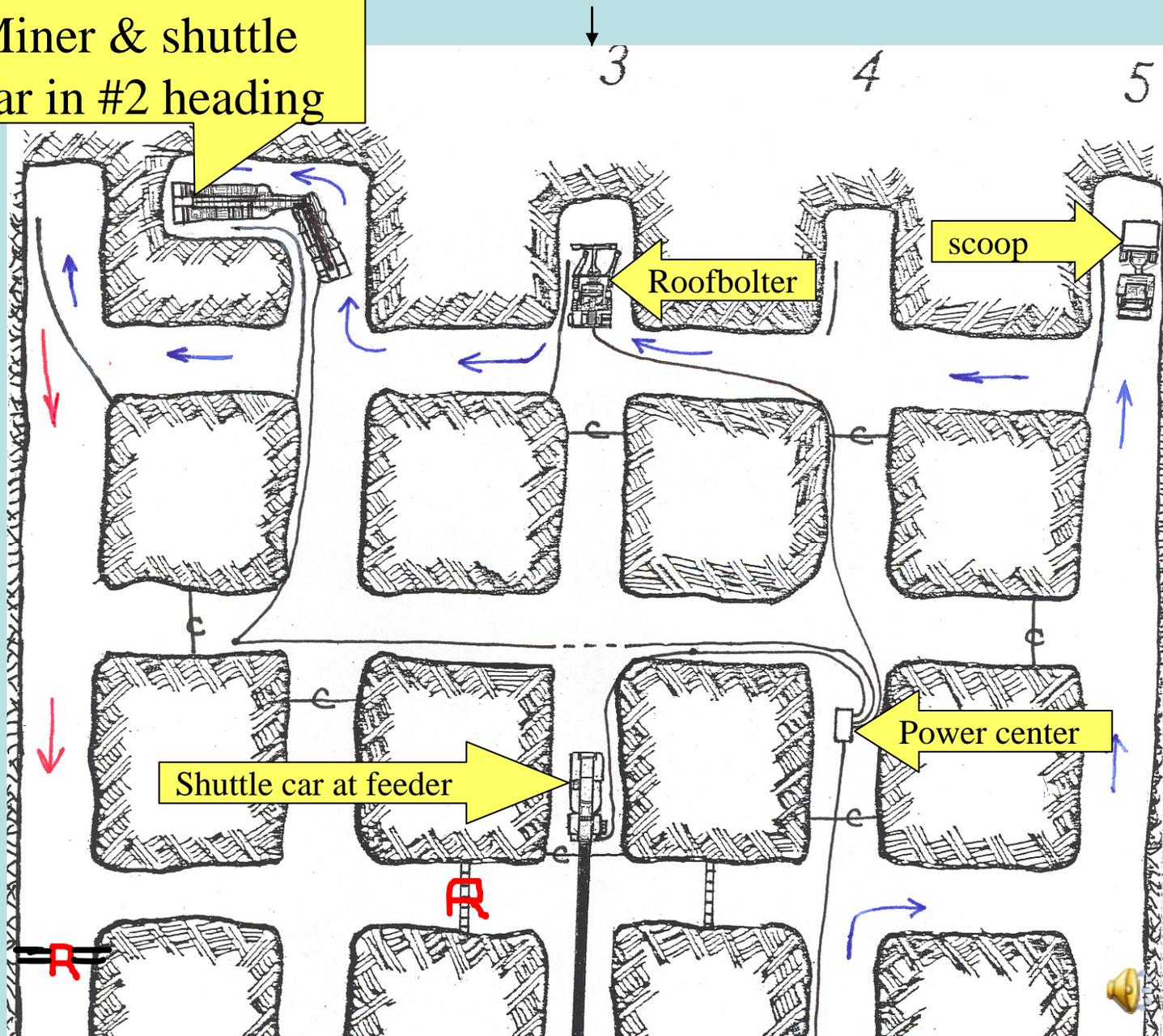


TYPICAL FACE AREA OF A FIVE ENTRY COAL MINE

Miner & shuttle car in #2 heading

Intake airways are designated by blue arrows and return airways are shown with red arrows.

Intake air travels up # 4 & 5 entries, is then directed up #5 and then to all remaining faces where it become return air after leaving the #1 entry working place.



The ventilation controls shown on this map are: stoppings (brattices), check curtains, line curtains, and regulators.



State and federal laws require conveyor belt entries to be totally enclosed by permanent stoppings. A check curtain (fire curtain) is installed across the belt just outby the feeder and a regulator is always installed on the return side of the belt just outby the feeder.



However, beltline air can be used to ventilate the section if a plan has been submitted and approved by MSHA and the Office of Mine Safety and Licensing (OSML).



For multi-section mines, a regulator must be installed to proportion or regulate the amount of air needed for each section. The section's regulator can be installed near the face area or it can be installed on the outby end of the section.

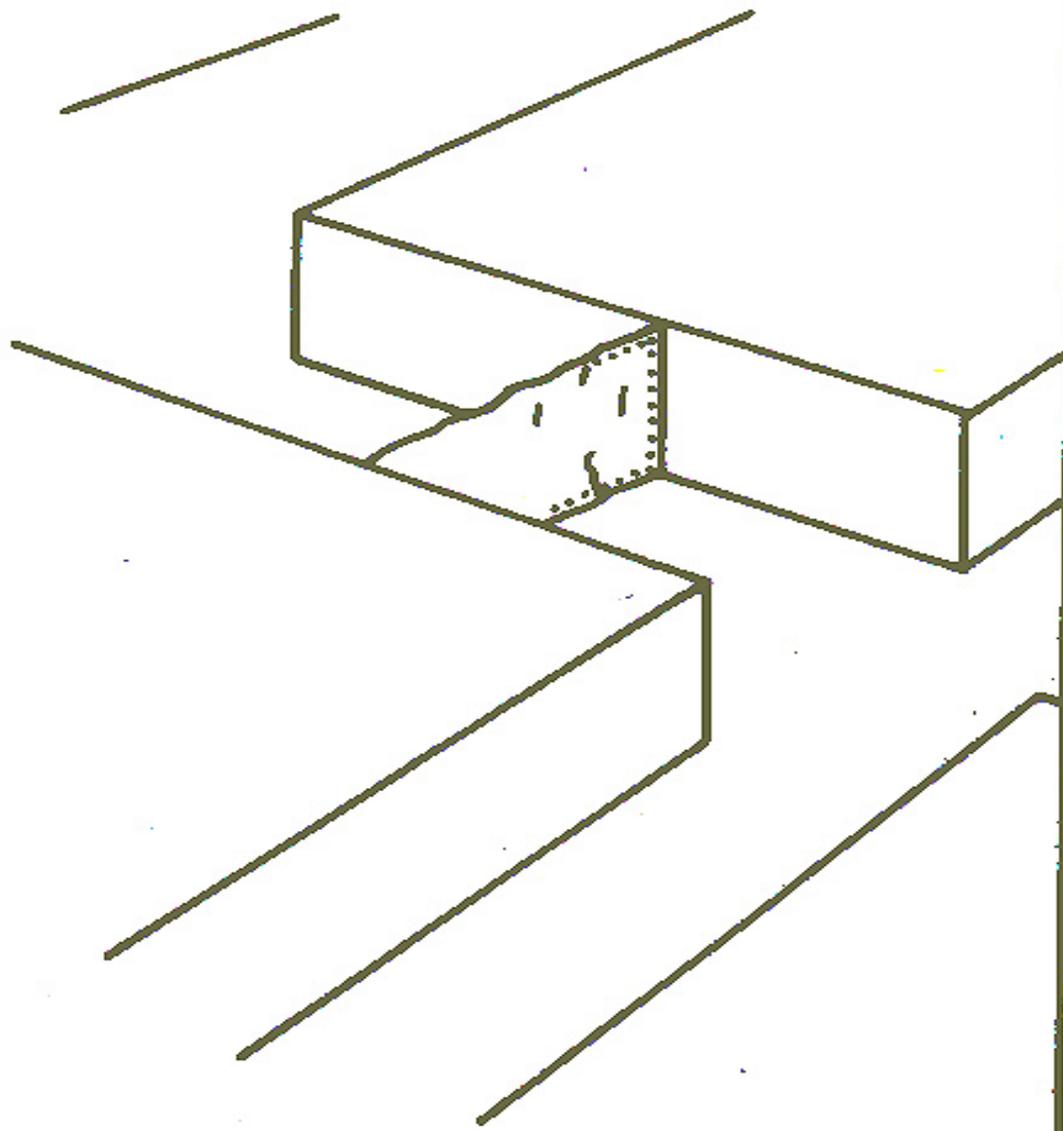


Let's review the symbols for ventilation controls, how they are denoted on a map, and how they are used in a mine.



curtains

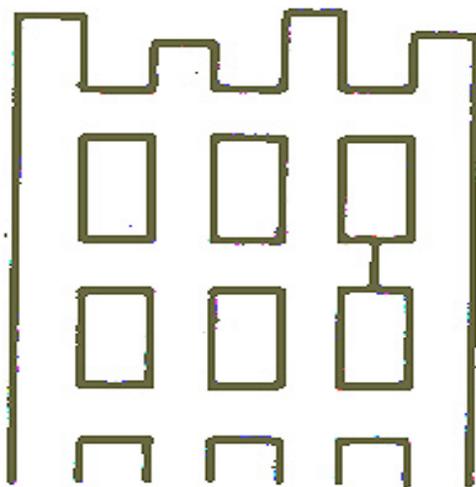
IN THE MINE . . .



THE SYMBOL . . .

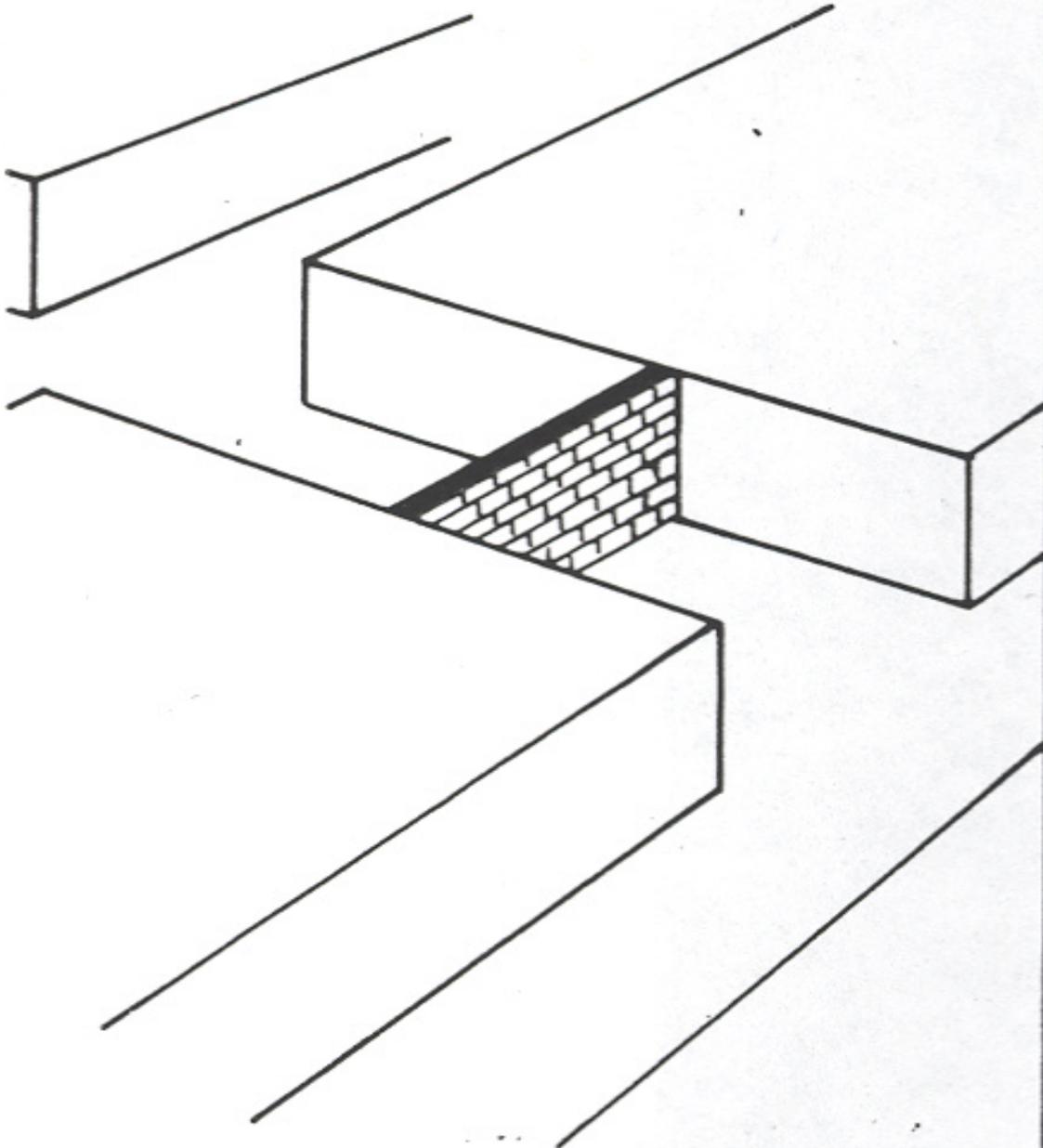


ON THE MAP . . .



Permanent Stoppings

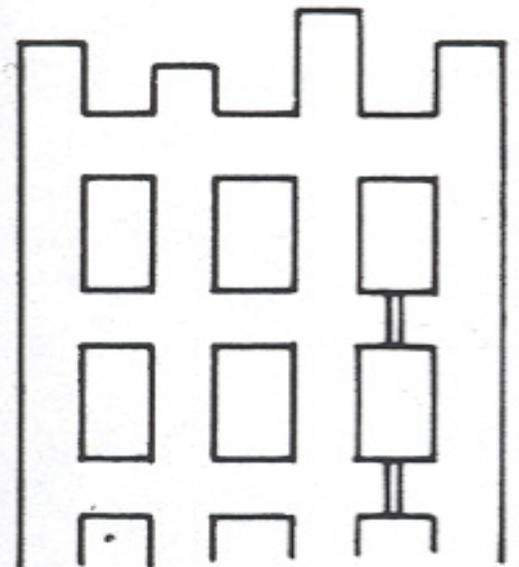
IN THE MINE . . .



THE SYMBOL . . .

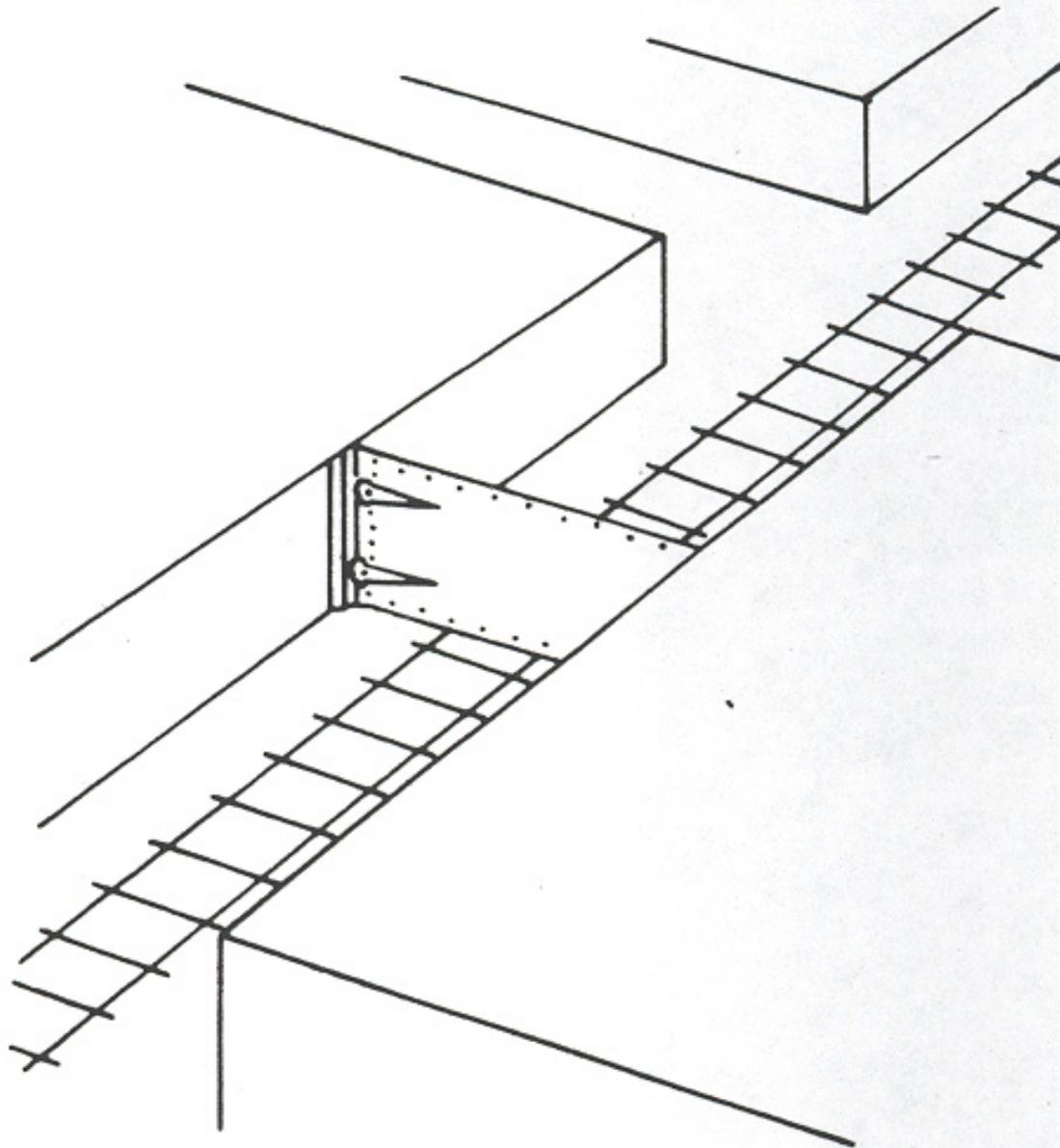


ON THE MAP . . .

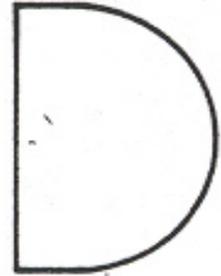


Door

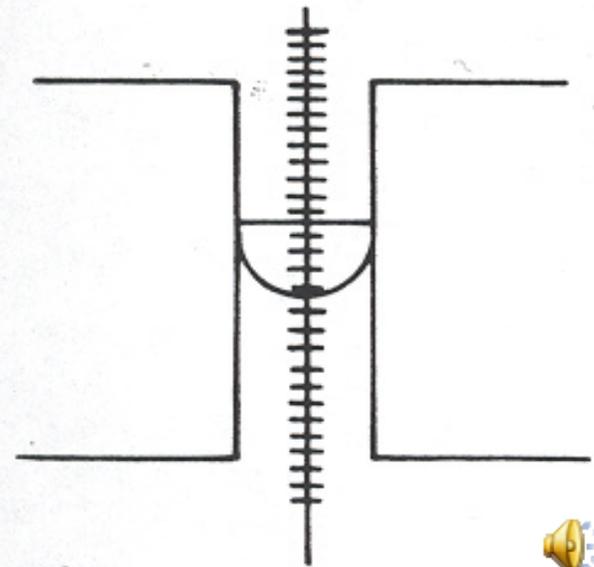
IN THE MINE . . .



THE SYMBOL . . .

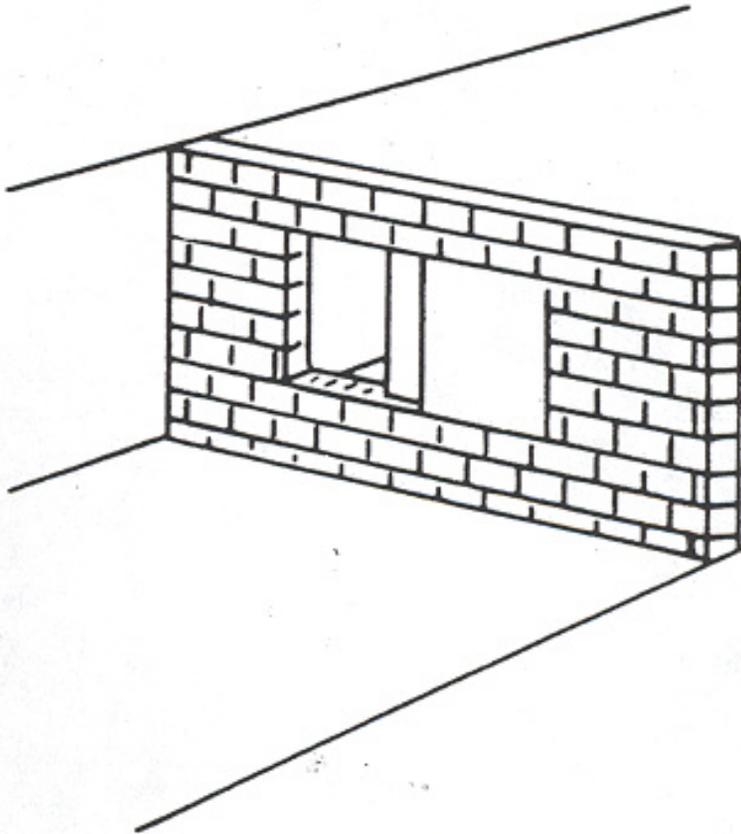


ON THE MAP . . .



Regulator

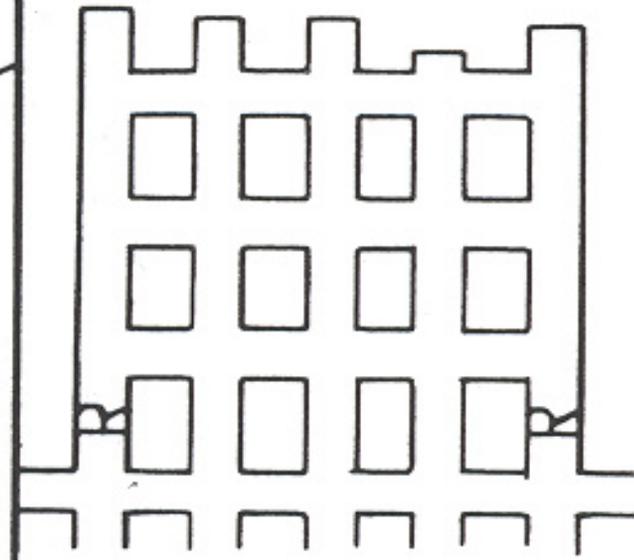
IN THE MINE . . .



THE SYMBOL . . .

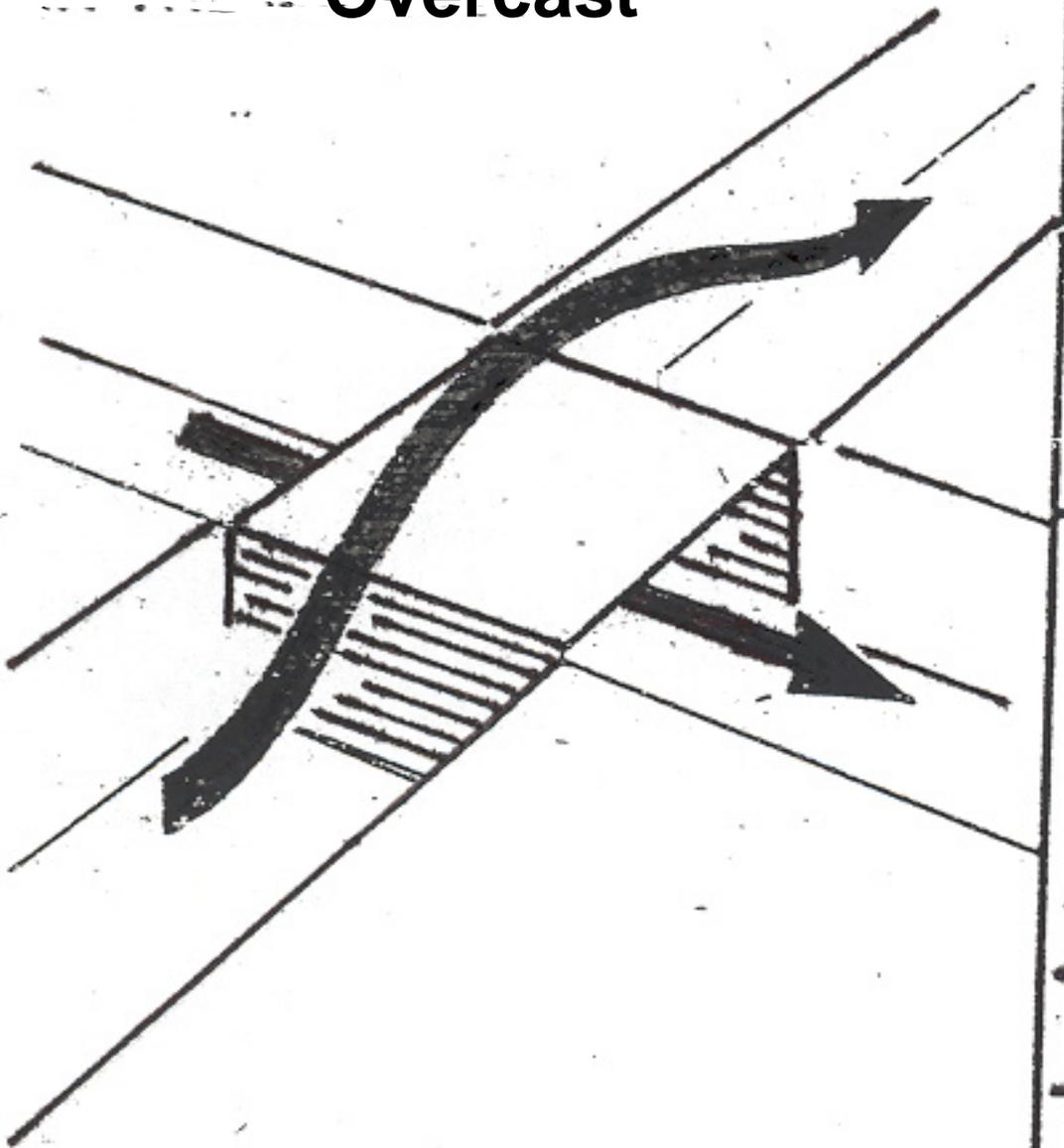


ON THE MAP . . .

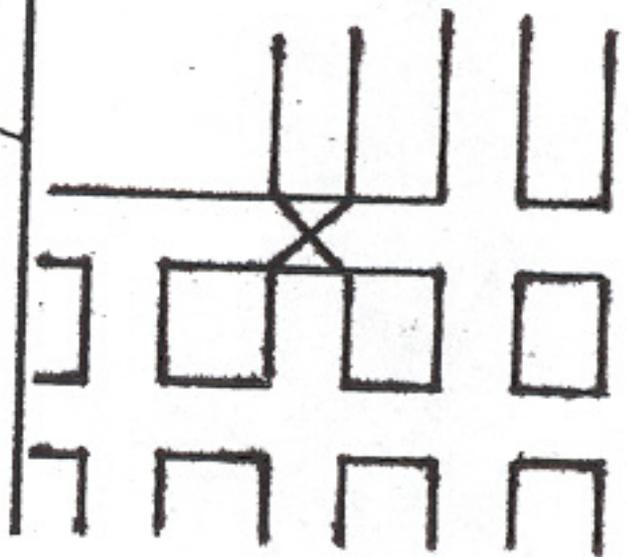


Overcast

The Symbol



ON THE MAP ...

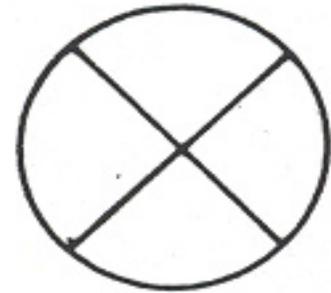
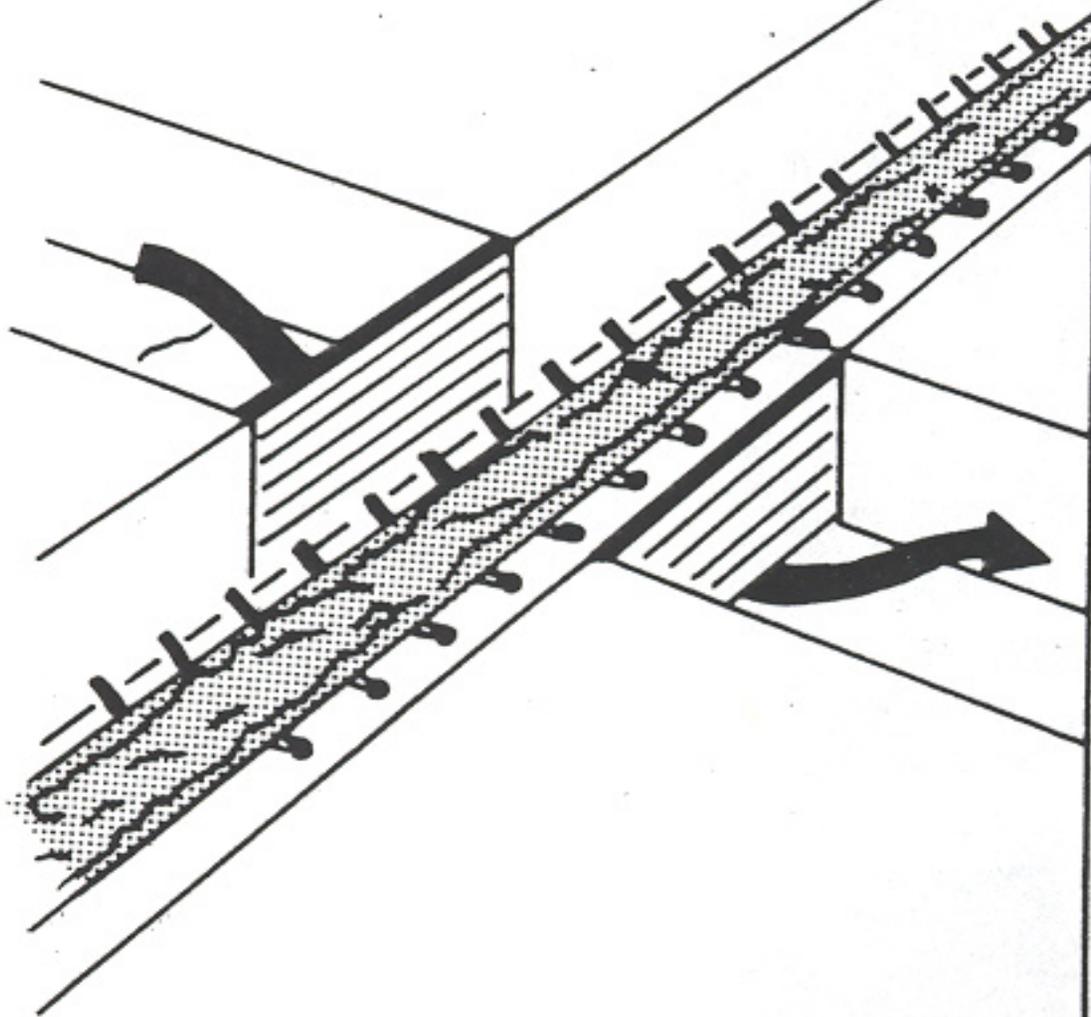


IN THE MINE

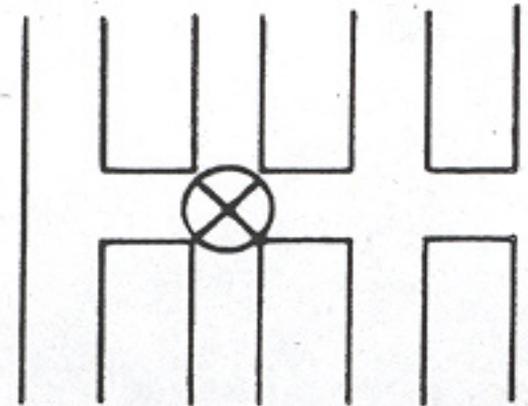


IN THE MINE . . .

THE SYMBOL . . .



ON THE MAP . . .



Undercast

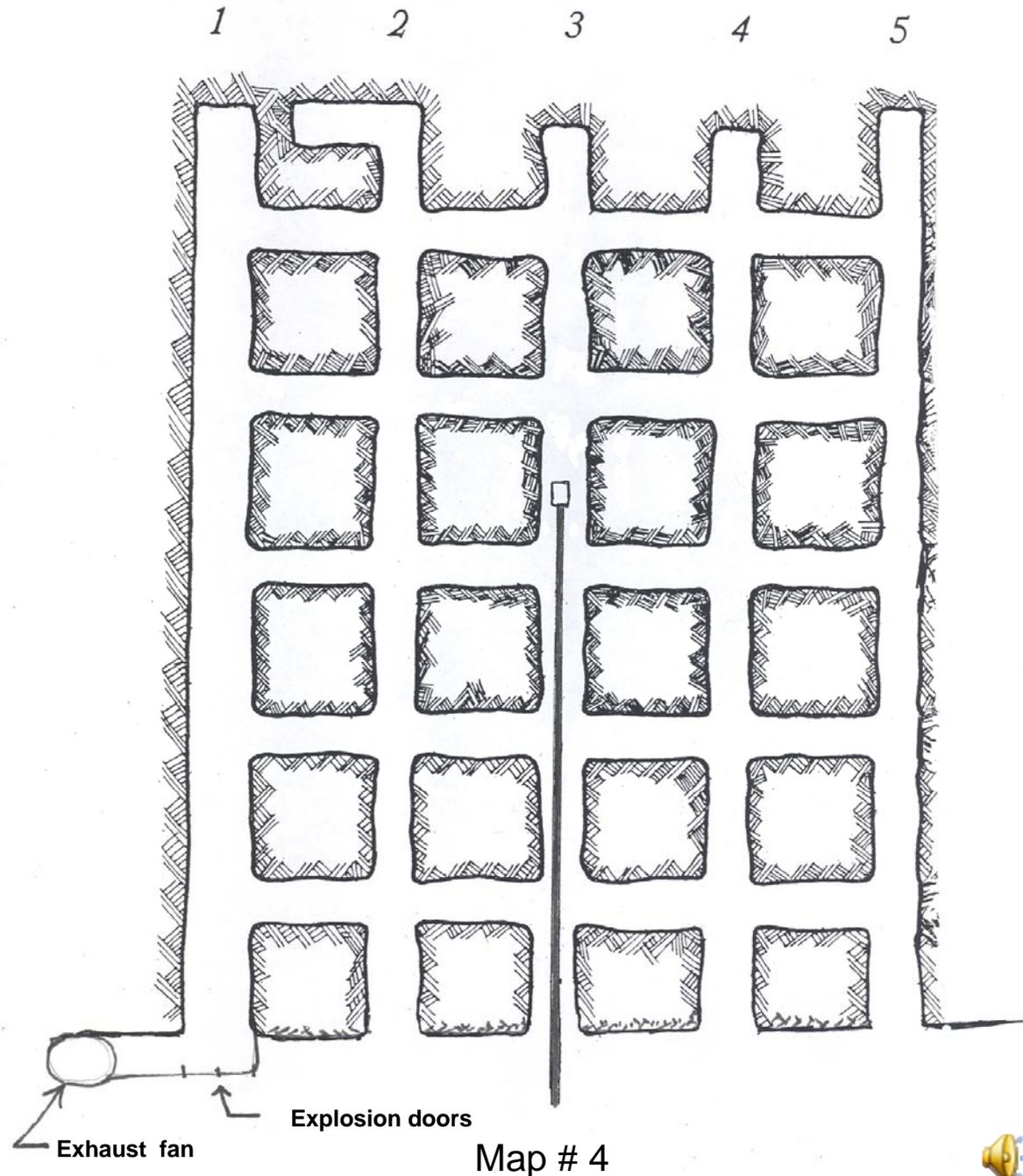


Let's ventilate a one (1) section mine. The instructor will distribute copies of "map # 4" to all class participants.



Instructions

- Distribute copies of this map (map #4) to all class participants.
- Ventilate this mine according to state and federal regulations which includes the following:
- Enclose the conveyor belt entry, with permanent stoppings and install all other necessary ventilation controls.
- Select intake airways and deliver fresh air to all faces and bring the air out of the mine through return airways.

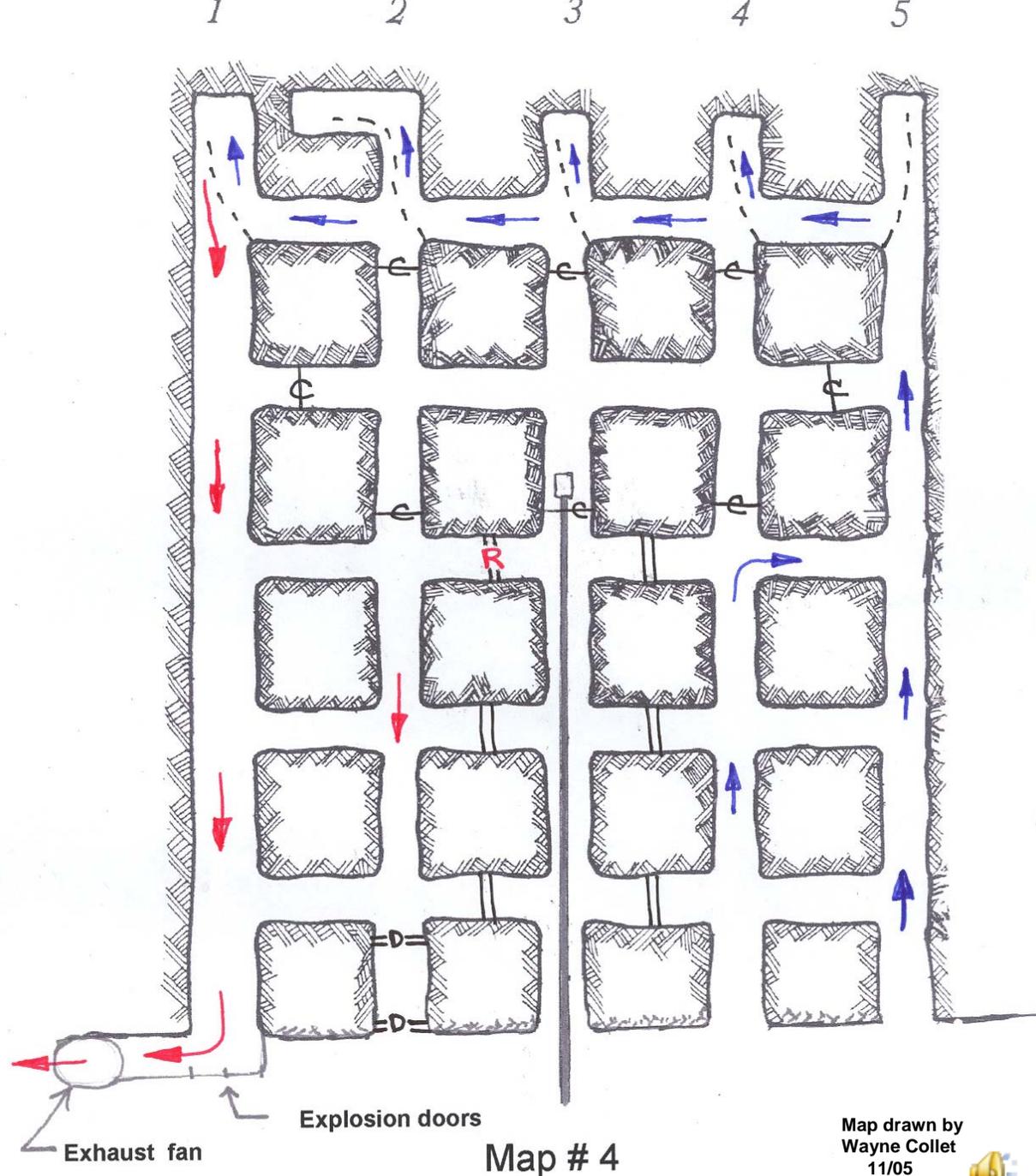


Instructors: turn off the power point program and allow time for class participants to ventilate map # 4, and be sure to move around the room – offering assistance. Resume power point program when everyone has completed the map.



Points for Review

- Blue arrows are for intake entries and red arrows are for return entries.
- The conveyor belt is enclosed by permanent stoppings, a fire curtain at the outby end of the feeder and a regulator on the return side of the conveyor belt.
- Check curtains and line or face curtains are used to direct the intake air all across the faces.
- Doors are used on the return to facilitate haulage vehicles.
- The fan is off-set at least 15 feet.



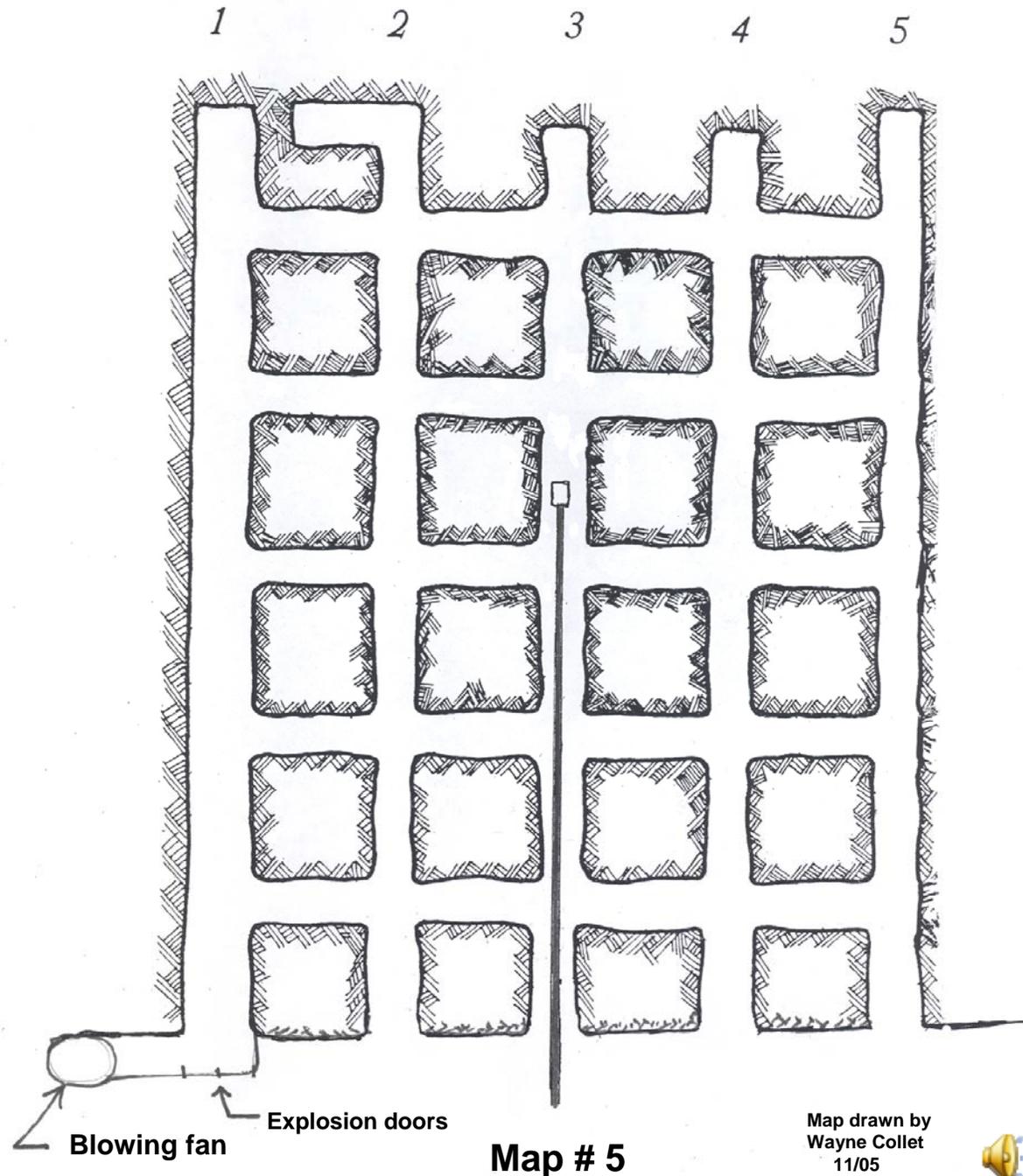
Instructions

Distribute copies of this map (map #5) to all class participants.

Ventilate this mine according to state and federal regulations which includes the following:

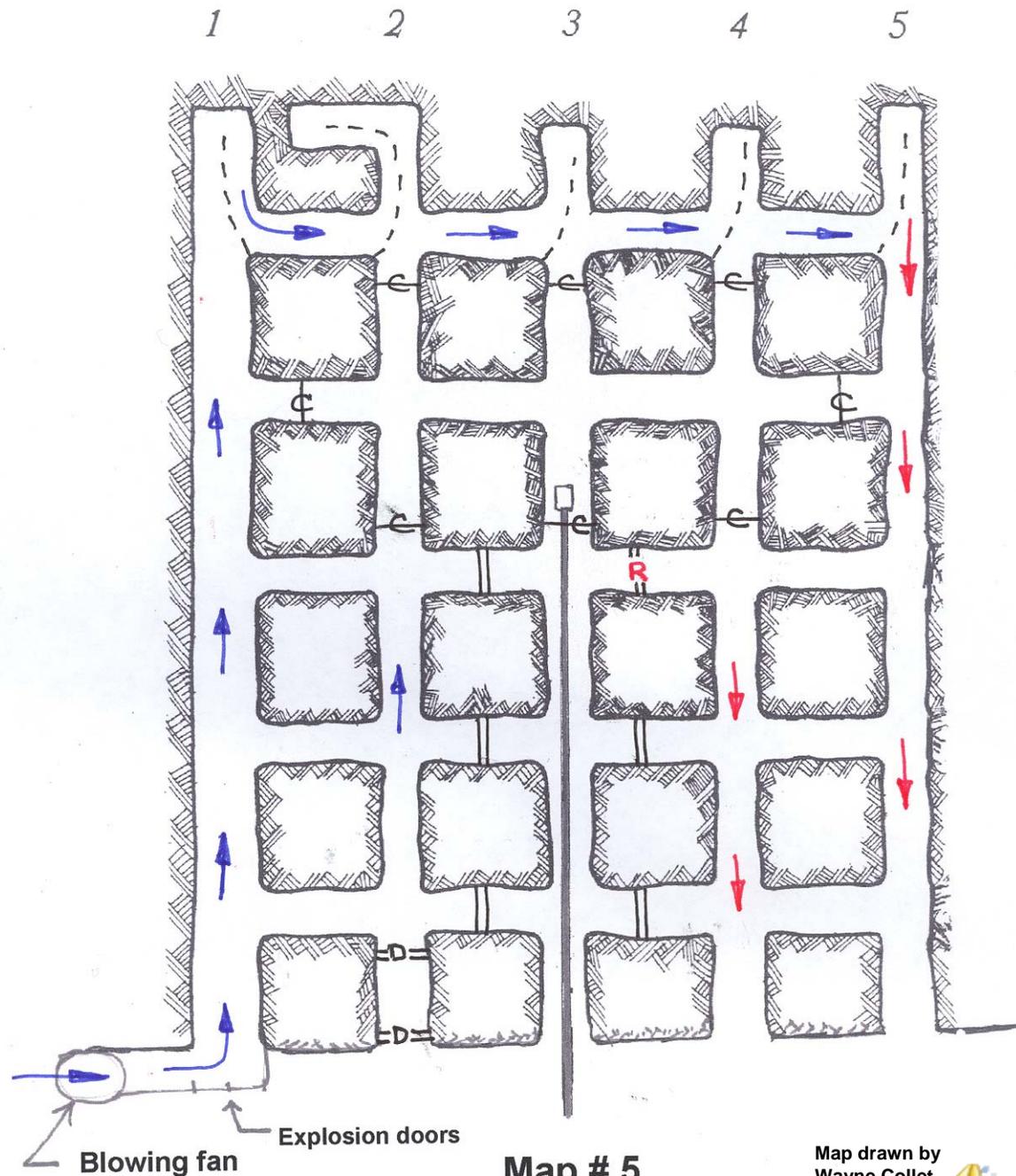
Enclose the conveyor belt entry, with permanent stoppings and install all other necessary ventilation controls.

Select intake airways and deliver fresh air to all faces and bring the air out of the mine through return airways.



Points for Review

- Blue arrows are for intake entries and red arrows are for return entries.
- The conveyor belt is enclosed by permanent stoppings, a fire curtain at the outby end of the feeder and a regulator on the return side of the conveyor belt.
- Check curtains and line or face curtains are used to direct the intake air all across the faces.
- Doors are used on the return to facilitate haulage vehicles.
- The fan is off-set at least 15 feet.



Before ventilating a multi-section mine, let's review some state and federal regulations regarding ventilation requirements.



All underground workings in a mine must be provided with a current of air containing not less than nineteen and one-half percent (19.5%) of oxygen, and no harmful quantities of other noxious or poisonous gases.



All working sections must be ventilated with a separate split of air and minimum quantities of air must also be provided at various locations.



To comply with these regulations, you will have to use the appropriate ventilation controls to prevent intake air and return air from mixing (short circuiting).

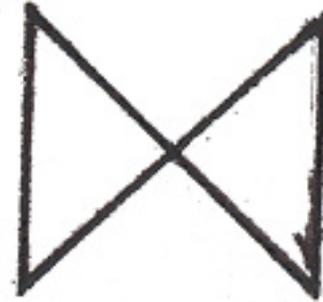
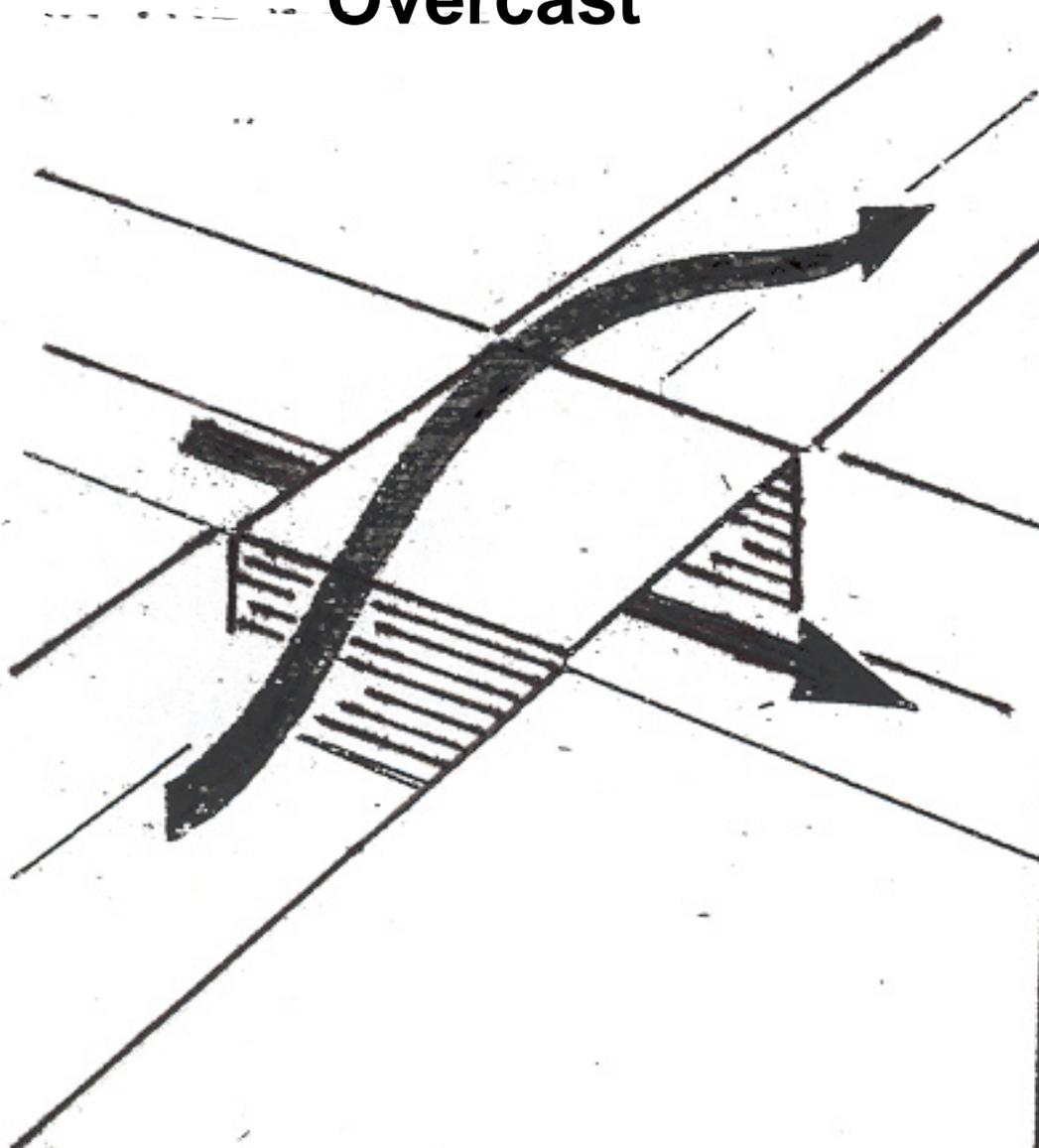


Ventilating multi-section mines will require the construction of overcasts or undercasts. Overcasts are more commonly used but both will permit intake air to pass over return air, without mixing (short circuiting).

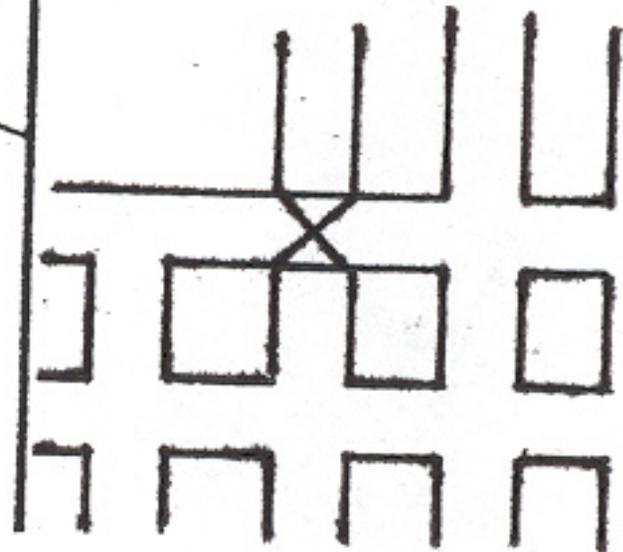


Overcast

The Symbol



ON THE MAP ...

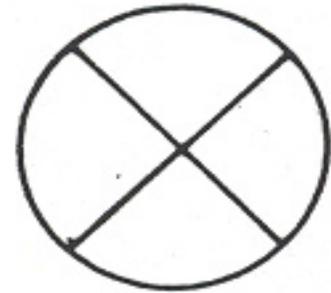
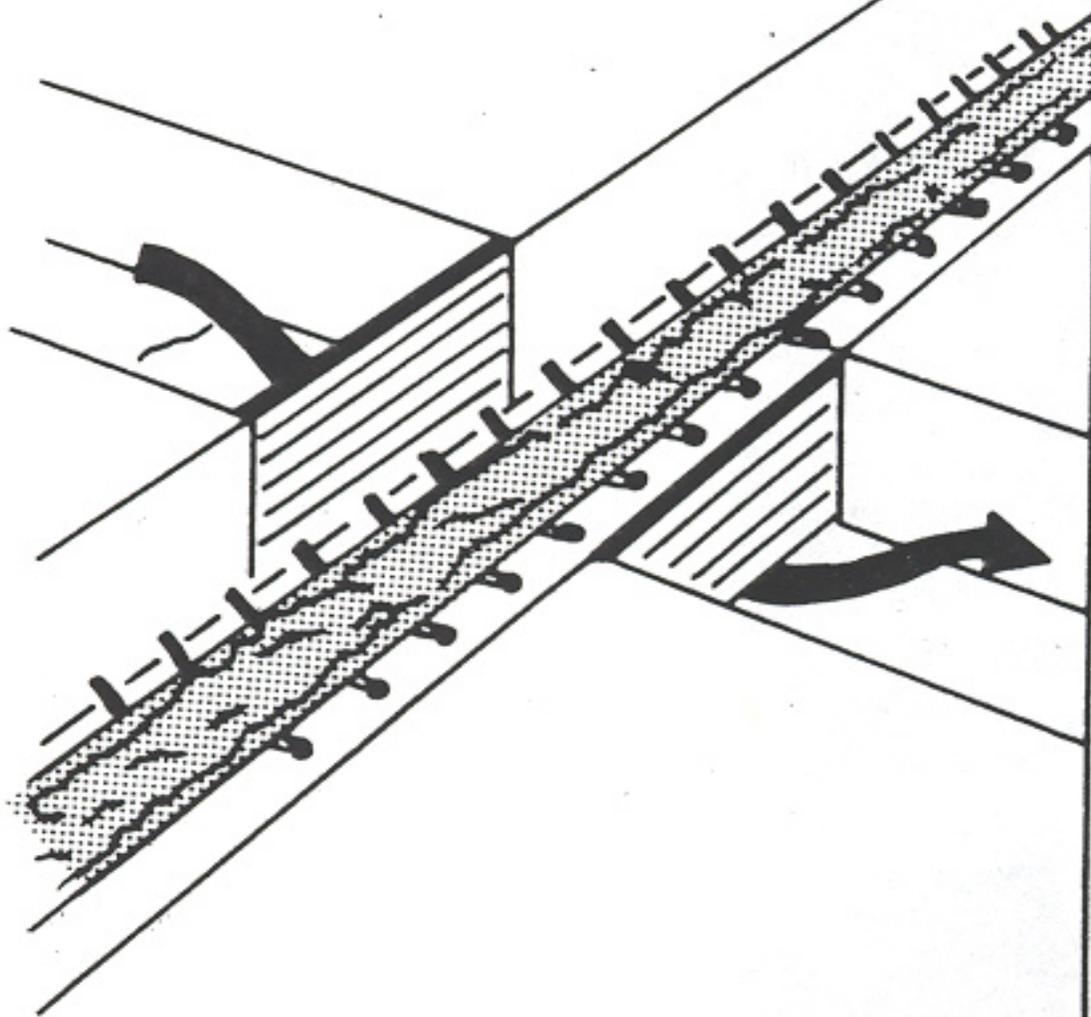


IN THE MINE

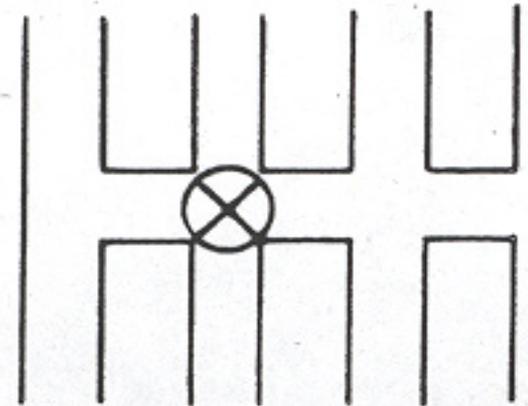


IN THE MINE . . .

THE SYMBOL . . .



ON THE MAP . . .



Undercast

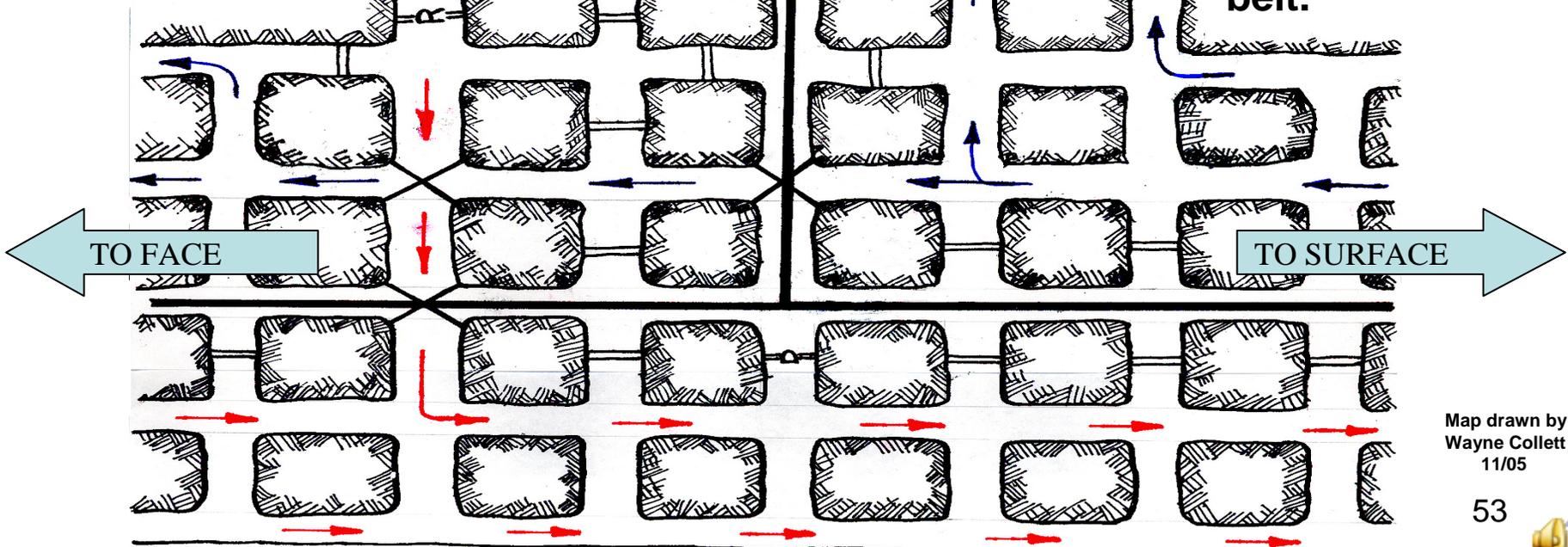


Let's look at a portion of a mine to see how ventilation controls such as: doors, stoppings, curtains, regulators, and overcasts are used to ventilate two sections.



This mine has 5 entries on both sections. Intake air, denoted by blue arrows, is brought from the surface up the right side. Red arrows denote return air.

The belt lines are totally enclosed by perm-stoppings and a fire curtain just outby the feeder. The belt regulator must always be placed on the return side of the belt.



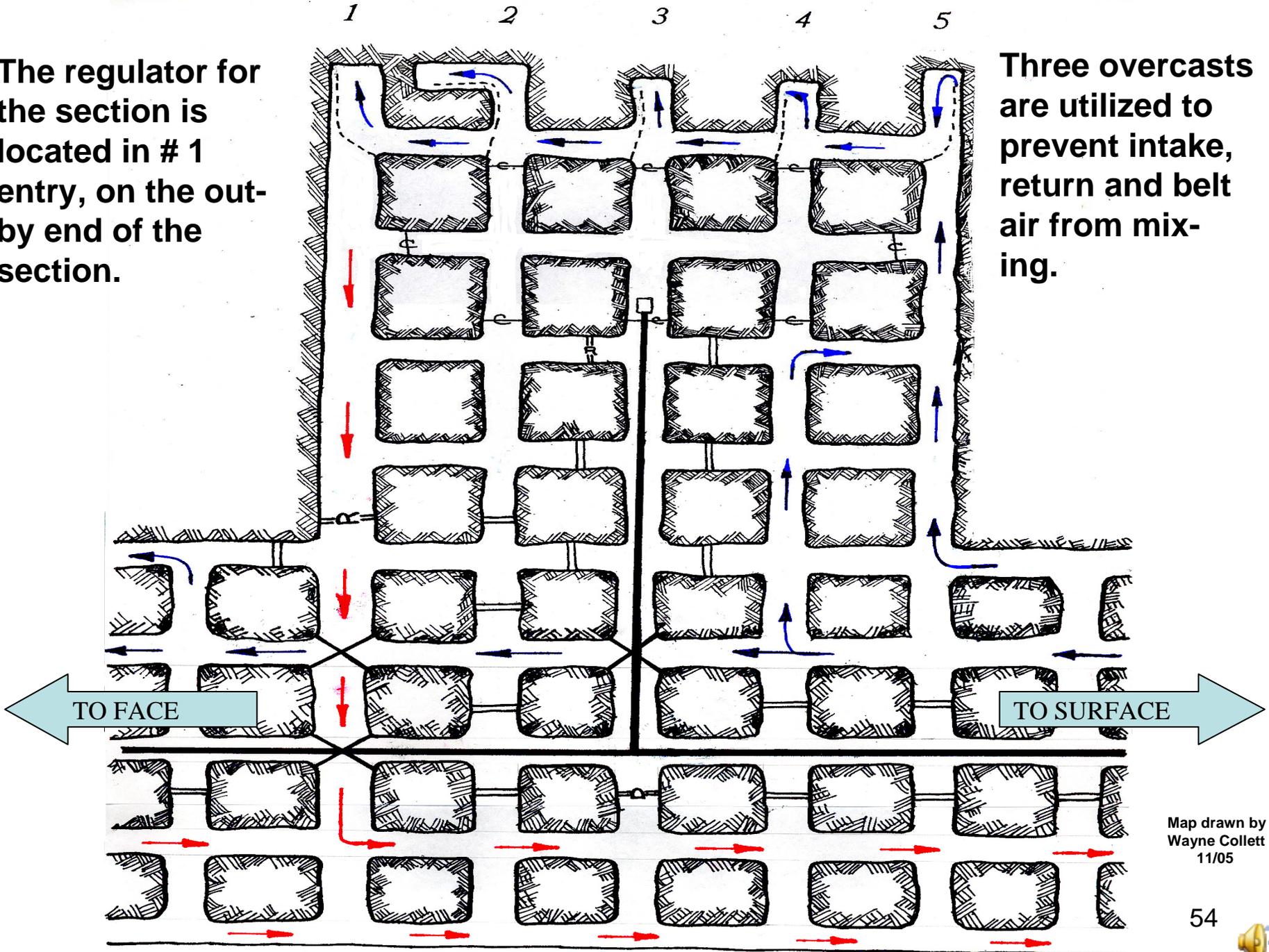
Map No. 6

Map drawn by
Wayne Collett
11/05



The regulator for the section is located in # 1 entry, on the out-by end of the section.

Three overcasts are utilized to prevent intake, return and belt air from mixing.



Map No.6

Map drawn by
Wayne Collett
11/05

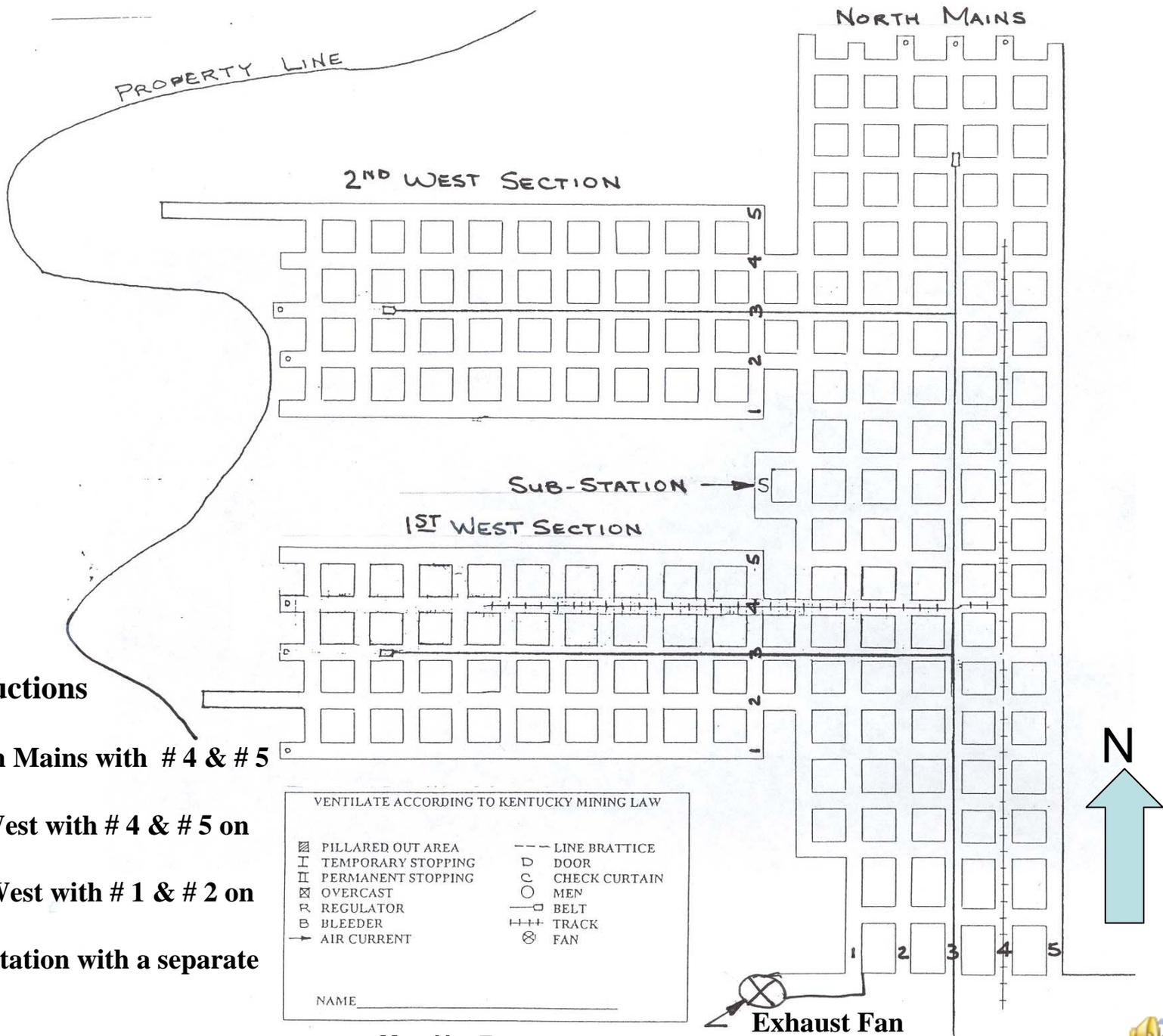


The following map (map #7) has three working sections. The sections are appropriately named: North Mains, First West, and Second West Section, because of their direction of advancement.



The instructor should now pass out copies of map # 7 to each class participant for review and discussion. The map is the next slide that follows.





Instructions

- Ventilate North Mains with # 4 & # 5 on intake air.
- Ventilate 1ST West with # 4 & # 5 on intake air.
- Ventilate 2nd West with # 1 & # 2 on intake air.
- ventilate Sub-Station with a separate split of air.

VENTILATE ACCORDING TO KENTUCKY MINING LAW

▣ PILLARED OUT AREA	--- LINE BRATTICE
I TEMPORARY STOPPING	□ DOOR
II PERMANENT STOPPING	□ CHECK CURTAIN
⊞ OVERCAST	○ MEN
R REGULATOR	○ BELT
B BLEEDER	+++ TRACK
→ AIR CURRENT	⊗ FAN

NAME _____

Map No. 7

Exhaust Fan



Instructors: turn off the power point program and allow time for class participants to ventilate map # 7, and be sure to move around the room – offering assistance. Resume power point program when everyone has completed the map.



The following slide illustrates only one way of ventilating this mine. You may increase or decrease the number of overcasts and stoppings and use the ventilation controls differently to correctly ventilate this map in other ways.



PROPERTY LINE

2ND WEST SECTION

SUB-STATION

1ST WEST SECTION

NORTH MAINS

Instructions

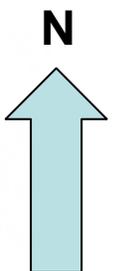
- Ventilate North Mains with # 4 & # 5 on intake air.
- Ventilate 1ST West with # 4 & # 5 on intake air.
- Ventilate 2nd West with # 1 & # 2 on intake air.
- ventilate Sub-Station with a separate split of air.

VENTILATE ACCORDING TO KENTUCKY MINING LAW

▨	PILLARED OUT AREA	---	LINE BRATTICE
I	TEMPORARY STOPPING	⊠	DOOR
II	PERMANENT STOPPING	⊠	CHECK CURTAIN
⊠	OVERCAST	⊠	MEN
R	REGULATOR	⊠	BELT
B	BLEEDER	⊠	TRACK
→	AIR CURRENT	⊠	FAN

NAME _____

Exhaust Fan



Map No. 7



Worked-out areas where pillars have been recovered shall be ventilated so that the methane-air mixtures and other gases, dusts, and fumes from throughout the worked-out areas are continuously diluted and routed into a return air course.



A bleeder system shall be used and maintained to control the air passing through the area and to continuously dilute and move the methane-air mixtures and other gases, dusts, and fumes from the worked-out area away from active workings and into a return air course.



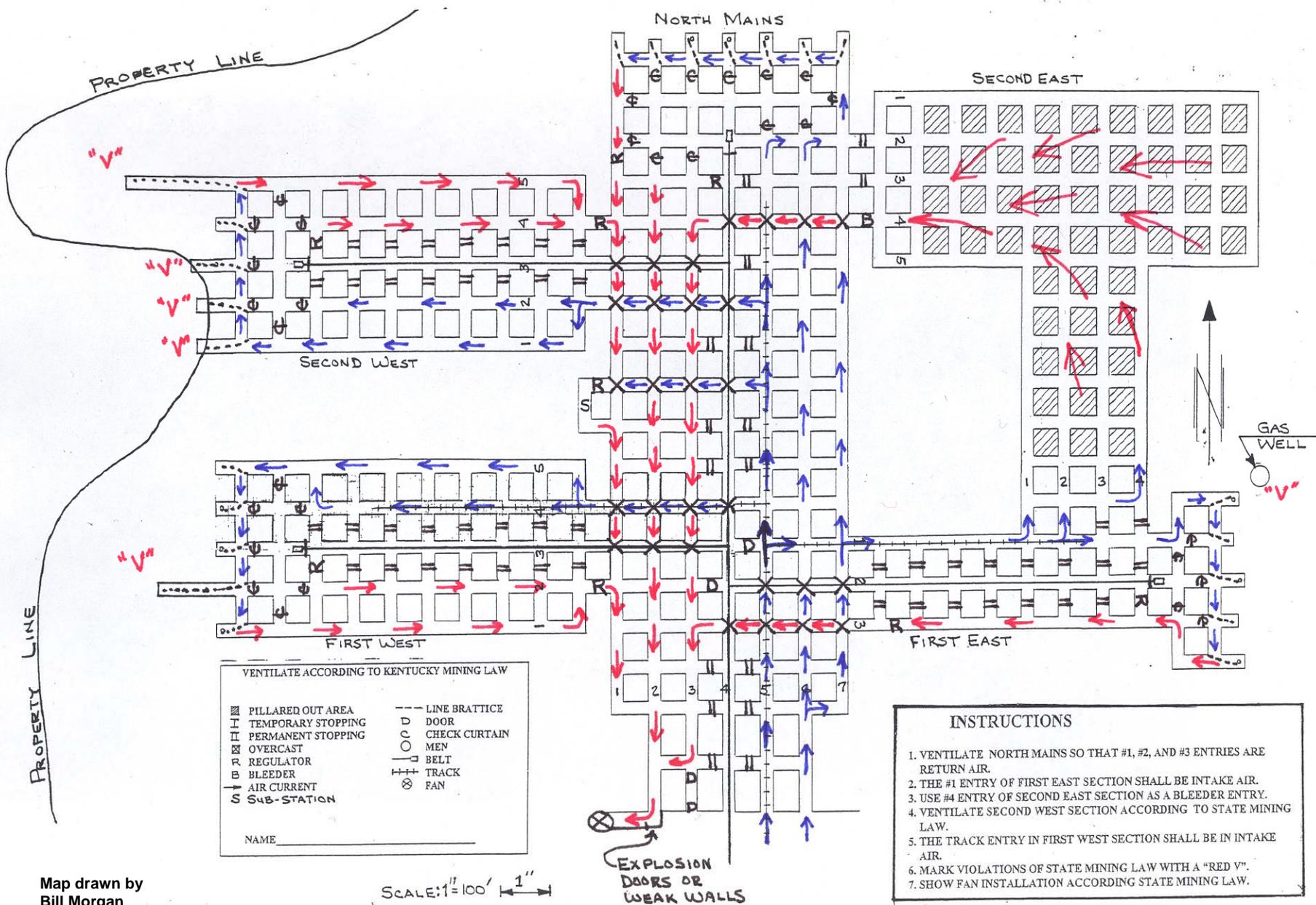
A bleeder is denoted on a map with the letter “B”. The bleeder, in most cases is just a permanent stopping with a small opening where the air from the worked out area is forced through and directed into the return.



The following slide is of a mine (Map #8) that contains several active sections including one that has been “pillared” and worked out. Air is being directed across the worked out area (Second East), taking any gases, dust, and fumes – directly to the North Mains return. (Instructors: distribute copies of this map to all class participants for review and discussion.)



Map #8



VENTILATE ACCORDING TO KENTUCKY MINING LAW

▨ PILLARED OUT AREA	--- LINE BRATTICE
⊥ TEMPORARY STOPPING	⊥ DOOR
⊥ PERMANENT STOPPING	⊥ CHECK CURTAIN
⊗ OVERCAST	⊥ MEN
R REGULATOR	⊥ BELT
B BLEEDER	⊥ TRACK
→ AIR CURRENT	⊗ FAN
S SUB-STATION	

NAME _____

INSTRUCTIONS

1. VENTILATE NORTH MAINS SO THAT #1, #2, AND #3 ENTRIES ARE RETURN AIR.
2. THE #1 ENTRY OF FIRST EAST SECTION SHALL BE INTAKE AIR.
3. USE #4 ENTRY OF SECOND EAST SECTION AS A BLEEDER ENTRY.
4. VENTILATE SECOND WEST SECTION ACCORDING TO STATE MINING LAW.
5. THE TRACK ENTRY IN FIRST WEST SECTION SHALL BE IN INTAKE AIR.
6. MARK VIOLATIONS OF STATE MINING LAW WITH A "RED V".
7. SHOW FAN INSTALLATION ACCORDING STATE MINING LAW.

Map drawn by
Bill Morgan
5/97

SCALE: 1" = 100' 1"

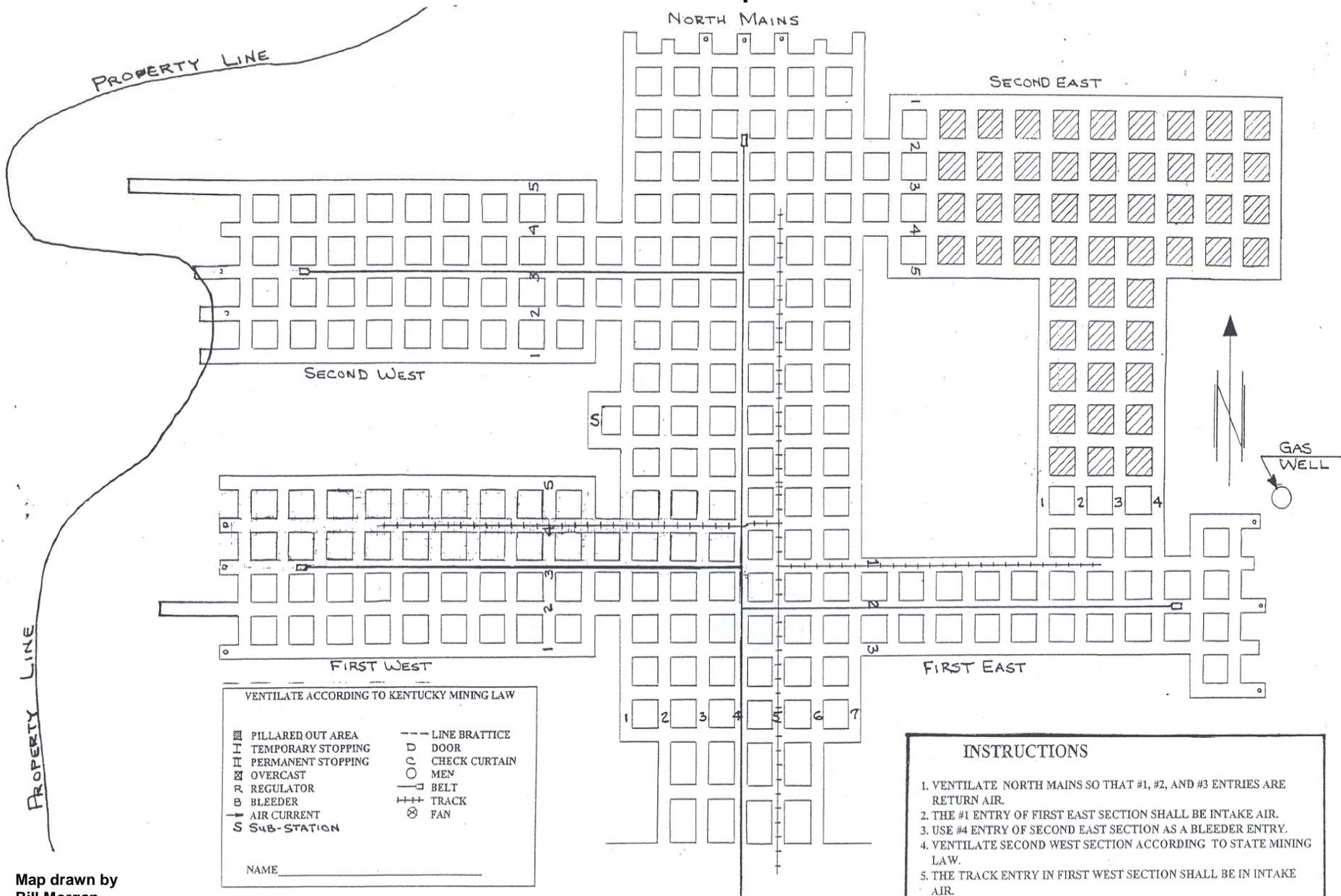
EXPLOSION
DOORS OR
WEAK WALLS



Copies of Map #9, which follow this slide, should now be given to the class for practice. The practice can be done in the classroom or as a homework assignment. Participants are encouraged to make every effort to ventilate the mine without referring to Map #8, which has already been ventilated. However, it's okay to refer to it if you get stalled and are unable to ventilate the map.



Map #9



VENTILATE ACCORDING TO KENTUCKY MINING LAW

▨	PILLARED OUT AREA	---	LINE BRATTICE
I	TEMPORARY STOPPING	⊥	DOOR
II	PERMANENT STOPPING	⊥	CHECK CURTAIN
⊠	OVERCAST	⊥	MEN
R	REGULATOR	⊥	BELT
B	BLEEDER	⊥	TRACK
→	AIR CURRENT	⊗	FAN
S	SUB-STATION		

NAME _____

- ### INSTRUCTIONS
1. VENTILATE NORTH MAINS SO THAT #1, #2, AND #3 ENTRIES ARE RETURN AIR.
 2. THE #1 ENTRY OF FIRST EAST SECTION SHALL BE INTAKE AIR.
 3. USE #4 ENTRY OF SECOND EAST SECTION AS A BLEEDER ENTRY.
 4. VENTILATE SECOND WEST SECTION ACCORDING TO STATE MINING LAW.
 5. THE TRACK ENTRY IN FIRST WEST SECTION SHALL BE IN INTAKE AIR.
 6. MARK VIOLATIONS OF STATE MINING LAW WITH A "RED V".
 7. SHOW FAN INSTALLATION ACCORDING STATE MINING LAW.

Map drawn by
Bill Morgan
5/97

SCALE: 1" = 100'

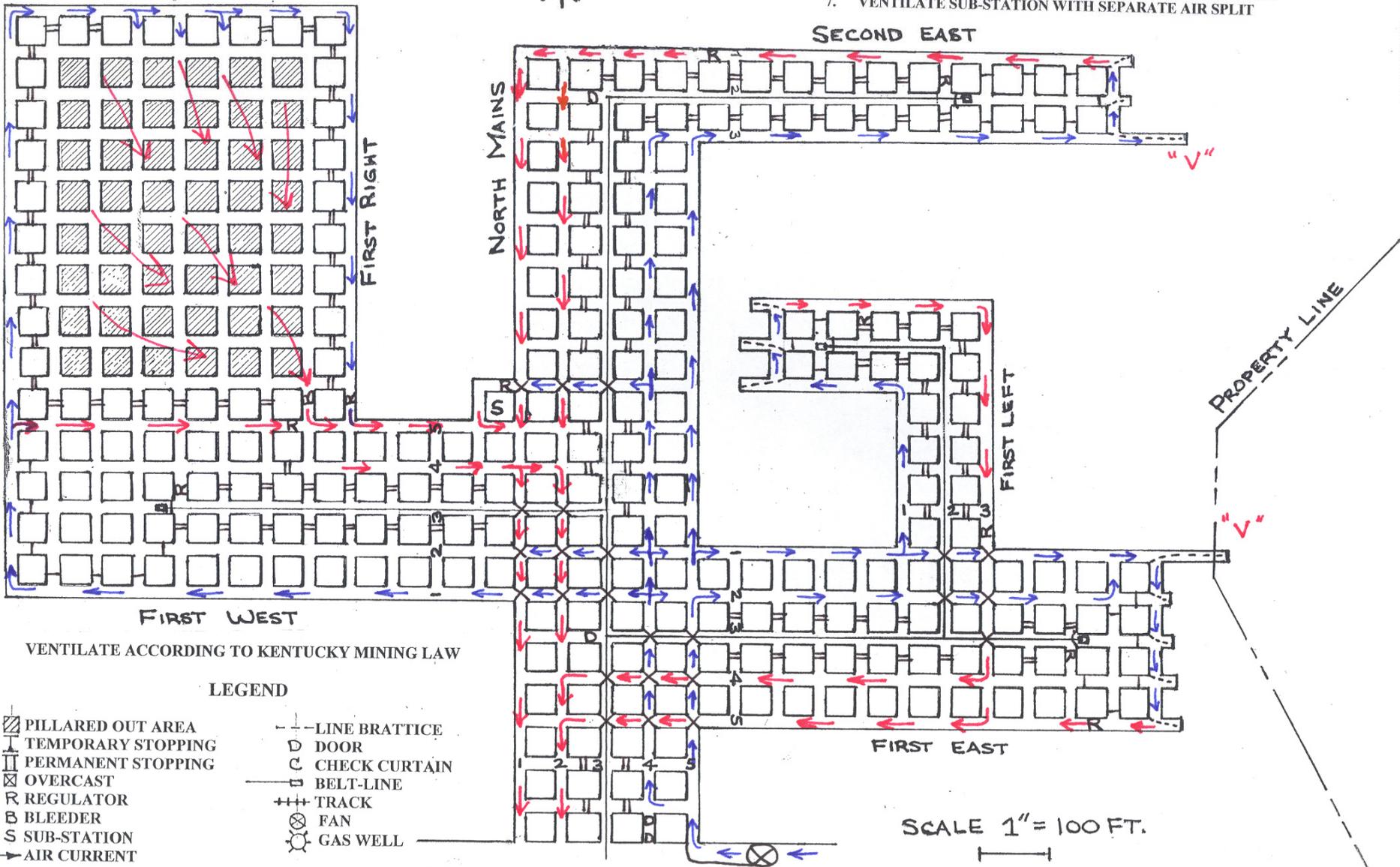


Bleeders must have a minimum amount of air flowing through them, directing any gases, fumes, and dust to the main return. The following slide (Map #10) shows a mine with a worked out area and a row of “barrier” blocks for travel and inspection. (Instructors: distribute copies of this map to all class participants for review and discussion.)



INSTRUCTIONS

1. MARK ALL VIOLATIONS
2. VENTILATE FIRST EAST & FIRST LEFT WITH SEPARATE AIR SPLITS
3. VENTILATE SECOND EAST ACCORDING TO STATE LAW
4. VENTILATE FIRST WEST USING #1 & #2 FOR INTAKE AIR
5. USE BLEEDER FOR FIRST RIGHT OFF FIRST WEST
6. USE #1 & #2 ENTRIES OF NORTH MAINS FOR RETURN AIR
7. VENTILATE SUB-STATION WITH SEPARATE AIR SPLIT



FIRST WEST

SECOND EAST

NORTH MAINS

FIRST LEFT

FIRST EAST

PROPERTY LINE

VENTILATE ACCORDING TO KENTUCKY MINING LAW

LEGEND

- PILLARED OUT AREA
- TEMPORARY STOPPING
- PERMANENT STOPPING
- OVERCAST
- REGULATOR
- BLEEDER
- SUB-STATION
- AIR CURRENT
- LINE BRATTICE
- DOOR
- CHECK CURTAIN
- BELT-LINE
- TRACK
- FAN
- GAS WELL

SCALE 1" = 100 FT.



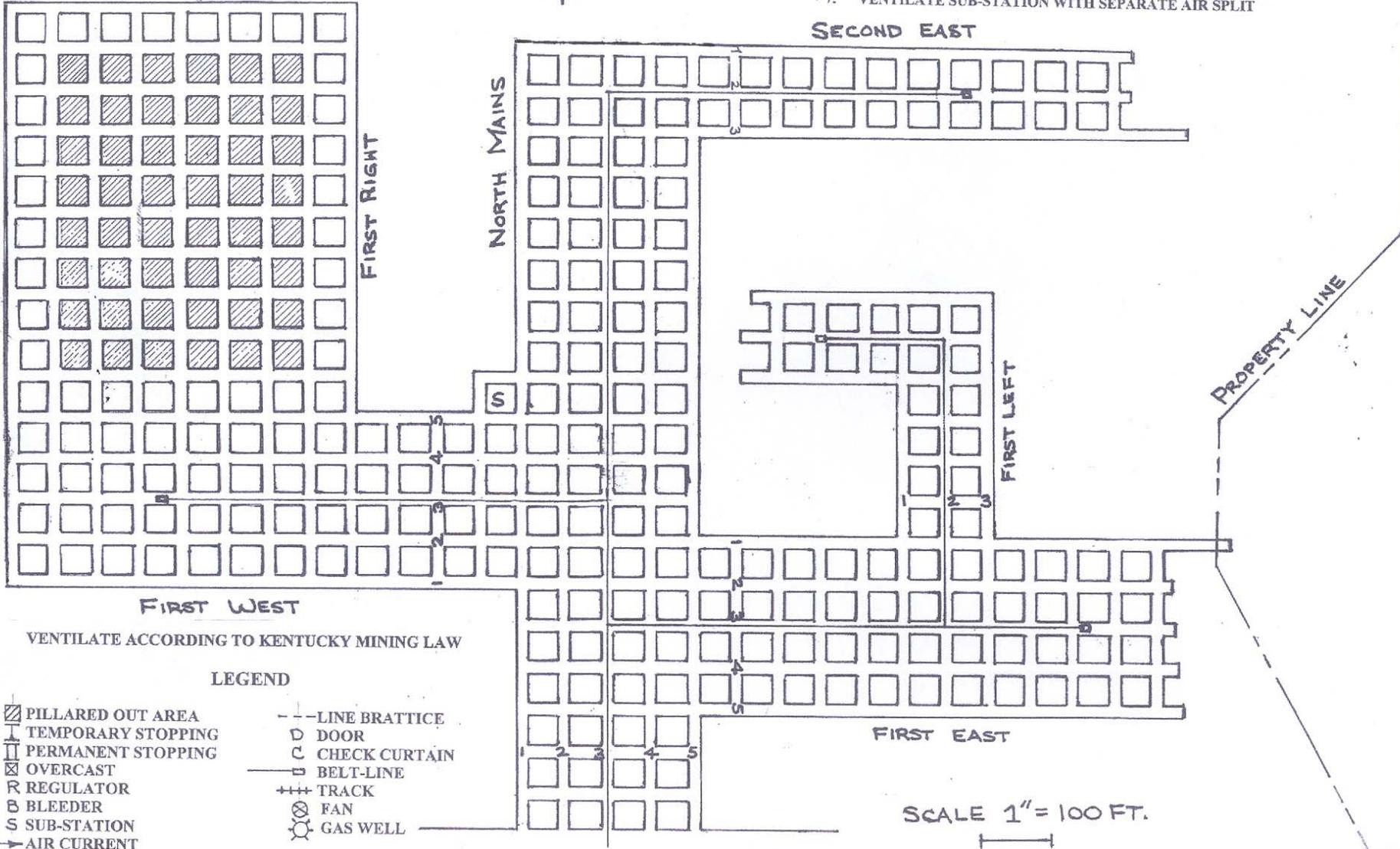
Copies of map #11, which follows this slide, should now be given to the class for practice. The practice can be done in the classroom or as a homework assignment. Participants are encouraged to make every effort to ventilate the mine without referring to Map #10, which has already been ventilated. However, it's okay to refer to it if you get stalled and are unable to ventilate the map.



Map #11

INSTRUCTIONS

1. MARK ALL VIOLATIONS
2. VENTILATE FIRST EAST & FIRST LEFT WITH SEPARATE AIR SPLITS
3. VENTILATE SECOND EAST ACCORDING TO STATE LAW
4. VENTILATE FIRST WEST USING #1 & #2 FOR INTAKE AIR
5. USE BLEEDER FOR FIRST RIGHT OFF FIRST WEST
6. USE #1 & #2 ENTRIES OF NORTH MAINS FOR RETURN AIR
7. VENTILATE SUB-STATION WITH SEPARATE AIR SPLIT



Underground mining methods include the room-and-pillar and the extended face (longwall) extraction techniques. The principal system of mining in Kentucky is the room and pillar method, which often involves the use of panels with multiple entries for ease of ventilation and transport of coal from working sections.



Longwall or extended face mining is a method of mining that uses a “plow” or a rotating drum (shearer), which is the cutting head that travels mechanically back and forth across a face of coal that is usually several hundred feet long. The coal cut by the shearer falls onto a conveyor and is transported out of the mine.



A company that utilizes the longwall method of mining coal will most likely ventilate the mine by a plan that has been developed by mining engineers. However, as a mine foreman candidate, you should be familiar with the methods for ventilating a longwall system.



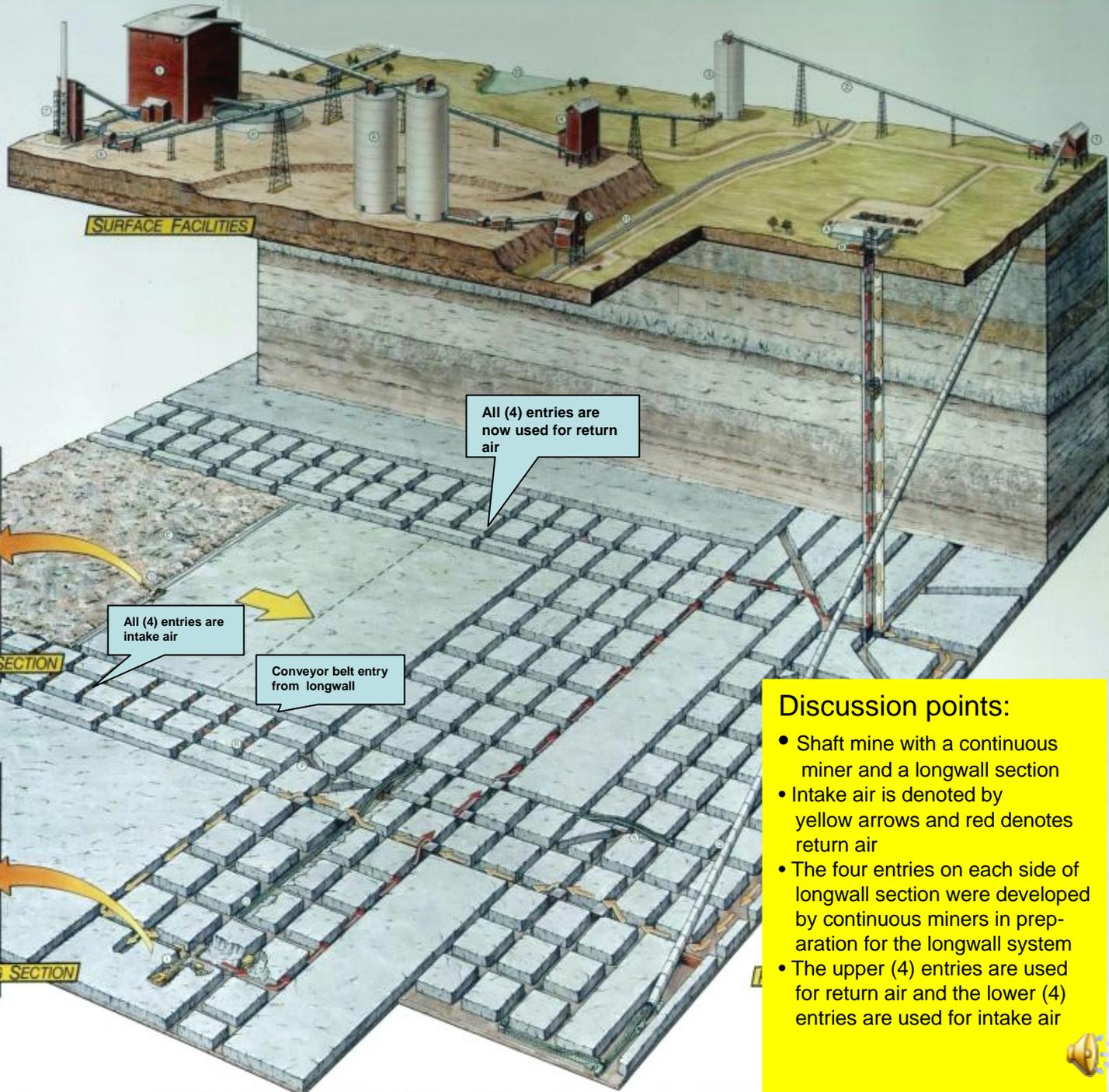
The following slide is a three-dimensional view of a longwall mining system developed and used by Consol Energy. They have graciously provided it for use in our training. (Instructors: Review and discuss the following slide with the class participants.)



This illustration is a conceptual representation of a mine. It is not complete in every detail. It is intended to illustrate the general layout of a modern mine, the methods of mining used and the technology employed.

- | | |
|------------------------------|-----------------------------|
| UNDERGROUND MINE | SURFACE FACILITIES: |
| A. PORTAL FACILITIES | 1. TRANSFER BUILDING |
| B. EXHAUST FAN | 2. RAW COAL CONVEYOR |
| C. VENTILATION SHAFT | 3. RAW COAL SILD |
| D. LONGWALL MINING SECTION | 4. BREAKER BUILDING |
| E. GOB | 5. PREPARATION PLANT |
| F. SHEARER | 6. THICKENER |
| G. SHIELD | 7. THERMAL DRYER |
| H. CONVEYOR | 8. PLANT SAMPLE BLDG |
| I. CONTINUOUS MINING SECTION | 9. CLEAN COAL SILD |
| J. CONTINUOUS MINER | 10. RAILROAD LOADOUT |
| K. INTEGRATED ROOF BOLTERS | 11. RAILROAD |
| L. LOADING MACHINE | 12. REFUSE CONVEYOR |
| M. SHUTTLE CAR | 13. FRESH WATER IMPOUNDMENT |
| N. SECTION FAN | |
| O. SECTION CONVEYOR BELT | |
| P. TRACK | |
| Q. SLOPE BELT | |
| R. STOPPING | |
| S. OVERCAST | |

→ indicates Intake Air
 ← indicates Return Air



All (4) entries are now used for return air

All (4) entries are intake air

Conveyor belt entry from longwall

- Discussion points:**
- Shaft mine with a continuous miner and a longwall section
 - Intake air is denoted by yellow arrows and red denotes return air
 - The four entries on each side of longwall section were developed by continuous miners in preparation for the longwall system
 - The upper (4) entries are used for return air and the lower (4) entries are used for intake air

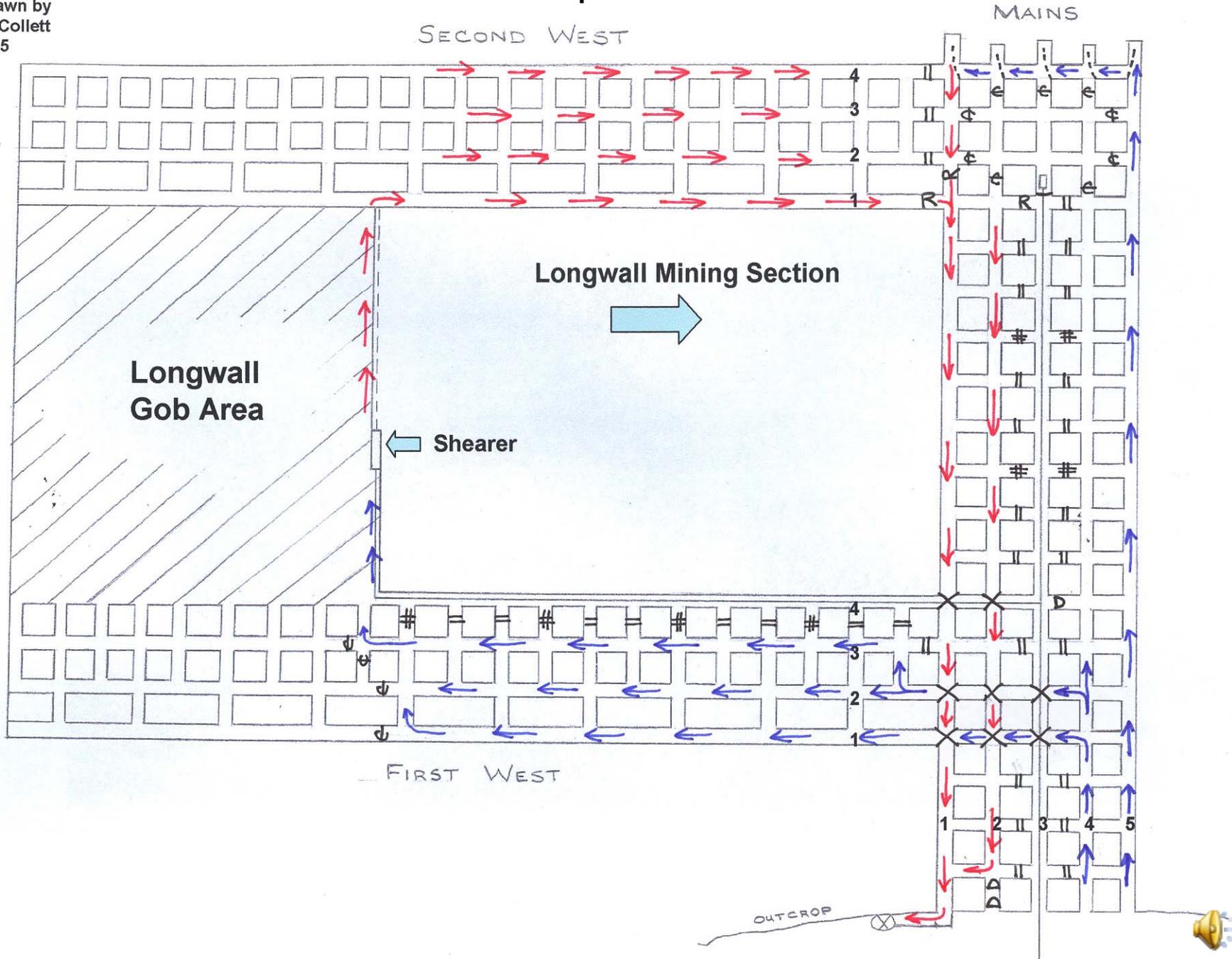
The following slide (Map #12) is a mine with a longwall and a continuous miner section. It is basically the same as the three-dimensional drawing provided by Consol that you reviewed in the previous slides, except it is a “drift” mine instead of a “shaft” mine.

(Instructors: distribute copies of (map #12) and review the ventilation method with all class participants.



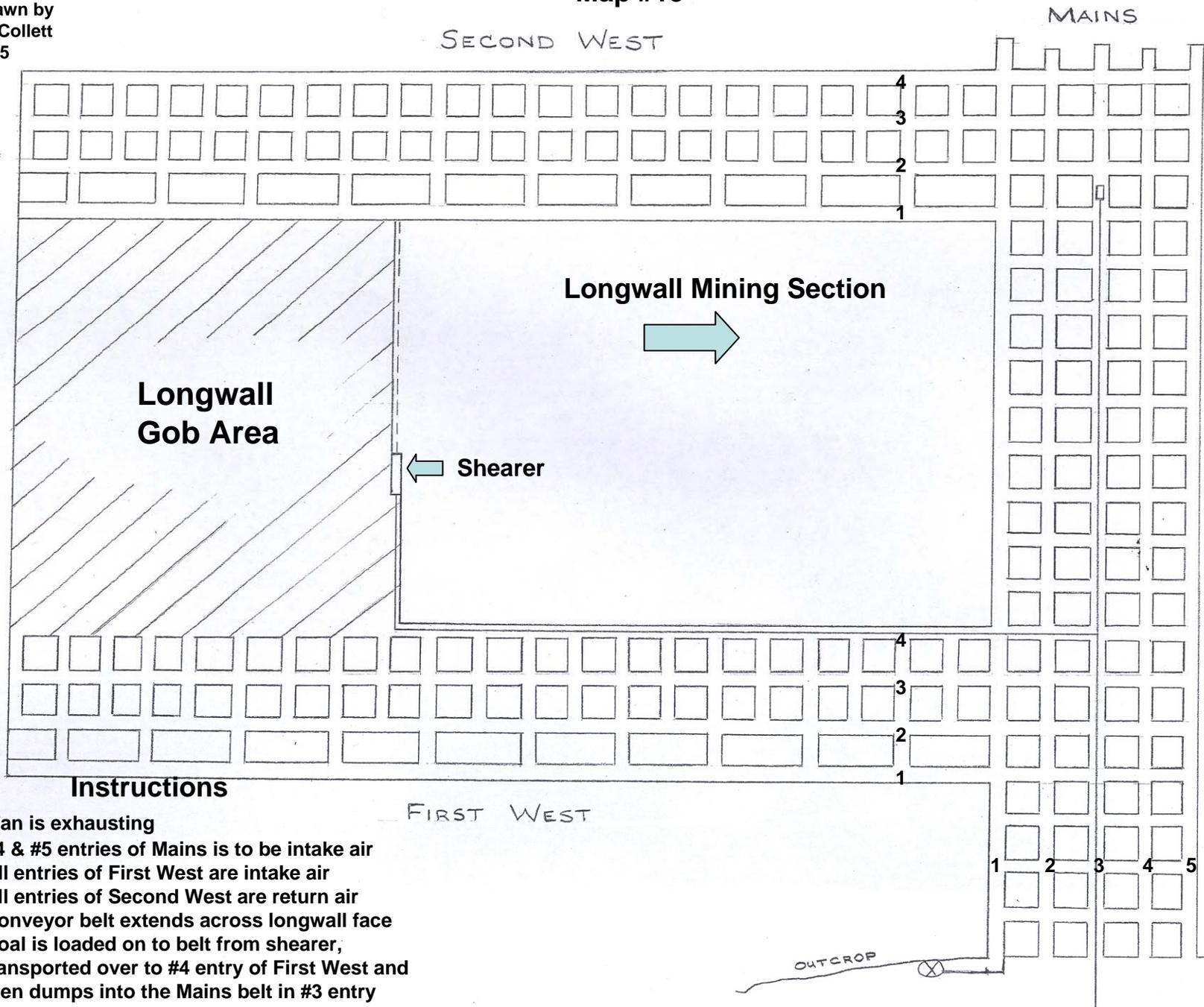
Map drawn by
Wayne Collett
11/05

Map #12



Copies of map #13, which follows this slide, should now be given to the class for practice. The practice can be done in the classroom or as a homework assignment. Participants are encouraged to make every effort to ventilate the mine without referring to Map #12, which has already been ventilated. However, it's okay to refer to it if you get stalled and are unable to ventilate the map.





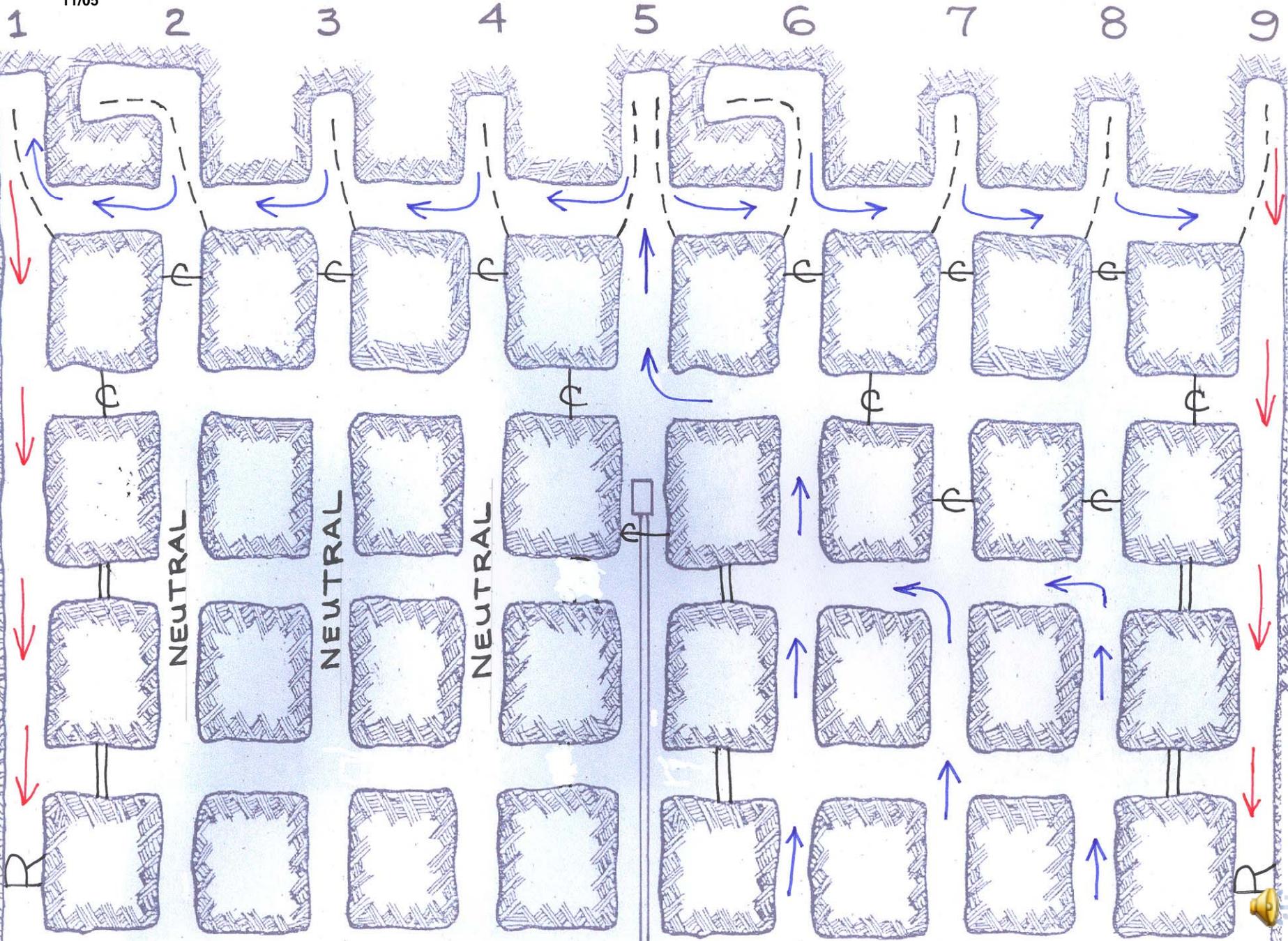
Instructions

- Fan is exhausting
- #4 & #5 entries of Mains is to be intake air
- All entries of First West are intake air
- All entries of Second West are return air
- Conveyor belt extends across longwall face
- Coal is loaded on to belt from shearer, transported over to #4 entry of First West and then dumps into the Mains belt in #3 entry
- Ventilate accordingly



Many coal companies are attempting to maximize production with the use of “super sections”. A super section utilizes two continuous miners on the same section. One continuous miner is located on the right side of the section and the other is located on the left side. A “split-type” of ventilation method is most commonly used. The following two slides show how a super section might be ventilated using a split-type ventilation system. (Instructors: distribute copies of (map #14 & #15) and review the ventilation method with all class participants.



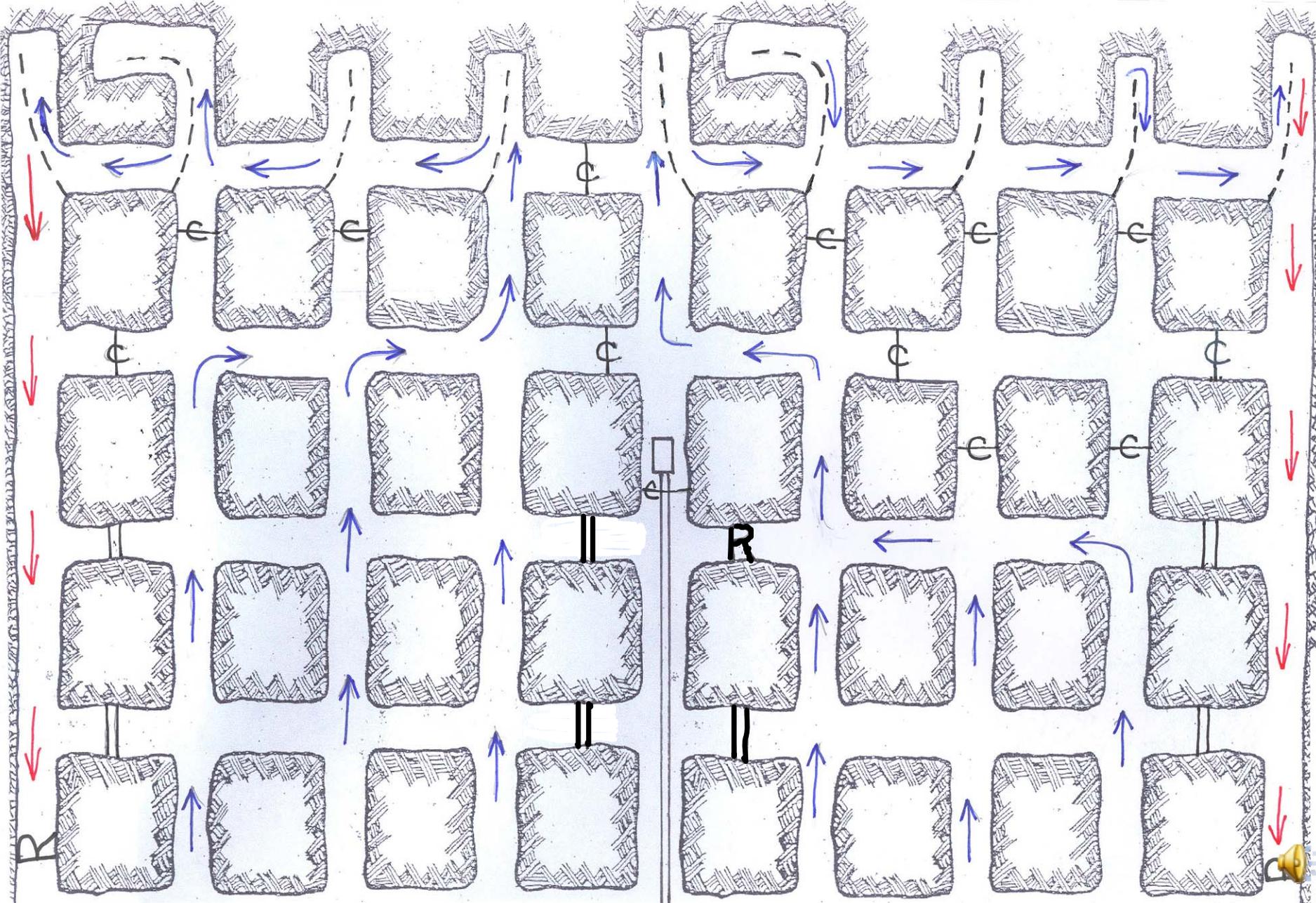


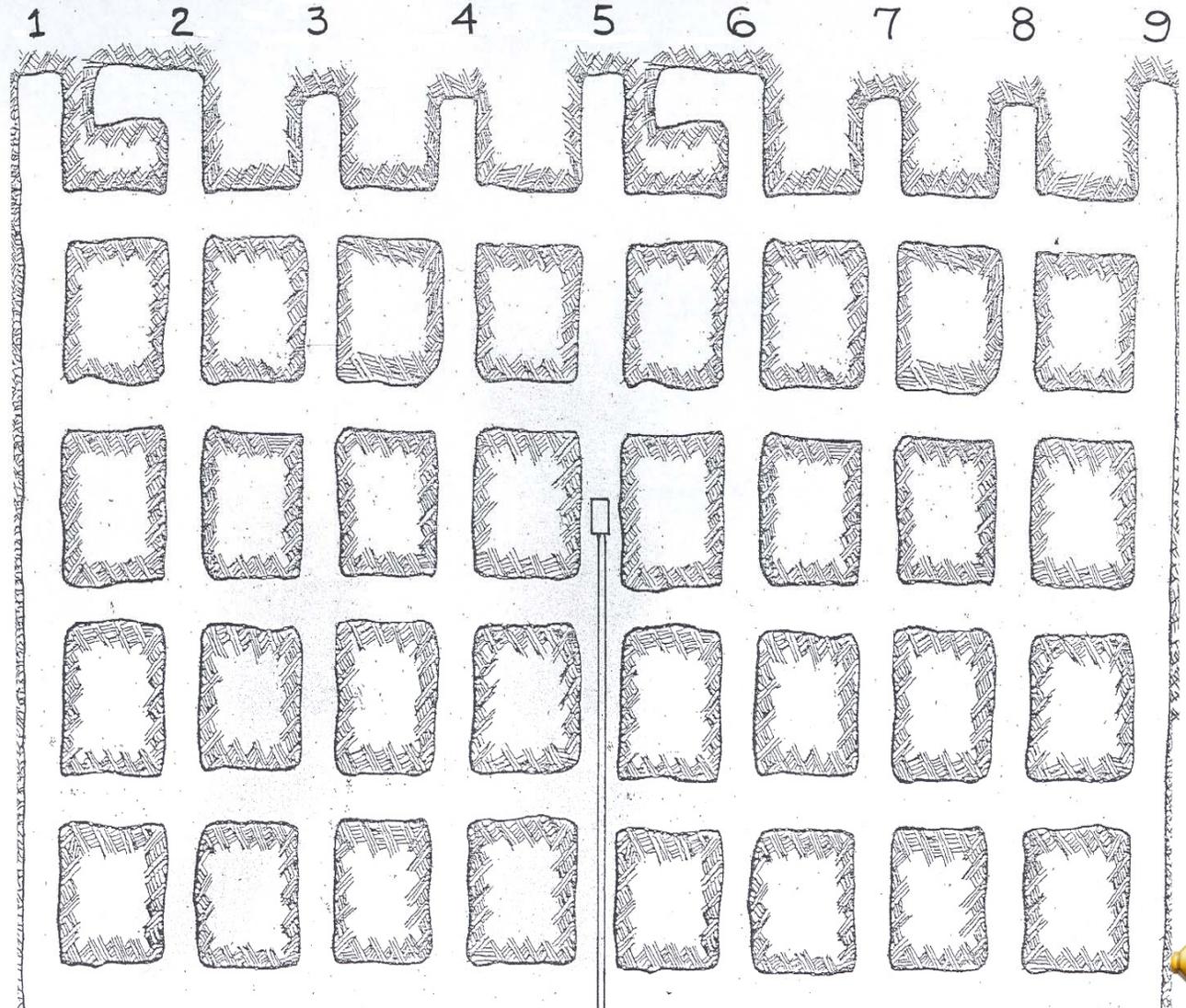
Map drawn by
Wayne Collett
11/05

Super Section

Map #15

1 2 3 4 5 6 7 8 9





Instructions

- Ventilate this super section with #1 and #9 entries being return airways.
- Entries #6, 7, and 8, are to be intake airways.
- Entries #2, 3, and 4, are to be neutral entries.



The mining process for some coal companies is to shoot the coal by use of explosives. They may utilize the conventional method, which is to undercut the coal with a cutting machine prior to shooting. The undercutting provides a “free face” for the coal to be shot.



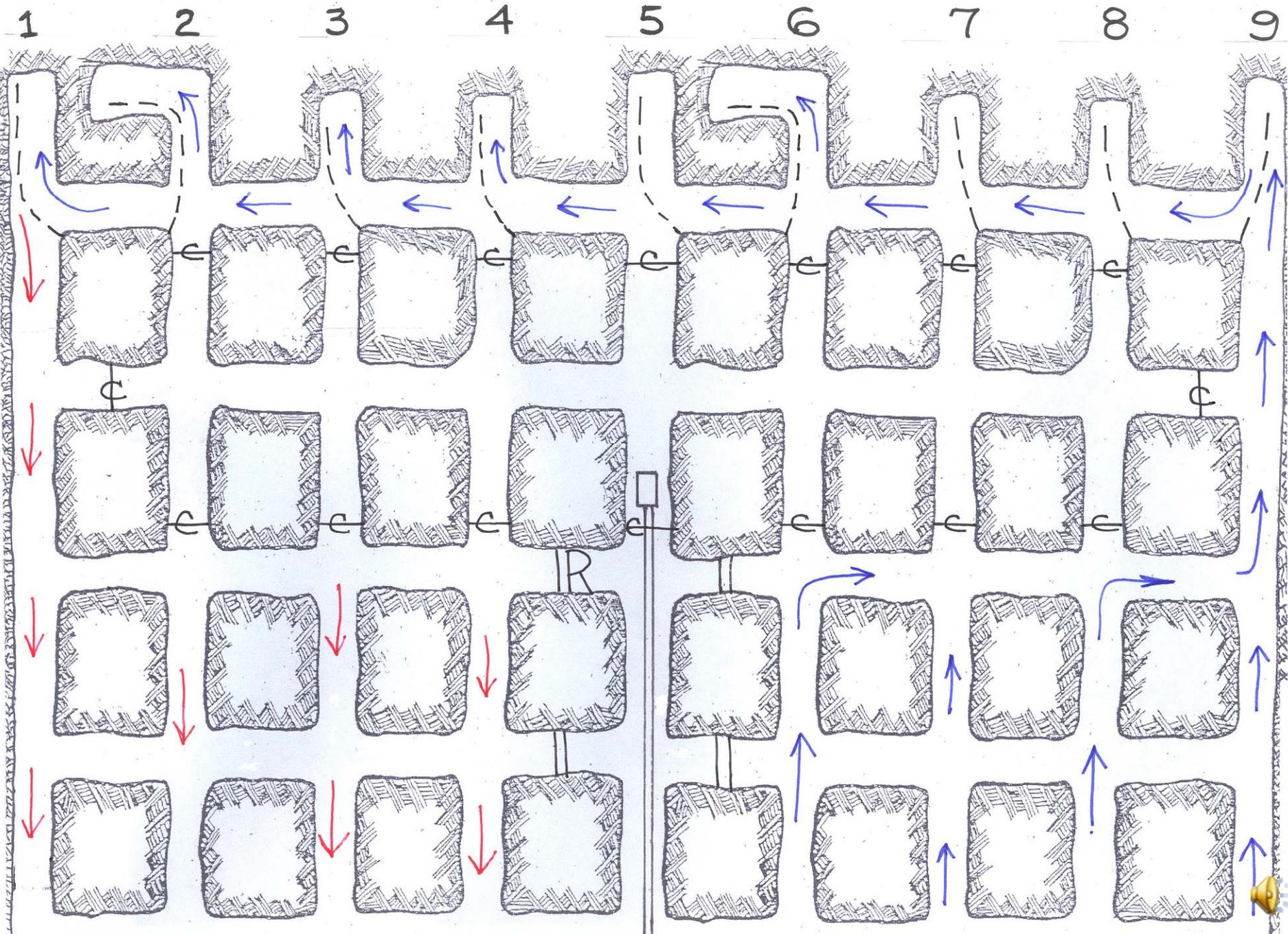
Some coal companies utilize the method of “shooting from the solid”. This method does not require undercutting and uses delay type detonators in the shooting process. As you recall from the unit on “Proper Use and Handling of Explosives” the process of “shooting from the solid” requires approval from OMSL prior to use.



When coal companies shoot coal in their mining process, the sections usually consist of several entries. A “shooting section” is ventilated much like a continuous miner section. The following slide illustrates how a “shooting” section may be ventilated.



Map #17



Copies of map #18, which follow this slide, should now be given to the class for practice. The practice can be done in the classroom or as a homework assignment.



Map #18

1

2

3

4

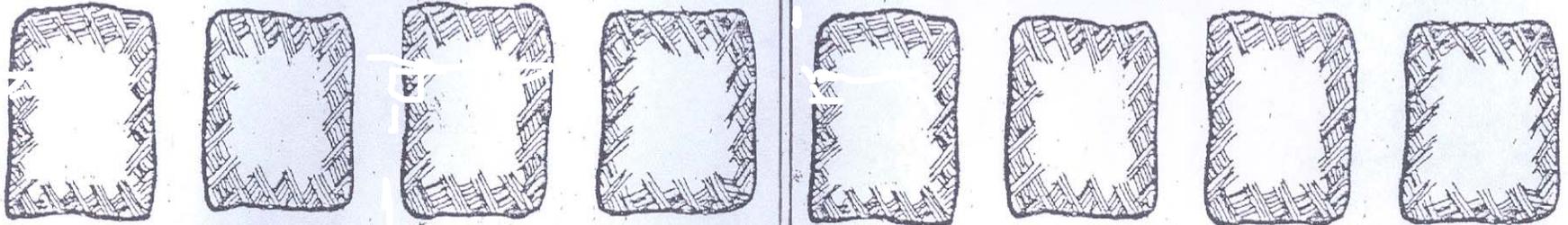
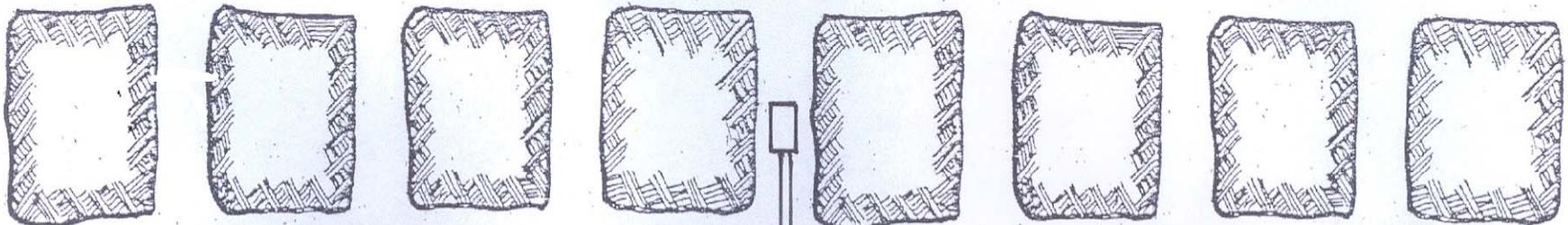
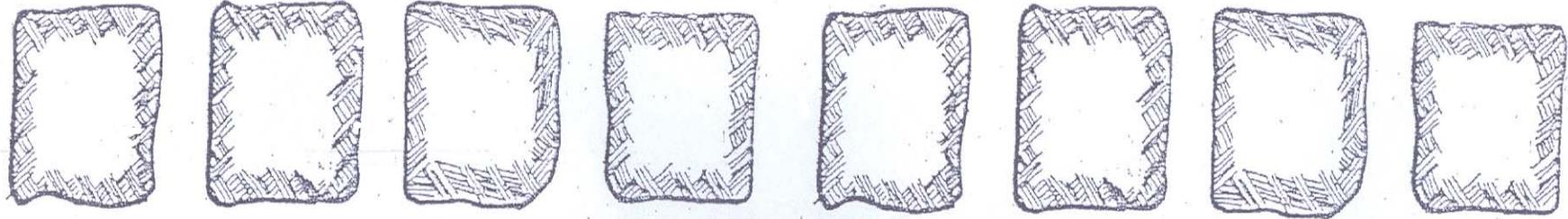
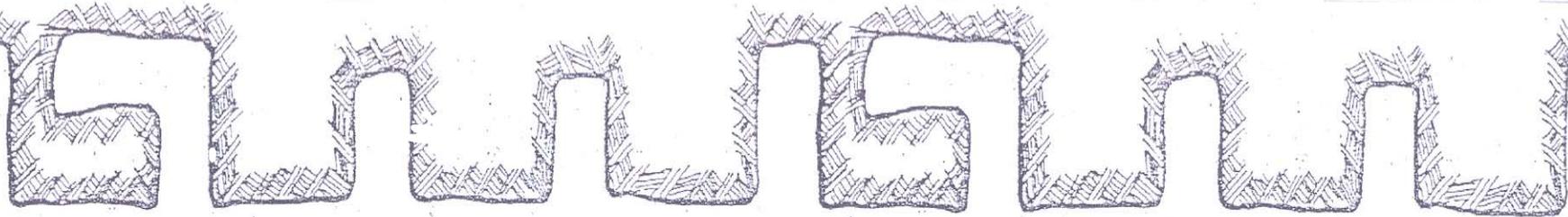
5

6

7

8

9



The next map that you will be given (map # 19) is to be ventilated according to the instructions shown on the map. It is the same size and similar to the map that you will be required to ventilate on your certification exam. The key to ventilating the map correctly is to “follow the instructions.”



NORTH MAINS

PROPERTY LINE

SECOND WEST

FIRST LEFT

FIRST EAST

FIRST WEST

INSTRUCTIONS:

1. Ventilate according to state law and mark all violations in "red"
2. Show intake air movement with "blue" arrows and return air with "red" arrows.
3. Ventilate North Mains section using No. 4 & 5 entries for intake air.
4. Ventilate First East using No. 4 & 5 entries for intake air.
5. Direct intake air through the No. 1 entry of First Left Section, located off First East. The intake air is to be coursed around the barrier blocks that enclose the "pillared out" area. Use a bleeder to course the return air from the pillared out area into the return of First East Section.
6. First West is a "Super Section". Use the "split" method of ventilation by using the No. 1 and 9 entries for return air and No. 2, 3, and 4 entries for intake air. Neutral entries will be No. 6, 7, and 8.
7. Second West is a "conventional section" and entries No. 1, 2, and 3 are to be used for intake air.
8. Ventilate sub-station with separate air current.

SCALE: 1" = 100'

Map #19

NAME _____

NUMBER _____

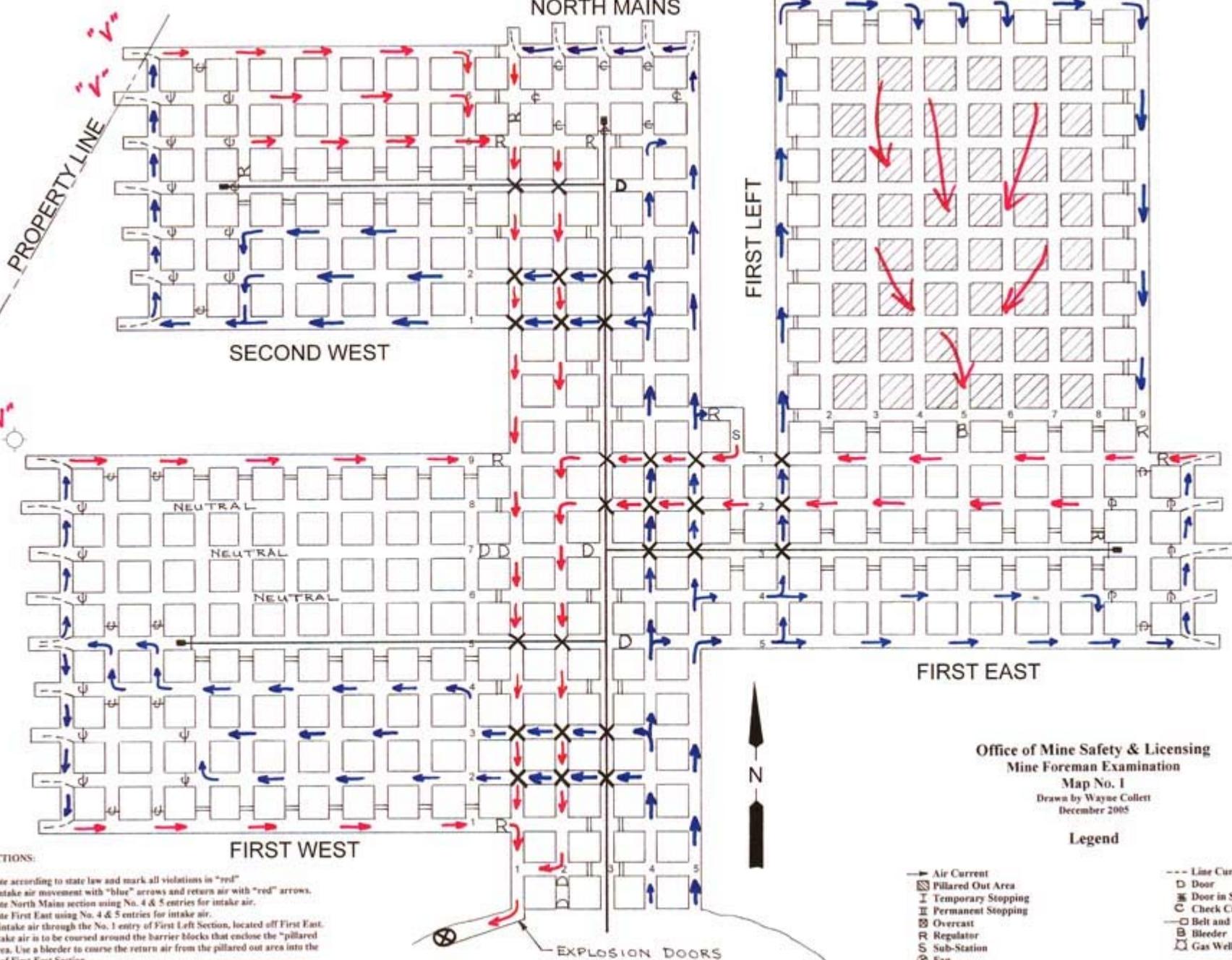
Office of Mine Safety & Licensing
Mine Foreman Examination

Map No. 1
Drawn by Wayne Collett
December 2005

Legend

- Air Current
- ▨ Pillared Out Area
- ⊥ Temporary Stopping
- ⊥ Permanent Stopping
- ⊥ Overcast
- ⊥ Regulator
- ⊥ Sub-Station
- ⊗ Fan
- Line Curtain
- D Door
- ⊥ Door in Stopping
- ⊥ Check Curtain
- ⊥ Belt and Feeder
- ⊥ Bleeder
- ⊗ Gas Well





INSTRUCTIONS:

1. Ventilate according to state law and mark all violations in "red"
2. Show intake air movement with "blue" arrows and return air with "red" arrows.
3. Ventilate North Mains section using No. 4 & 5 entries for intake air.
4. Ventilate First East using No. 4 & 5 entries for intake air.
5. Direct intake air through the No. 1 entry of First Left Section, located off First East. The intake air is to be coarsed around the barrier blocks that enclose the "pillared out" area. Use a bleeder to coarse the return air from the pillared out area into the return of First East Section.
6. First West is a "Super Section". Use the "split" method of ventilation by using the No. 1 and 9 entries for return air and No. 2, 3, and 4 entries for intake air. Neutral entries will be No. 6, 7, and 8.
7. Second West is a "conventional section" and entries No. 1, 2, and 3 are to be used for intake air.
8. Ventilate sub-station with separate air current.

SCALE: 1" = 100'

Map #20

Office of Mine Safety & Licensing
 Mine Foreman Examination
 Map No. 1
 Drawn by Wayne Collett
 December 2005

Legend

- Air Current
- ▨ Pillared Out Area
- ⊥ Temporary Stopping
- ⊥ Permanent Stopping
- ⊥ Overcast
- R Regulator
- S Sub-Station
- ⊗ Fan
- Line Curtain
- D Door
- ⊠ Door in Stopping
- C Check Curtain
- Belt and Feeder
- B Bleeder
- ⊗ Gas Well

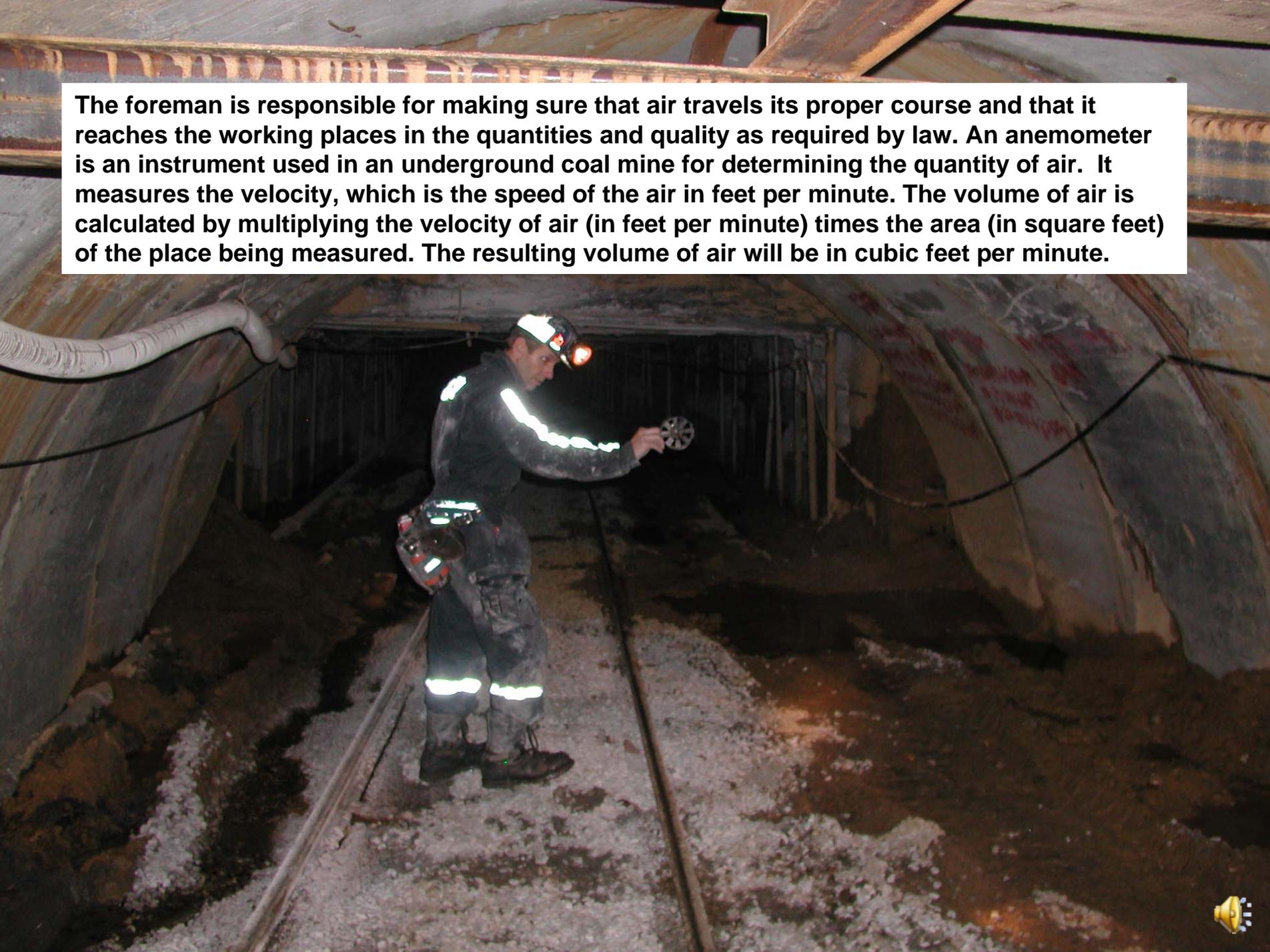
NAME _____ NUMBER _____



Use of Anemometer



The foreman is responsible for making sure that air travels its proper course and that it reaches the working places in the quantities and quality as required by law. An anemometer is an instrument used in an underground coal mine for determining the quantity of air. It measures the velocity, which is the speed of the air in feet per minute. The volume of air is calculated by multiplying the velocity of air (in feet per minute) times the area (in square feet) of the place being measured. The resulting volume of air will be in cubic feet per minute.



The quantity of air that travels through a working place is determined by measuring the speed or velocity of the air with an anemometer, and then multiplying the velocity (in feet per minute) by the area of the place being measured (in square feet). The result will be the volume of air (in cubic feet per minute).



To determine the quantity of air, you must measure the air velocity with an anemometer for one minute. Traverse back and forth across the place to obtain an average reading. The reading is the speed or velocity of the air in feet per minute.



Measure the width of the place



Measure the height of the place.



You are ready to calculate the volume of air. Multiply the height (in feet) by the width of the place (in feet) and this gives you the area (in square feet) of the place being measured. Multiply the area (in square feet) by the anemometer reading, which is the velocity (speed of air in feet per minute) and the result will be the quantity or volume of air in cubic feet per minute.



To Determine Air Quantity:

- Use an anemometer to measure the air velocity for one minute. Traverse the area to insure an average reading with the anemometer.
- After determining the air velocity, measure the width and height of the place to determine the area in square feet.
- Multiply the area (in square feet) by the anemometer reading (velocity or speed of air in feet per minute) and the result will be the quantity of air in cubic feet per minute.



Correct use of the anemometer for one (1) minute and then correctly determining the air velocity reading is necessary for accurate air volume measurements. The following slides will assist you in determining correct anemometer readings.

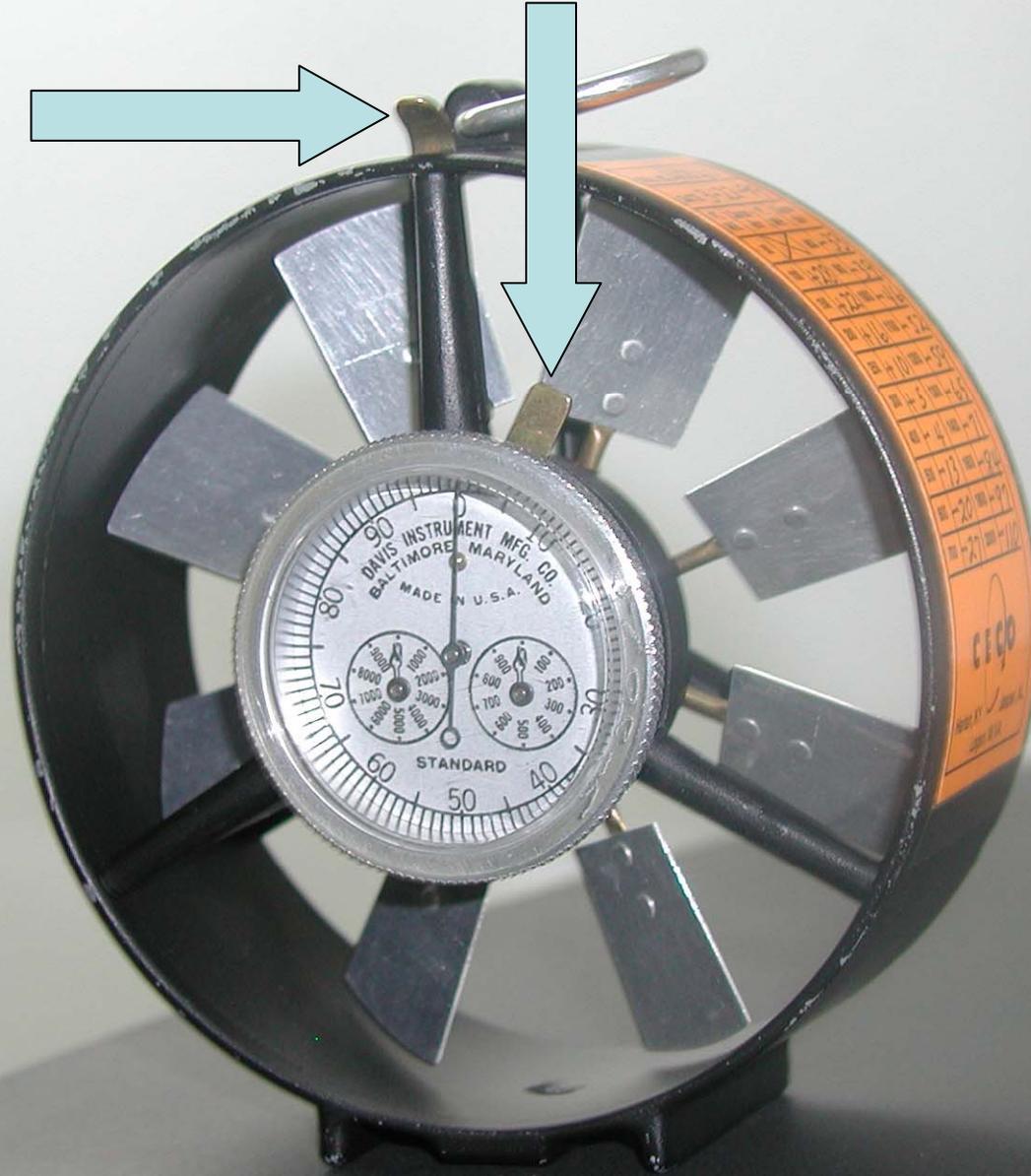


The anemometer consist of a propeller or a series of blades which turn inside a metal ring. Air currents striking the blades rotate the vane. Each revolution of the vane corresponds to one linear foot of air travel.



Zero Lever

Brake Lever



Front View of Anemometer

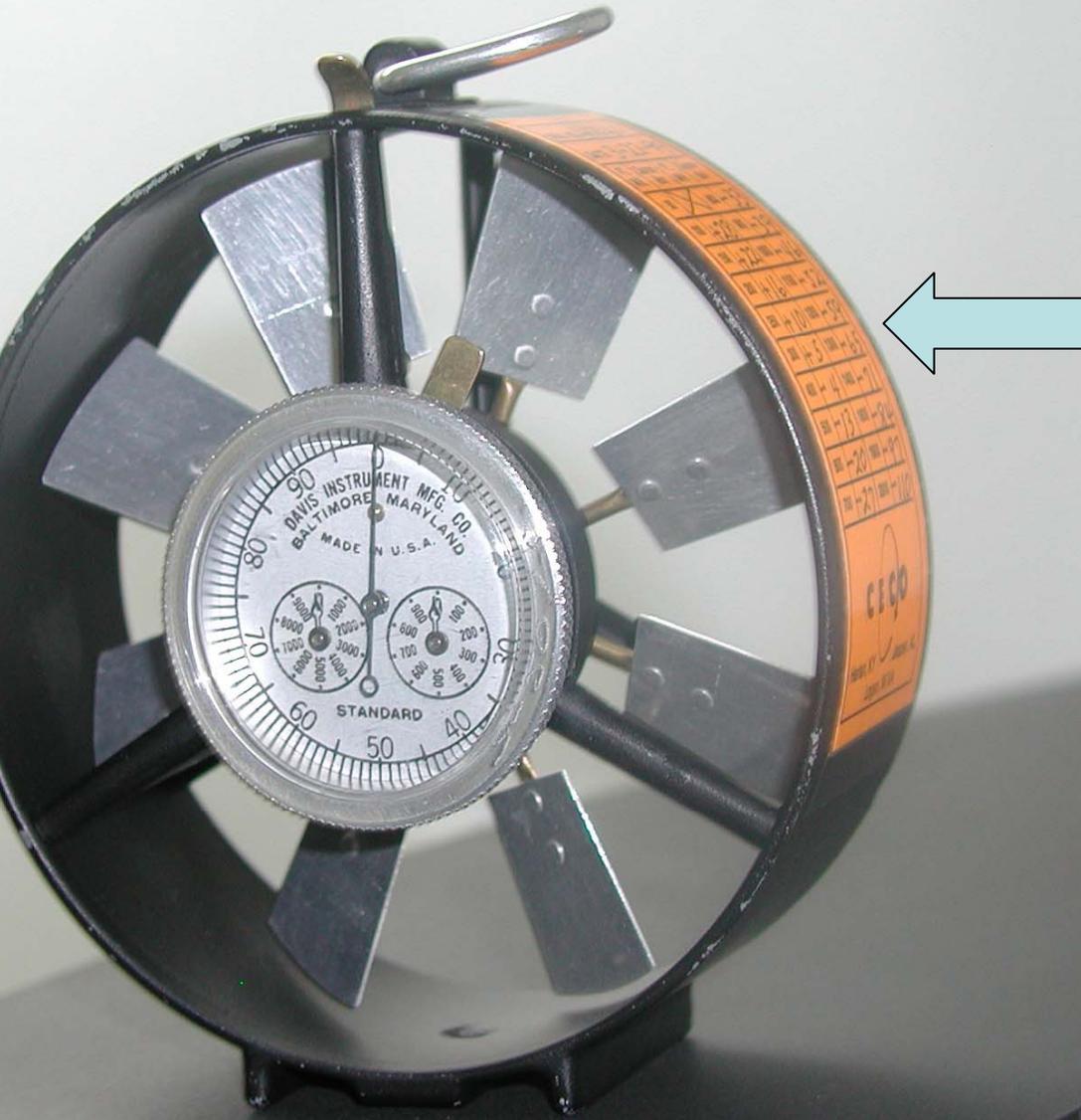


When taking an air reading, the anemometer must be held so that air enters through the rear side of the anemometer. This causes the pointers on the front dials to turn in a clockwise direction.



Rear side of anemometer



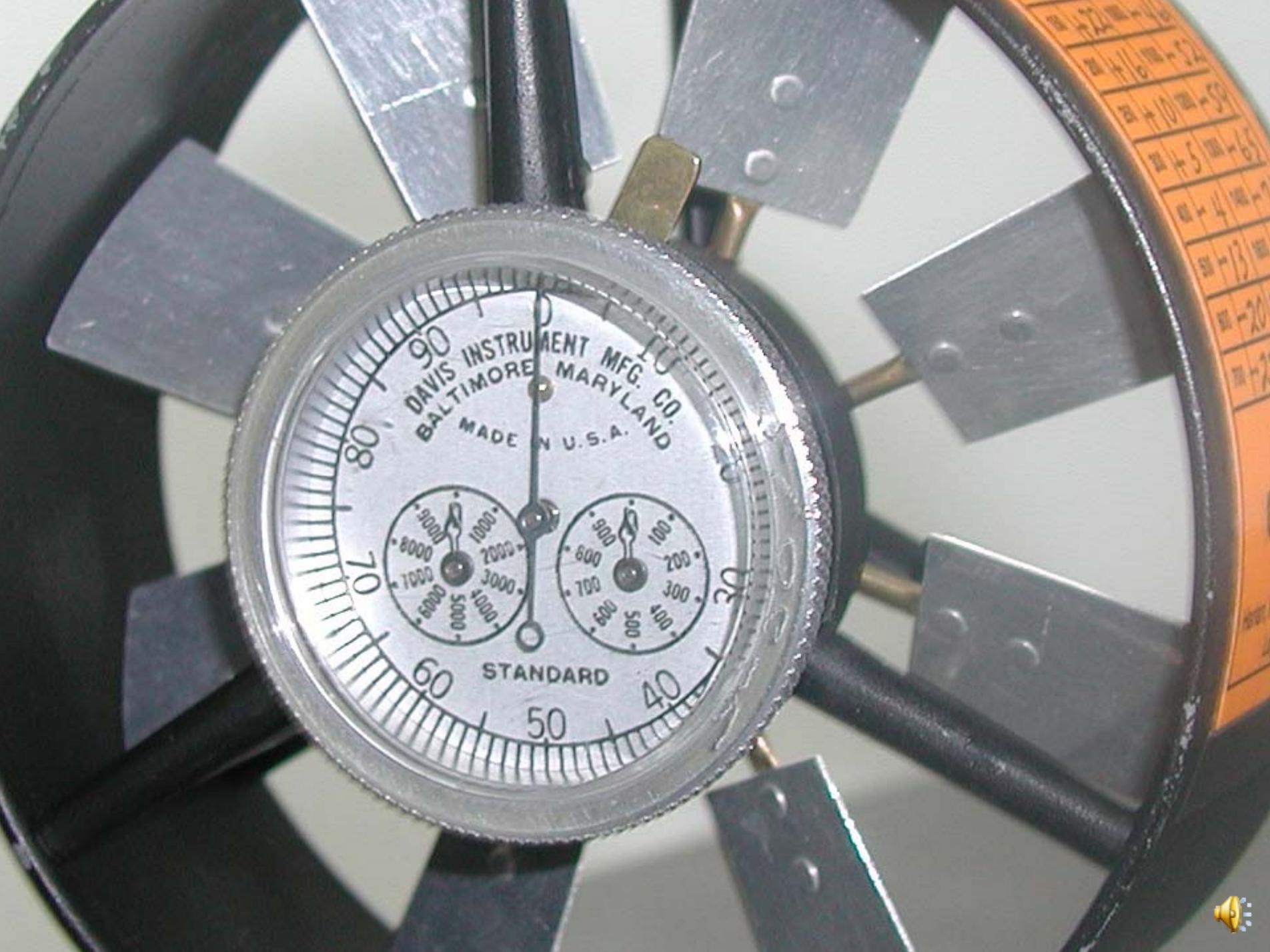


Anemometers should be calibrated periodically to provide accurate air readings.

The blue arrow to the left is pointing to an orange sticker containing calibration data. After measuring the air with the anemometer for one minute, the foreman will compare the results with the calibration data and adjust accordingly.

The instructors can review this more in detail, after participants learn to take air readings and perform necessary calculations.





DAVIS INSTRUMENT MFG. CO.
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MADE IN U.S.A.

90

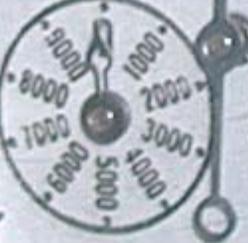
80

70

60

50

40



STANDARD



On the front side of an anemometer you see (3) dials with needle pointers that will turn clockwise when air enters the rear of the anemometer. After taking the reading for one minute, you observe the position of the needles to determine the air reading.

One (1) complete turn of the largest needle represents one (1) linear foot of air measurement.

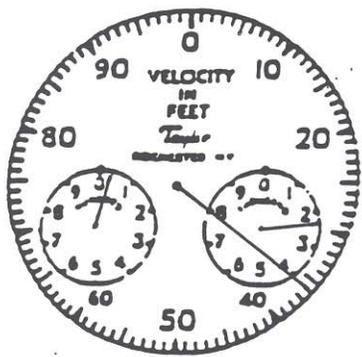
Observing the position of all three needles is required for determining air readings.

To correctly read the anemometer requires practice. The following slides will help you do this.

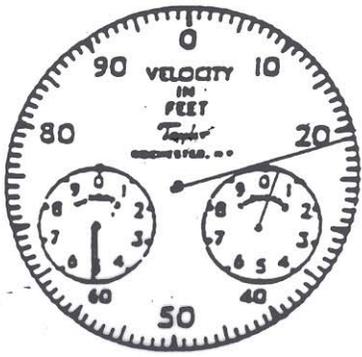


we 7/97

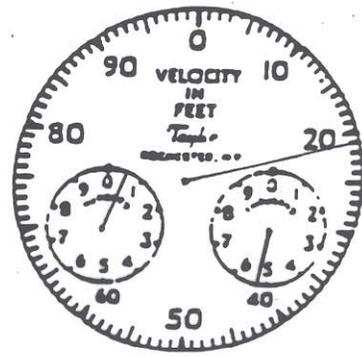
Draw the anemometer hands for the reading given.



236 fpm

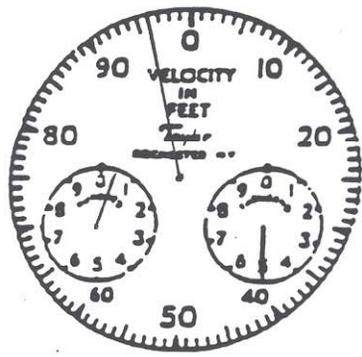


5021 fpm

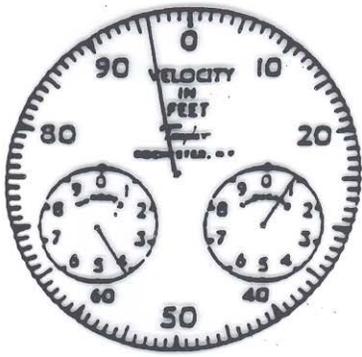


521 fpm

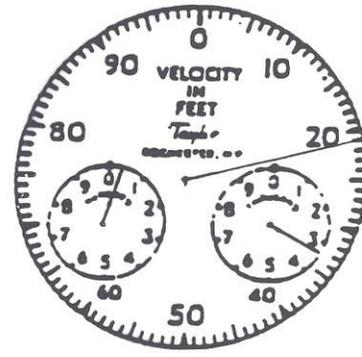
Draw the anemometer hands for the reading given.



496 fpm



4096 fpm



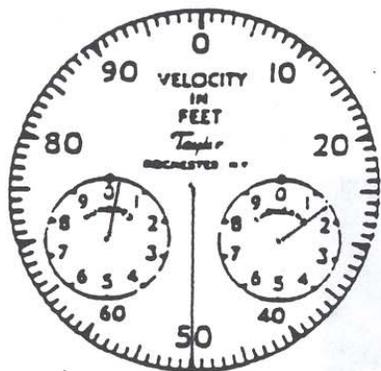
321 fpm

Draw the anemometer hands for the reading given.

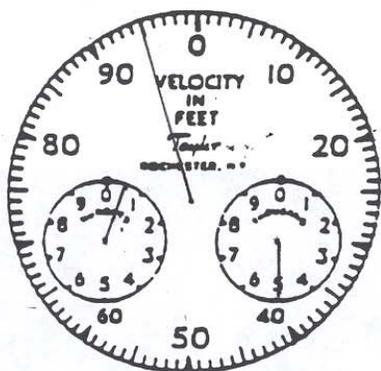
**Instructors:
review and
discuss
each air
reading
example
with class
participants.**



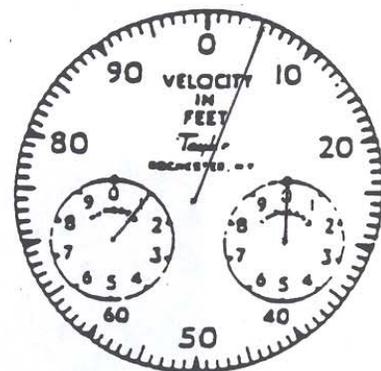
Draw the anemometer hands for the reading given.



150 fpm



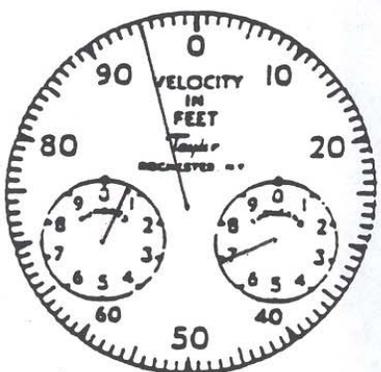
495 fpm



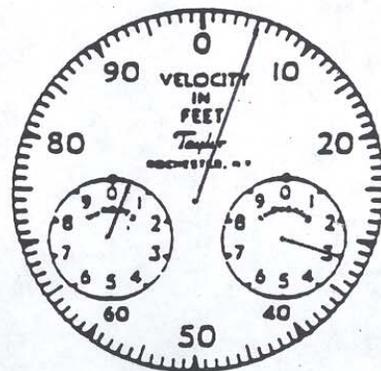
1005 fpm

**Instructors:
review these
examples
with class
participants.**

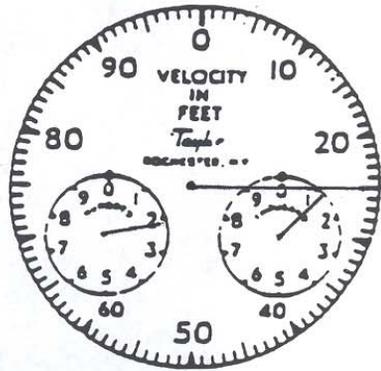
Draw the anemometer hands for the reading given.



695 fpm



305 fpm

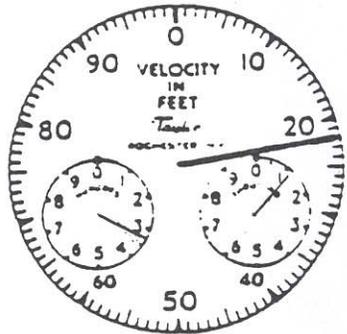


2125 fpm

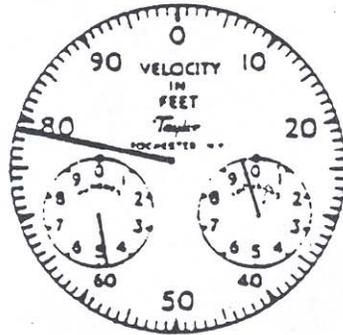


Anemometer - Taylor

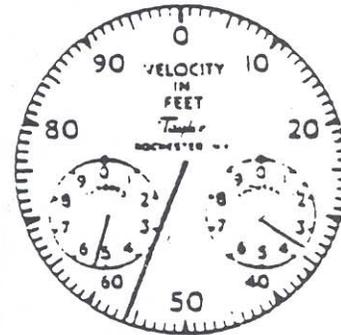
Read and record the feet per minute.



_____ fpm



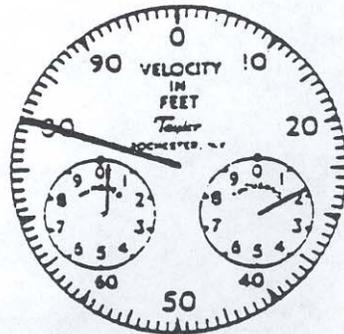
_____ fpm



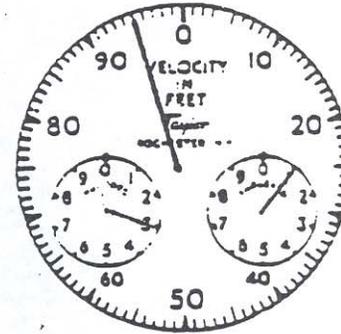
_____ fpm



_____ fpm



_____ fpm



_____ fpm

Instructors:
distribute copies of this slide to each participant for their practice. They are to record the air reading under each sample.

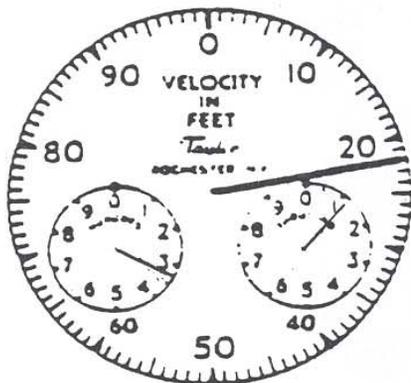
After the participants complete the exercise, review the correct readings which are shown on the next slide.



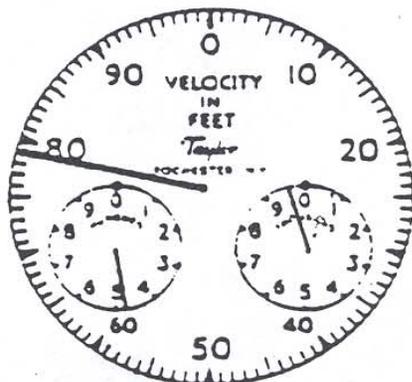
Anemometer - Taylor

Instructors: review these readings with the class participants.

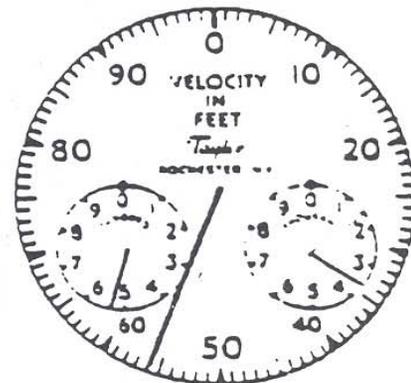
Read and record the feet per minute.



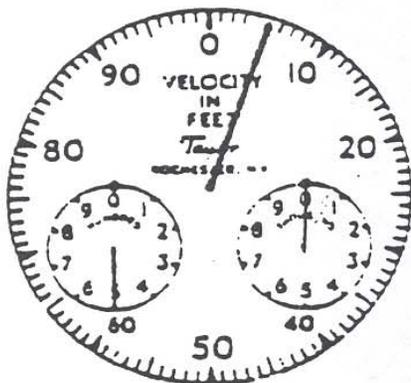
3122 fpm



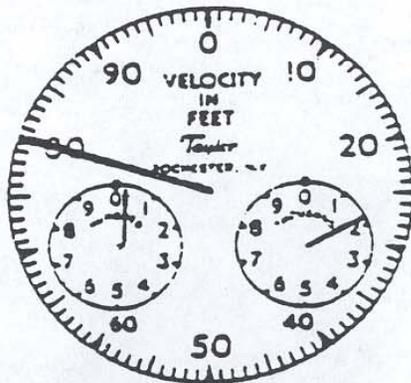
4979 fpm



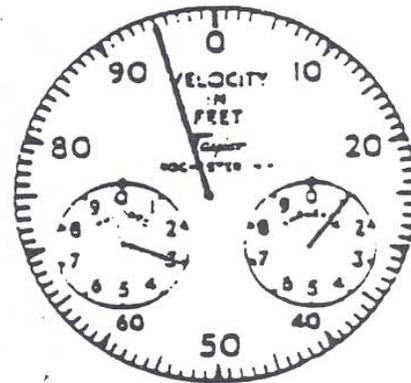
5356 fpm



5005 fpm



180 fpm



3095 fpm

Instructors: demonstrate to class participants how to hold and use the anemometer properly. Require all participants to practice with the anemometers in the classroom. Air movement can be simulated with a small fan. Check their air readings and calculations for accuracy.



This is a new type anemometer that is being used by some coal companies. It is small enough to fit into your shirt pocket and provides an accurate instantaneous reading because it is digital. The reading shown is 154 feet per minute. While you may have an opportunity to use this type anemometer in the future, you will be tested on the older style anemometer previously discussed.



End of Part 2 of Unit 7