



VENTILATION

A principal control for dust as well
as methane

DUST CONTROL

CONTINUOUS MINERS AND ROOF BOLTERS

BEST PRACTICES

FACE VENTILATION METHODS

Continuous Miners

Blowing ventilation with scrubbers

Exhaust ventilation with scrubbers

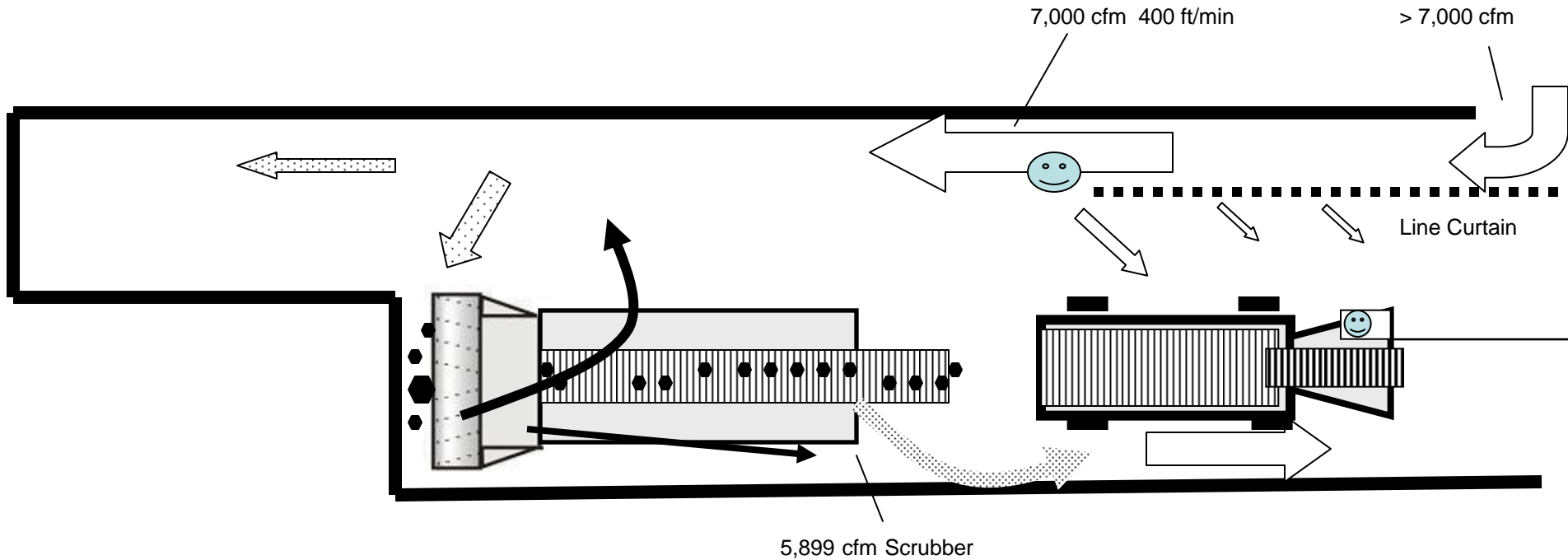
Exhaust ventilation without scrubbers

BLOWING FACE VENTILATION

DUST SCRUBBERS

Fresh air is directed behind the line curtain and then discharged from the end of the line curtain/duct toward the face. This fresh air dilutes and entrains dust at the mining face, and the dust-laden air then passes out of the immediate face area and into the dust scrubber. After the dust is removed from the air, the air is discharged backwards from the rear of the mining machine on the side of the machine opposite the line curtain.

BLOWING FACE VENTILATION



1. End of Line curtain airflow approximately 1000 cfm greater than scrubber.

2. Airflow measured with scrubber off.

3. Use measured scrubber airflow not the name plate.

4. Operator stands in fresh air (out of red zone).

This may require adjustment of curtain during movement of the continuous miner .

5. Shuttle car operator is on the curtain side of the entry.

6. Scrubber discharge on off curtain side.

BLOWING FACE VENTILATION

CURTAIN AIRFLOW MEASURED WITH SCRUBBER ON

BAD PRACTICE

NOT RECOMMENDED

>7,000 cfm

7,000 cfm

3,000 cfm

Line Curtain (>40 ft.)

5,899 cfm Scrubber

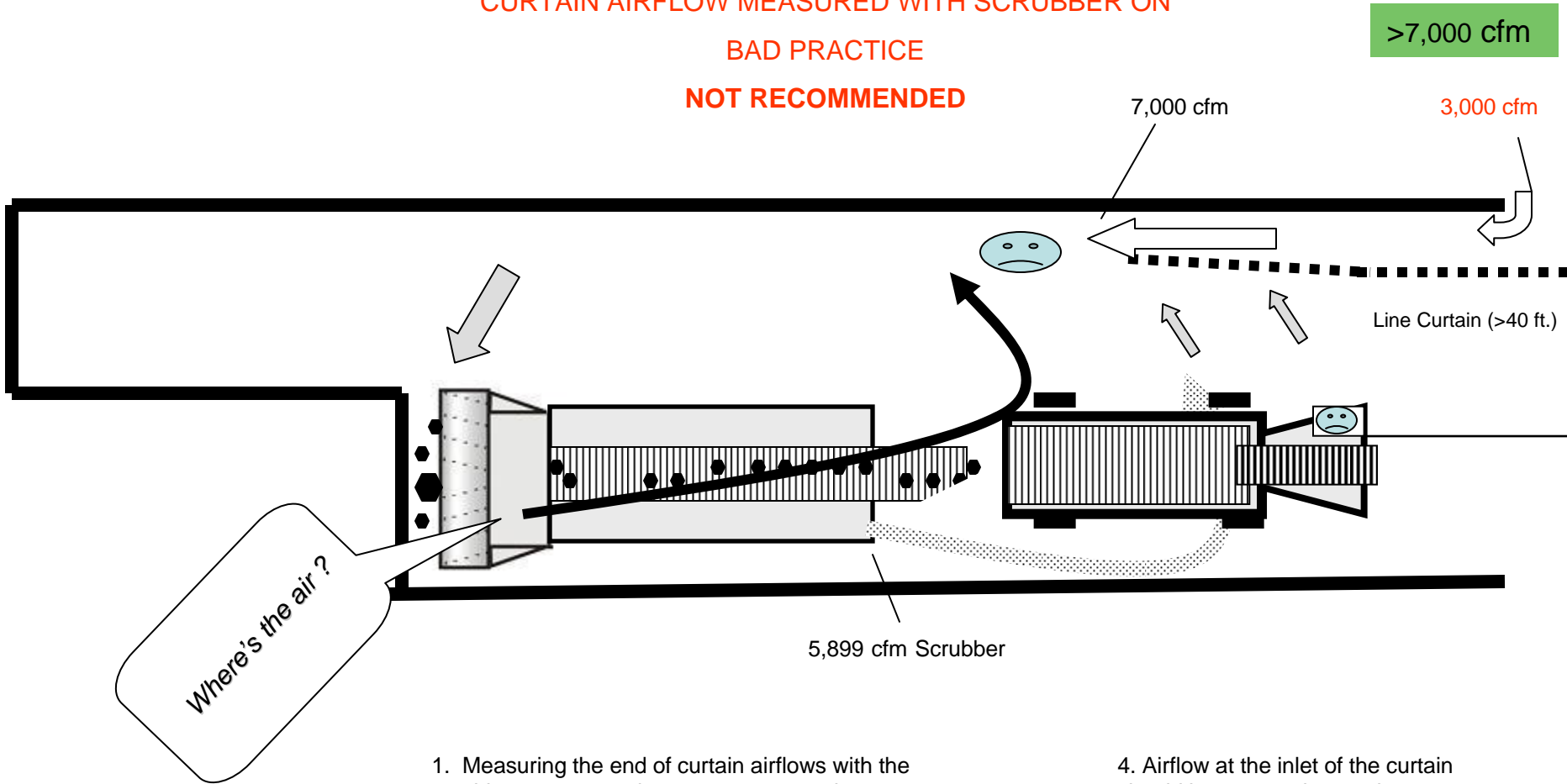
Where's the air?

1. Measuring the end of curtain airflows with the scrubber on can produce erroneous results.

2. Providing less makeup air than the scrubber requires can significantly increase re-circulation of dusty air.

3. May cause miner operator and shuttle car operator to be in dusty air.

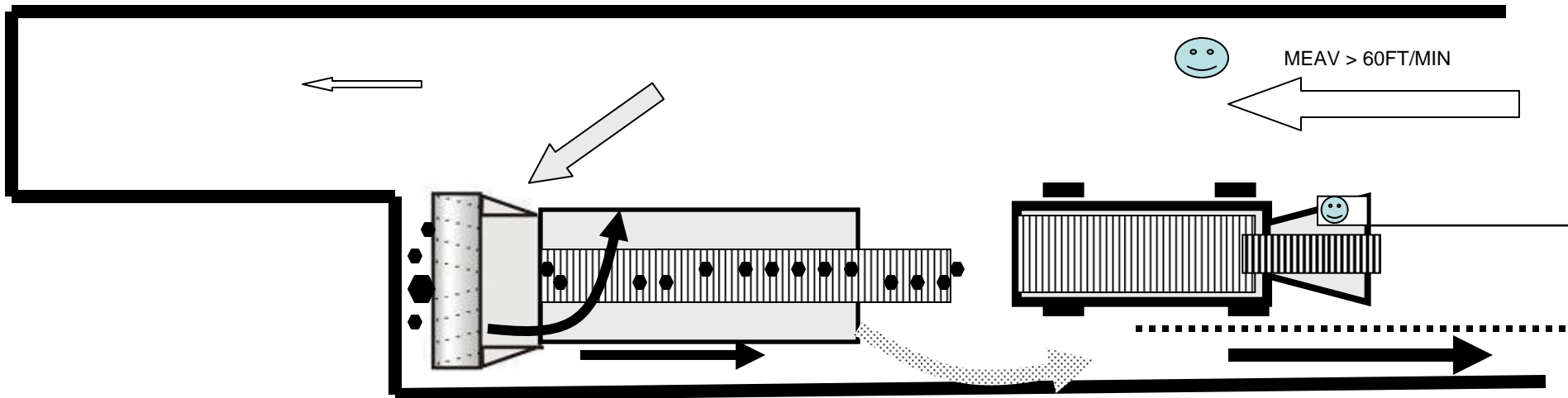
4. Airflow at the inlet of the curtain should be greater than at the curtain outlet.



EXHAUST FACE VENTILATION DUST SCRUBBERS

When exhaust ventilation is used with a scrubber, fresh air is drawn through the mine entry toward the face. This air then passes into the scrubber where it is cleaned of dust and discharged back toward the line curtain. From the line curtain, the air passes to the return.

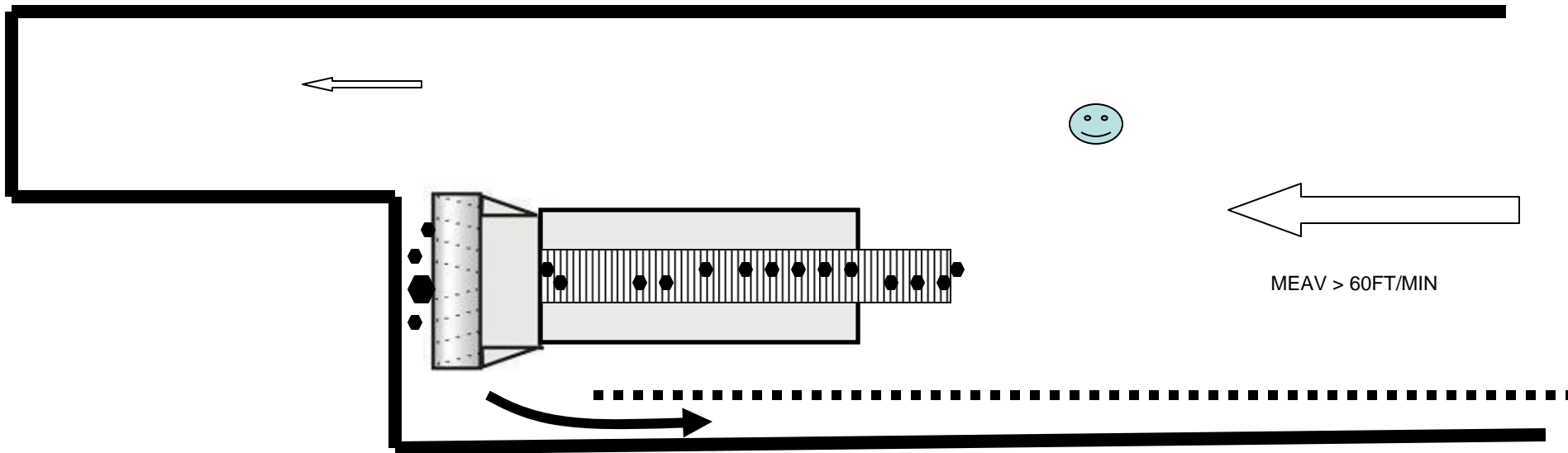
EXHAUST FACE VENTILATION WITH SCRUBBER



1. Curtain airflows measured with the scrubber off.
2. Curtain airflow greater than measured scrubber airflow.
3. Miner operator remains in intake air outby the end of the curtain.

4. Curtain set back should be far enough to capture scrubber exhaust.
5. Shuttle car operator located on off curtain side.

EXHAUST FACE VENTILATION WITHOUT SCRUBBER



1. Recommend that the mean entry air velocity be as high as possible without degrading line curtain integrity. Face air quantity usually has the greatest impact on dust reduction.

2. Keep the end of the curtain or tubing within 10 feet of the face. (Or as stated in Vent Plan)

3. Maintain the line curtain and keep leakage to a minimum.

Best Practices

Blowing Face Ventilation

- Keep miner operators/ helpers on intake side of curtain in fresh air.
- Shuttle car operator should be located on curtain side of the entry.
- Scrubber should always exhaust on the return/off curtain side of the entry.
- The end of curtain airflow should be measured with the continuous miner at the face and the scrubber off.
- The minimum airflow at the end of the line curtain should provide the required makeup air for the dust scrubber to work properly.
- To prevent dust bypassing or passing through the scrubber from being drawn back to the operator's position, it is recommended that the end of line curtain air quantity be 1000 cfm greater than the measured scrubber airflow.

Best Practices

Exhaust Face Ventilation

- Operators/helpers should remain on the intake side of the entry.
- Scrubbers should always exhaust on the return/curtain side of the entry.
- Like the blowing curtain, the end of the line curtain airflow should be measured with the continuous miner at the face with the scrubber off.
- The line curtain should be hung snugly to the roof and floor to reduce as much short circuiting of intake air as possible.
- There is no recommended maximum airflow to the face. All available airflow should be directed to the face.
- The minimum airflow should be greater than the measured scrubber airflow with a minimum of a 60 fpm mean entry air velocity.
- Shuttle car operator should be located on off curtain side of entry.
- When dust **scrubber not used** end of curtain or tubing should be within 10 feet of the face. When dust scrubber is used the end of the curtain should be set back far enough to capture scrubber exhaust.

BLOWING FACE VENTILATION

ADVANTAGES

1. Easier to maintain than exhaust
2. Provides a better sweep of the face for methane dilution.

DISADVANTAGES

1. Shuttle car operators are in return air.
2. Miner operator must remain in fresh air at the end of the line curtain during cutting of coal.
3. Incorrect balance of airflow may cause re-circulation or over powering of scrubber inlets.

EXHAUST FACE VENTILATION

ADVANTAGES

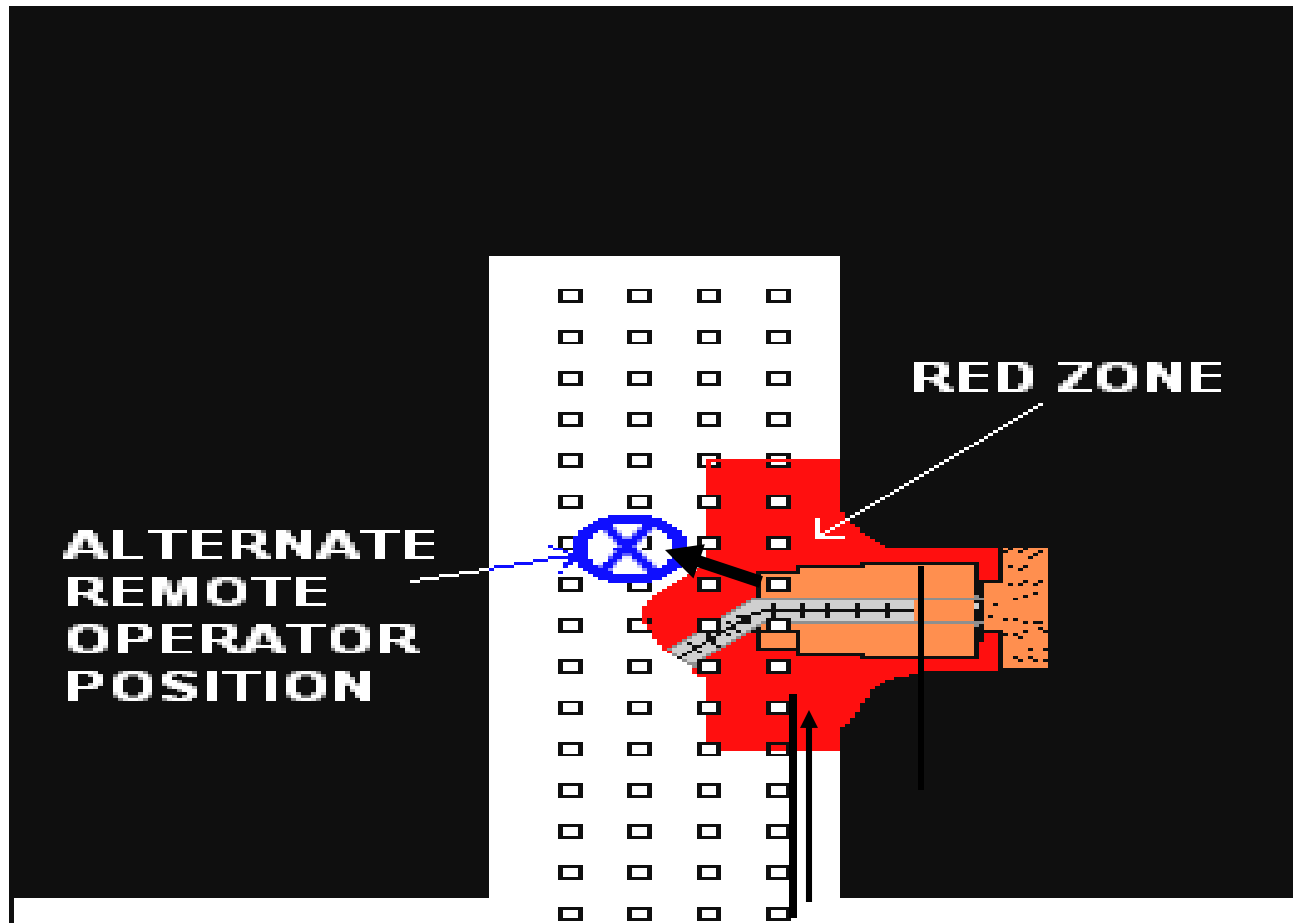
1. Shuttle car operator is in fresh air during cutting of coal.
2. Miner operator has more options as where to stand and still remain in fresh air while cutting coal.
3. Typically, does not interfere with inlet capture efficiency. .

DISADVANTAGES

1. Curtain is hard to maintain.
2. Typically does not provide a fresh air sweep of the face that is as effective for methane dilution as blowing ventilation.

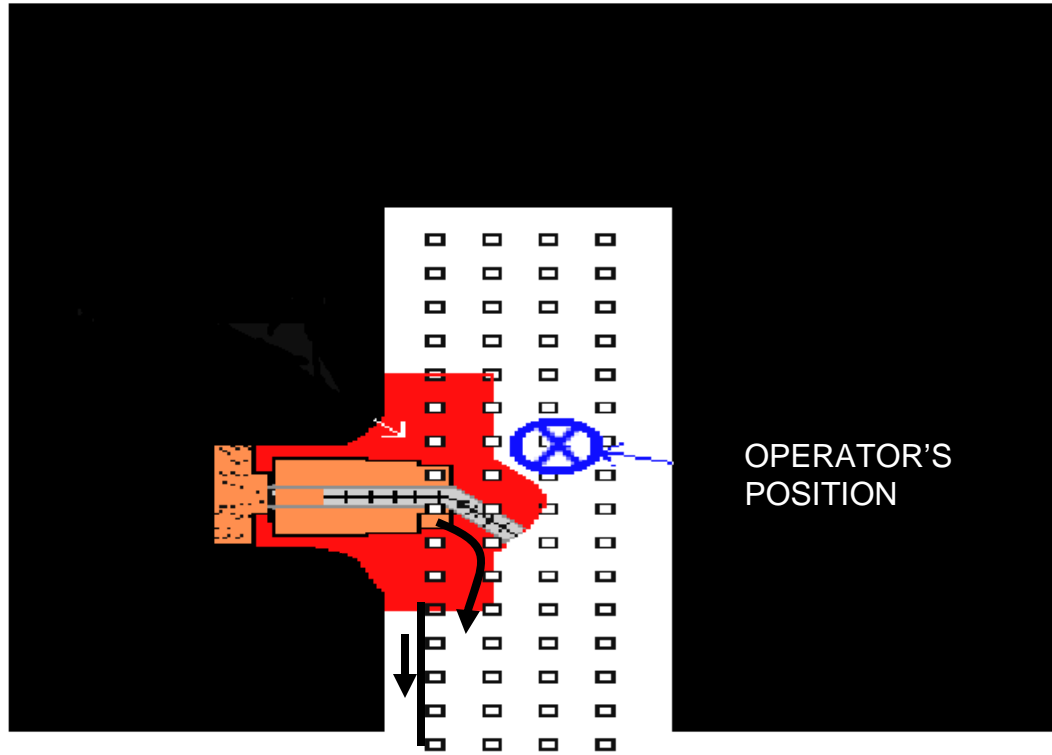
CROSS CUTS WITH BLOWING CURTAIN

PIB03-28



Depending on specific mining circumstances, an additional best practice for turning crosscuts is to allow the remote-controlled continuous miner (CM) operator the option to be positioned on the inby side of the intersection.

CROSS CUTS WITH EXHAUST CURTAIN



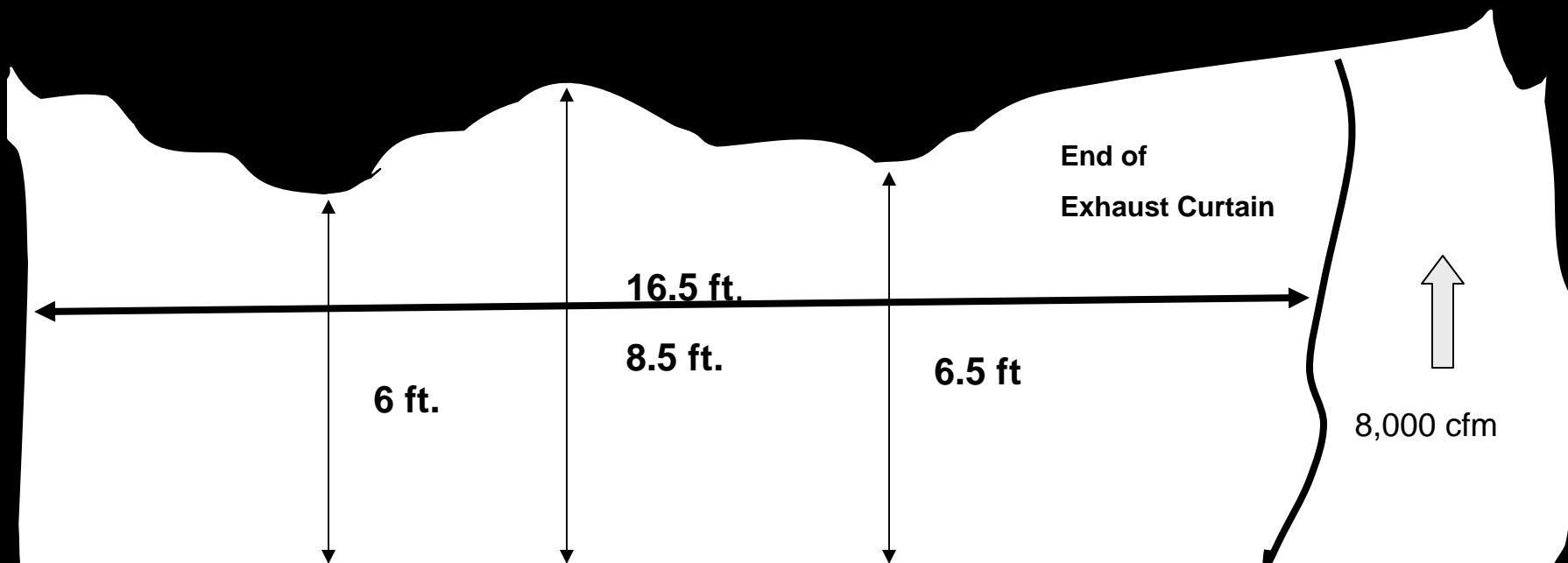
Preferably, crosscuts should be turned with exhaust curtain. This may require hanging the continuous miner cable.

Mean Entry Air Velocity

§ 75.326 Mean entry air velocity.

In exhausting face ventilation systems, the mean entry air velocity shall be at least 60 feet per minute reaching each working face where coal is being cut, mined, drilled for blasting, or loaded, and to any other working places as required in the approved ventilation plan. A lower mean entry air velocity may be approved in the ventilation plan if the lower velocity will maintain methane and respirable dust concentrations in accordance with the applicable levels. Mean entry air velocity shall be determined at or near the inby end of the line curtain, ventilation tubing, or other face ventilation control devices.

Measure Width



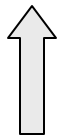
Measure Height

Curtain Airflow

Calculated Ave Velocity = Air Quantity (cfm)/ Area (sq ft)

$$\text{MEAV} = 8,000 \text{ cfm} / 115.5 \text{ sq ft} = 69.26 \text{ ft/min}$$

End of
Exhaust Curtain



8,000 cfm

$$\text{Ave Height} = (6+8.5+6.5)/ 3 = 7 \text{ ft.}$$

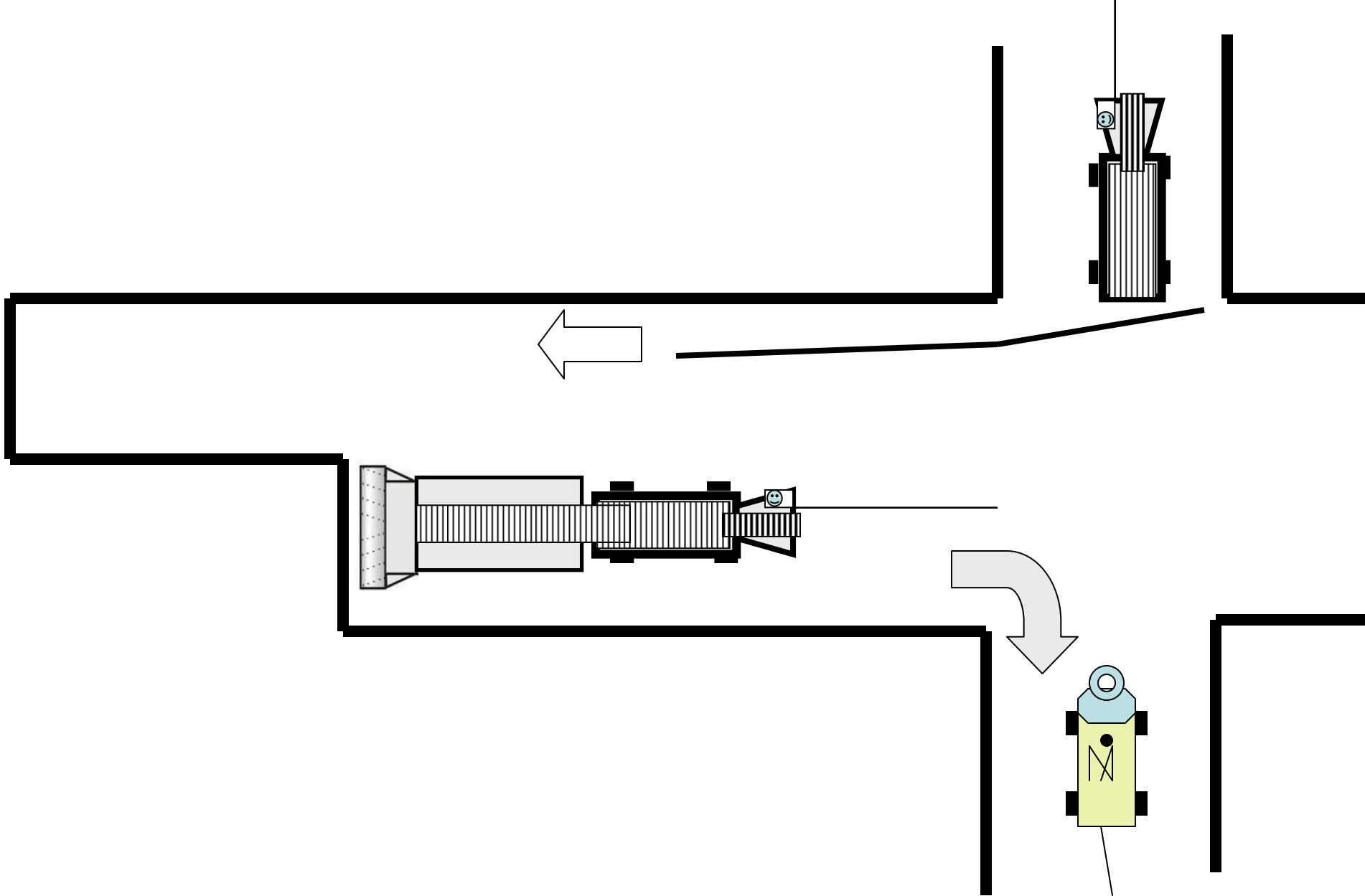
$$\text{Width} = 16.5 \text{ ft.}$$

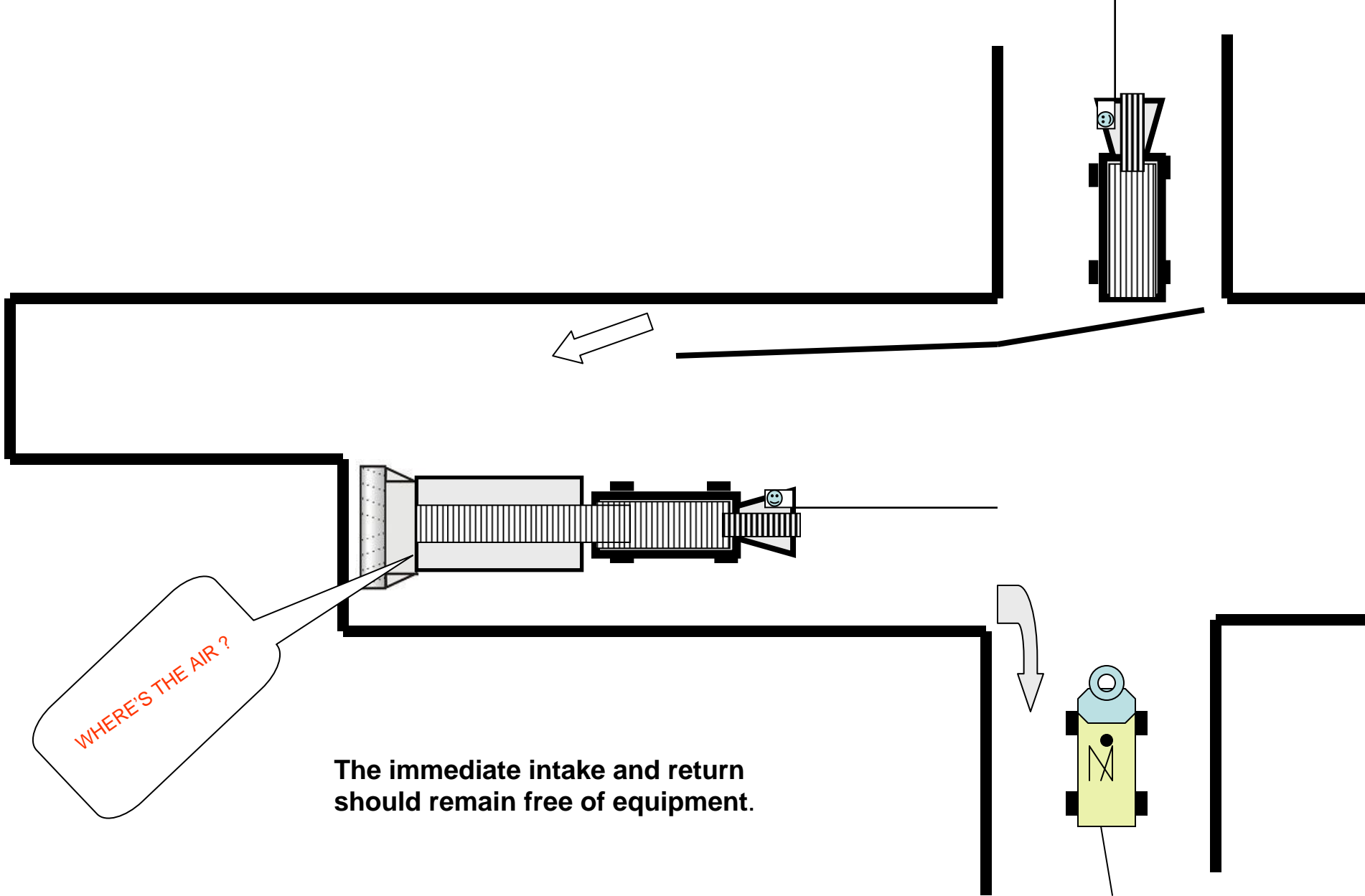
$$\text{Area} = H \times W = 7 \times 16.5 = 115.5 \text{ sq ft}$$

SMALL MISTAKES

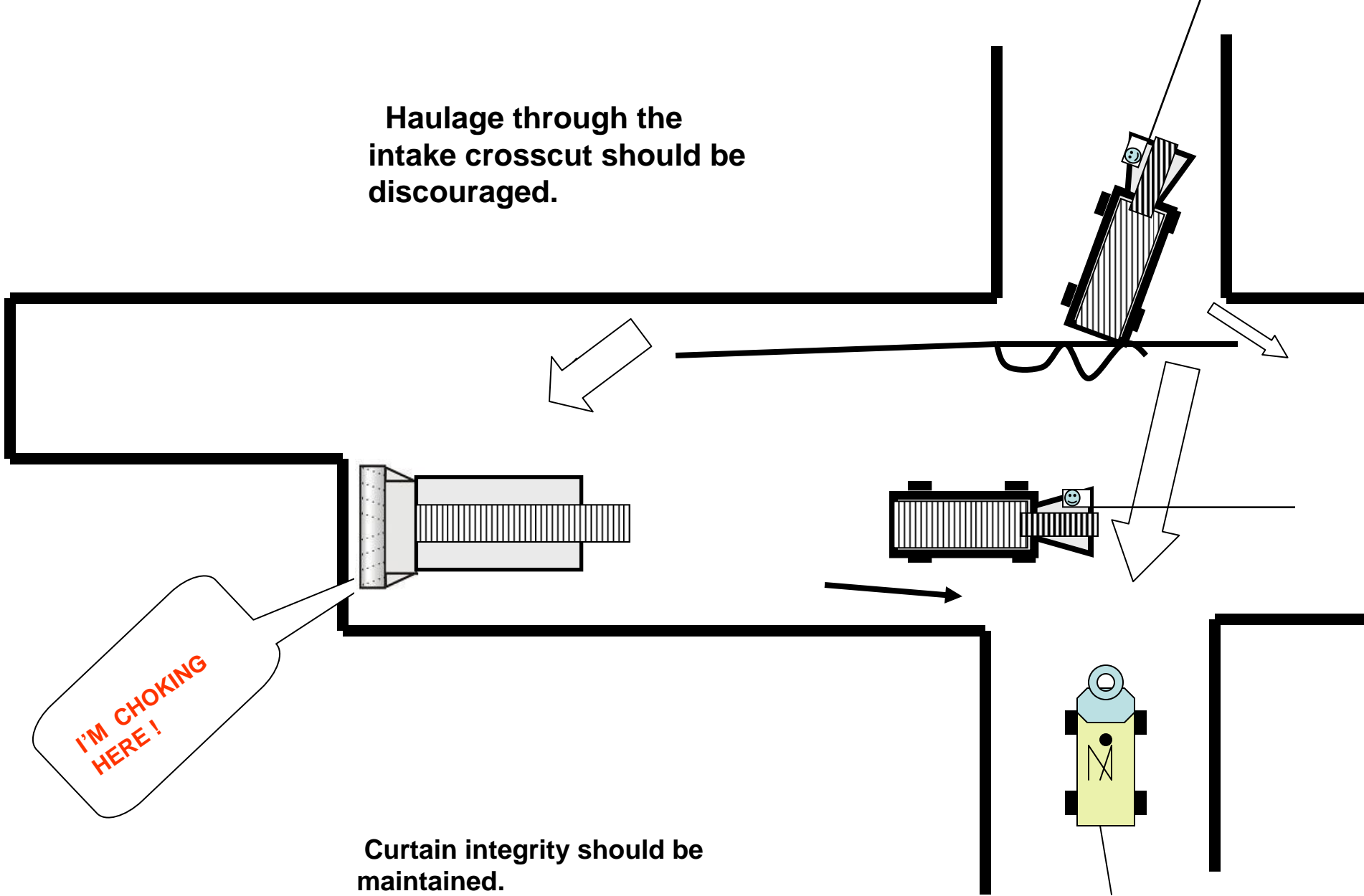
BIG

PROBLEMS





Haulage through the intake crosscut should be discouraged.



Curtain integrity should be maintained.

Body Size can Affect Air Readings

Miner's Size 1 foot wide by 6 feet high

Takes up an area of 6 square feet

$V = 300$ fpm

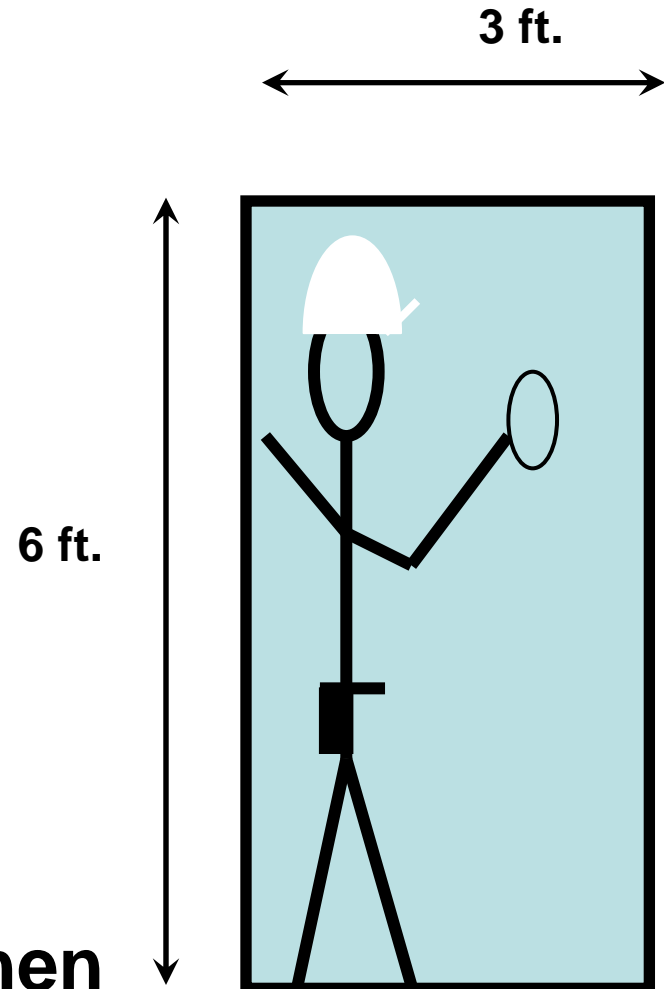
$A = 18$ square feet

$Q = 5,400$ cfm

$V = 300$ fpm

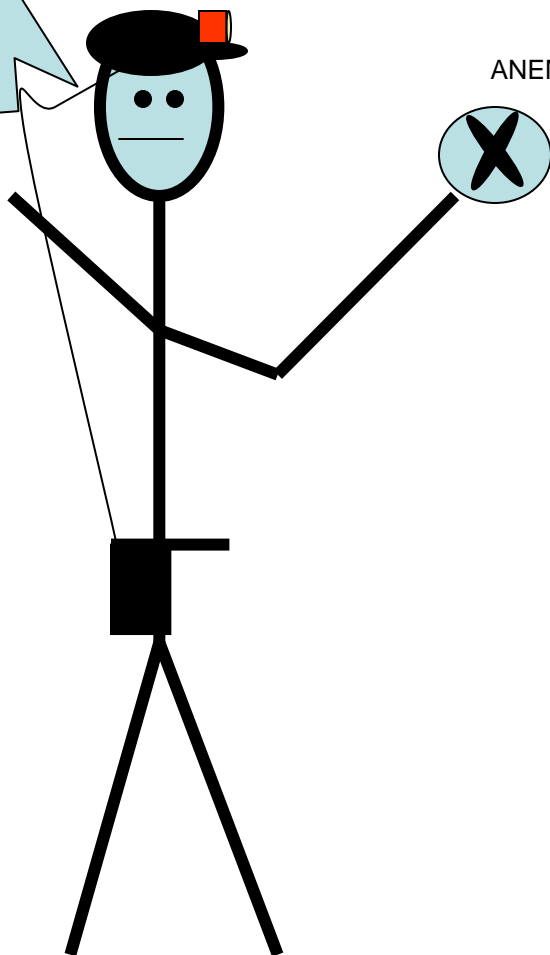
$A = 12$ Square feet ($18 - 6$)

$Q = 3,600$ cfm

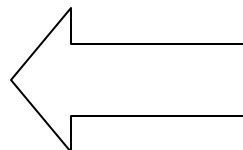


Foreman reports 5,400 cfm when he actually only has 3,600 cfm

WORKS BETTER
NOW !



ANEMOMETER

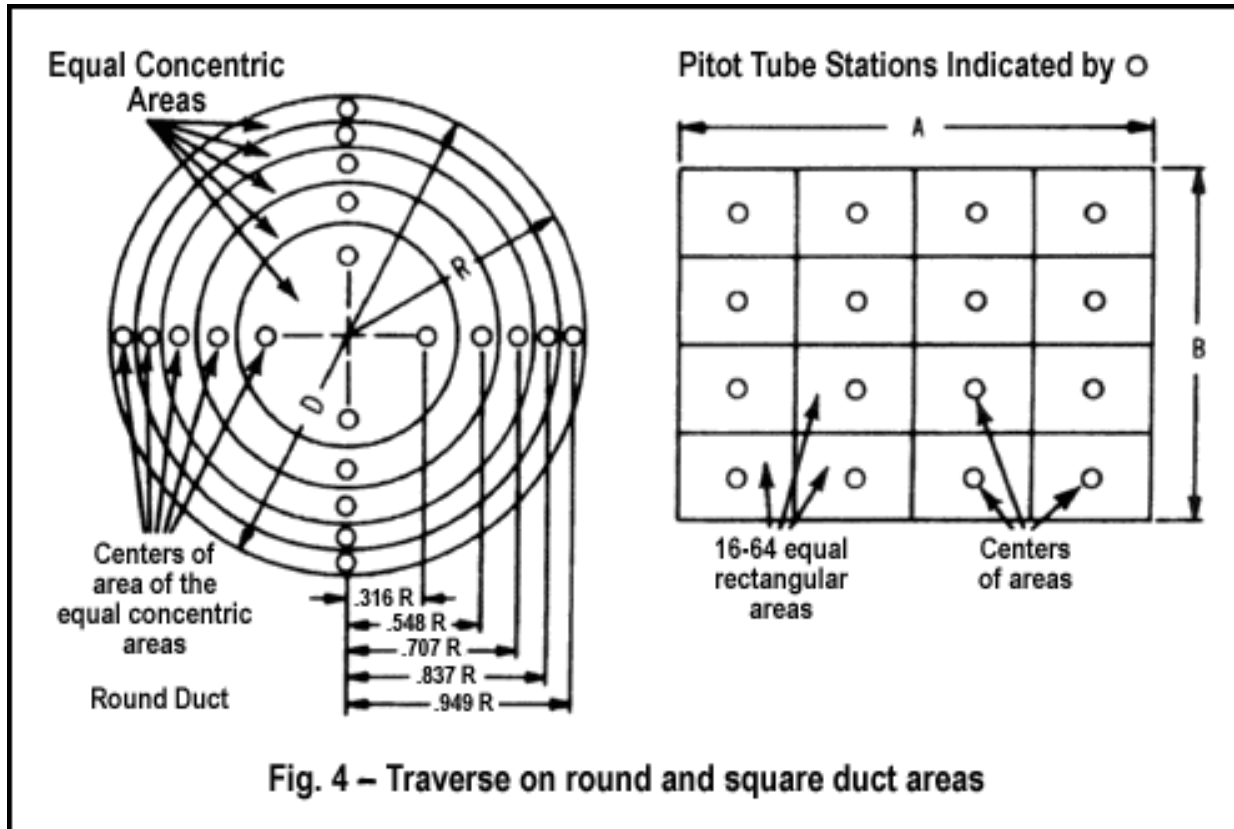


LINE
CURTAIN

Check anemometers for
damage and current
calibration.



EXHAUST TUBING



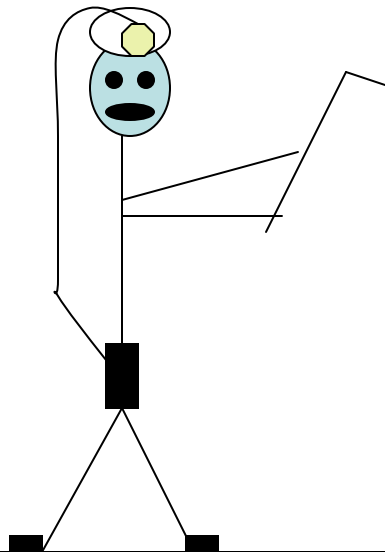
1. A Pitot Tube traverse should be used to measure airflow in ventilation tubing and dust scrubbers.

2. Accepted method should be utilized.

VENT TUBING



Stick this where ?



Using a Pitot Tube
requires hands on
training.

FACE VENTILATION

ROOF BOLTERS

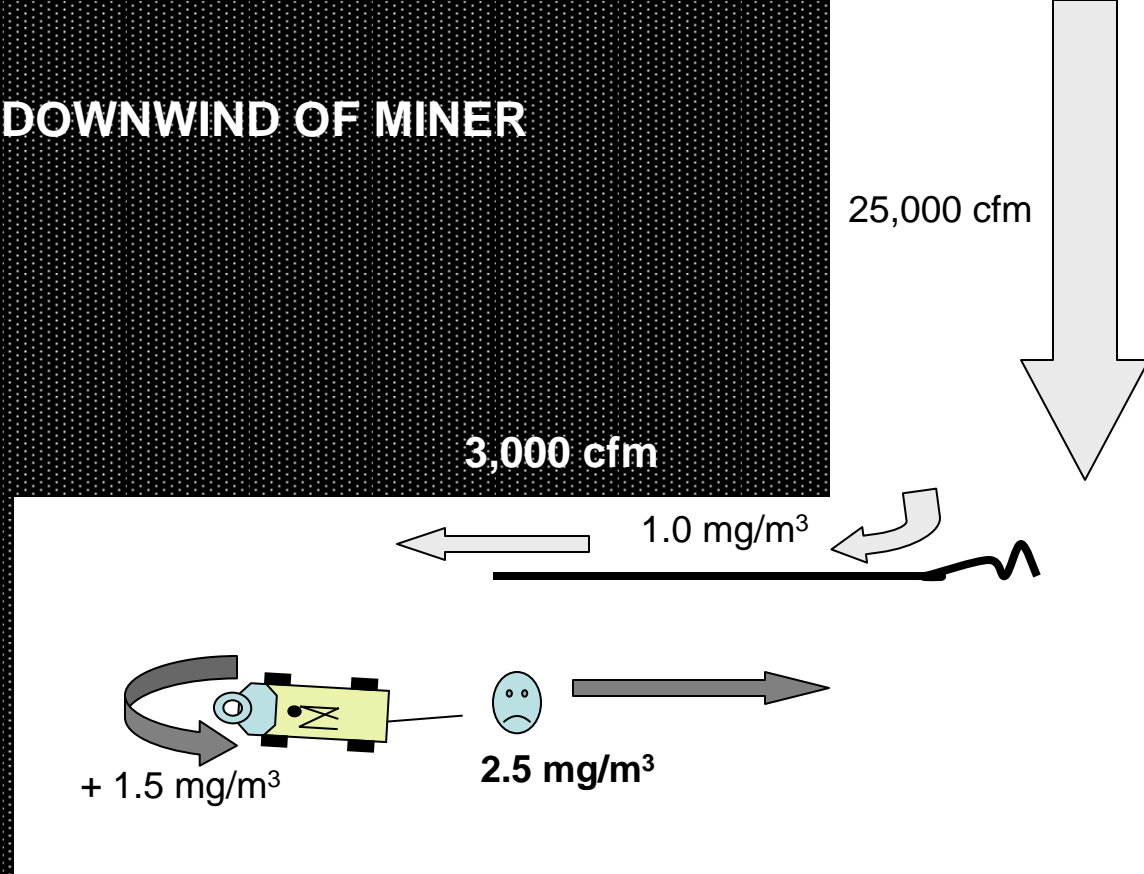
While most of the roof bolter operator's dust exposure comes from upwind sources (e.g., the continuous miner), some bolting machines allow a significant amount of dust to escape the dust collector system, thus contaminating the region around the bolter. Such contamination is more likely when an insufficient amount of clean air is available to dilute the dust.

VENTILATION

BEST PRACTICE

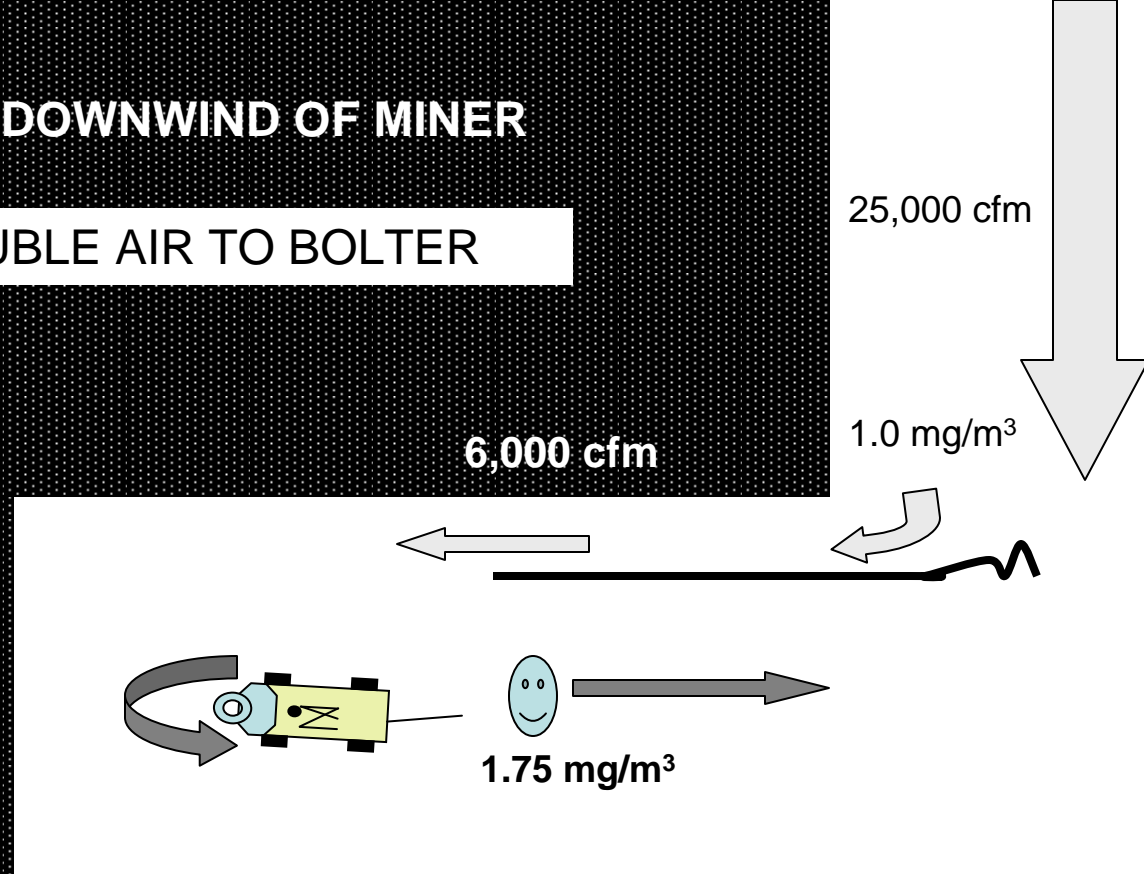
- **EXHAUST LINE CURTAIN NO SCRUBBER** – Do not bolt down wind of the continuous miner.
- **EXHAUST OR BLOWING LINE CURTAIN WITH SCRUBBER** - Design mining cycle to limit the time the continuous miner is upwind of the bolter.
- **AUXILLARY VENTILATION AND EXHAUST TUBING** – Utilize soft tubing (bologna skin) attached to fan exhaust to route return air downwind of the bolter.

DOWNWIND OF MINER



DOWNWIND OF MINER

DOUBLE AIR TO BOLTER



SIMPLE DILUTION

$$= C_{\text{INTAKE}} + C_{\text{BOLTER}} \times Q_1 / Q_2$$

$$= 1.0 + 1.5 \times 3000 / 6000 = 1.75$$

CONTROL THE DUST PREVENT BLACK LUNG

