

EXAMINATIONS OF BLEEDER SYSTEMS

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Abstract

The Mine Safety and Health Administration (MSHA) has developed a Mine Ventilation Bleeder and Gob Training Course. This three day course is designed to increase the knowledge and understanding of bleeder ventilation systems. It discusses concepts, designs, plan approval, inspection and evaluation of bleeder systems. This paper will introduce some of the material contained in that course, focusing on the inspection, examination, and evaluation of bleeder systems. The regulations addressing the use of bleeder systems are found in Title 30 Code of Federal Regulations (30 CFR) Section 75.334. The examination requirements are found in 30 CFR Section 75.364. Section 75.364 describes specific locations where examinations are to be made and specific information to be gathered at those locations. The required locations and information will be discussed in some detail with examples and illustrations. These weekly

examinations for bleeder systems are designed to monitor the parameters of the bleeder system and to evaluate its effectiveness. Over time, conditions can develop in the bleeder system that affect the ventilation and lead to hazards such as methane accumulations. The hazards of methane accumulations need to be understood as such accumulations can contribute to mine explosions. The importance of additional information gathered by the mine examiner that can assist in evaluating the performance of the system will also be discussed.

Use of Bleeder Systems

The use of bleeder systems in underground coal mines in the United States is addressed in 30 CFR Section 75.334, Worked-out areas and areas where pillars are being recovered. Section 75.334(b)(1) states "During pillar recovery a bleeder system shall be used to control the air passing through the area and to continuously dilute and move methane-air mixtures and other gases, dusts, and fumes from the worked-out area away from active workings and into a return air course or to the surface of the mine."

The purpose of the bleeder system is to keep methane accumulations away from mining activities, including the primary airflow paths that provide a conduit to the active working section. The system functions by diluting and moving air-gas mixtures away from the active workings and into a return aircourse or to the surface of the mine. Sufficient pressure differential must be available to maintain the necessary airflow.

The Regulations

Section 75.323(e) of 30 CFR limits the methane in the bleeder split of air to 2.0% immediately before it enters another split of air.

Section 75.334 (c) states that "the approved ventilation plan shall specify the following:

- (1) The design and use of bleeder systems;
- (2) The means to determine the effectiveness of the bleeder systems;

- (3) The means for adequately maintaining bleeder entries free of obstructions such as roof falls and standing water; and
- (4) The location of ventilating devices such as regulators, stoppings and bleeder connectors used to control air movement through the worked-out area.

Section 75.364 addresses the weekly examinations. The examinations provide information to determine the effectiveness of the system. Section 75.364 (a)(2) states that "At least every 7 days, a certified person shall evaluate the effectiveness of bleeder systems required by Section 75.334 as follows:

- (i) Measurements of methane and oxygen concentrations and air quantity and a test to determine if the air is moving in its proper direction shall be made where air enters the worked-out area.
- (ii) Measurements of methane and oxygen concentrations and air quantity and a test to determine if the air is moving in the proper direction shall be made immediately before the air enters a return split of air.
- (iii) At least one entry of each set of bleeder entries used as part of a bleeder system under Section 74.334 shall be traveled in its entirety. Measurements of methane and oxygen concentrations and air quantities and a test to determine if the air is moving in the proper direction shall be made at the measurement point locations specified in the mine ventilation plan to determine the effectiveness of the bleeder system.
- (iv) In lieu of the requirements of the paragraphs (a)(2)(i) and (iii) of this section, an alternative method of evaluation may be specified in the ventilation plan provided the alternative method results in proper evaluation of the effectiveness of the bleeder system."

Discussion of Examination Locations

A general comment needs to be made concerning persons assigned to make the weekly examinations and evaluate whether the system is effective. The person cannot judge the effectiveness of a system unless he/she has an understanding of how the system is to function. They need to know what is expected in order to be able to discern any abnormalities.

Also, the routes of travel and the specific locations designated for ventilation readings and where measurements and tests are necessary should be clearly defined.

Where Air Enters the Worked-Out Area

Air must enter the worked-out area from the face area of the working section. Air may enter the worked out area from other locations depending on the system design. Section 75.364 (a)(2)(i) requires that measurements and tests must be conducted at all of these locations.

The preshift examination requirements of Section 75.360 specify that examinations and tests be conducted at approaches to worked-out areas on the active section, which is similar to the weekly examination requirements, except that an air quantity measurement where air enters the worked-out area is not required during the preshift examination. The regulations permit the two examinations to be made at the same time. Therefore, as a practical measure, when examining the approaches to the worked-out area on the working section where the air enters the gob, the preshift examiner could make the additional air quantity measurements and thereby also complete the requirements for the weekly examination.

Examinations are also required at locations that are not on the working section where air enters the worked-out area. These measurements are required at any location where air enters the worked-out area, regardless of whether the air is from an intake or return air course.

The weekly examination requires air quantity to be measured; however, air quantity measurements cannot be taken where an area cannot be determined or where the air velocity cannot be measured with an anemometer. (The mine examiner normally travels alone and smoke tube readings are not practical when working alone.) The air velocity may not be measurable with an anemometer in approaches to the gob blocked by ventilation controls or check curtains. An area may not be able to be determined in the longwall headgate and tailgate entries adjacent to longwall roof support. Air quantity measurements are to be completed in open and regulated approaches to the gob where the air velocity is sufficient

to be measured and an area can be determined.

Figures 1 and 2 are simplified examples of different bleeder systems that show where these examinations are required to be made, both on the working section and at other locations where air enters the worked-out areas. Figure 1 shows the locations where these examinations are required in this example of a room-and-pillar flow through with bleeder entries system.

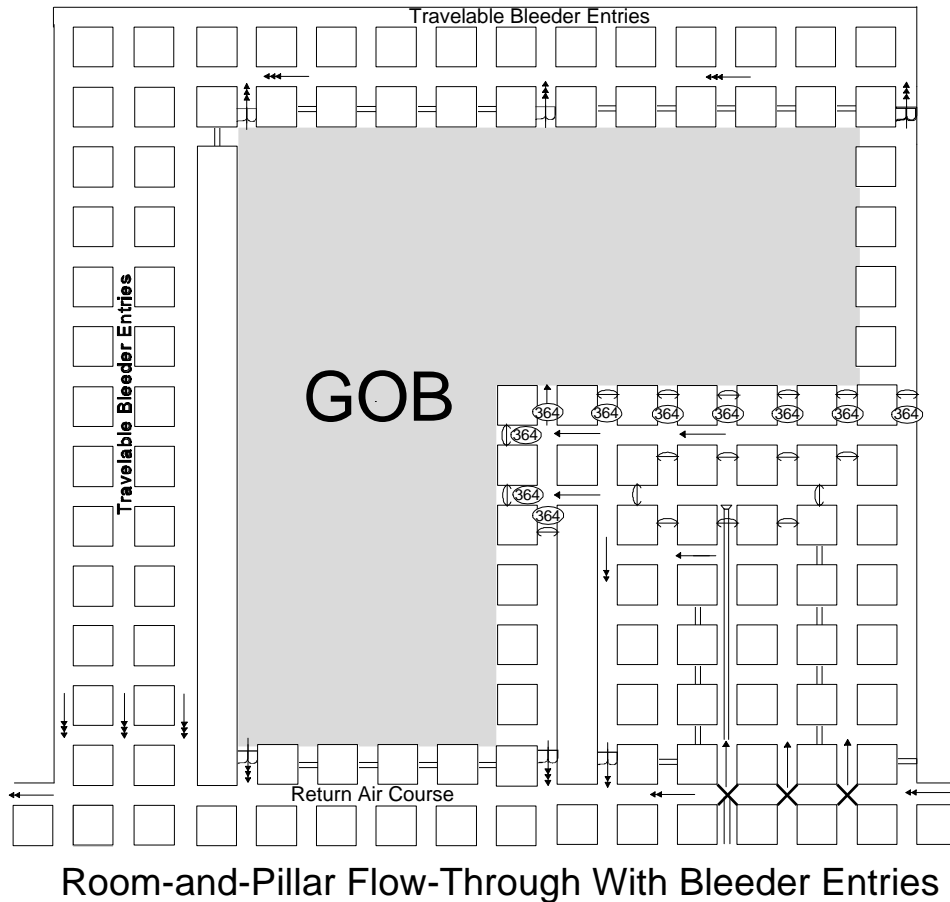


Figure 1. Example of inlet examination locations for a room-and-pillar bleeder system.

Figure 2 shows the locations where these examinations are required in this example of a longwall bleeder fan system with bleeder entries.

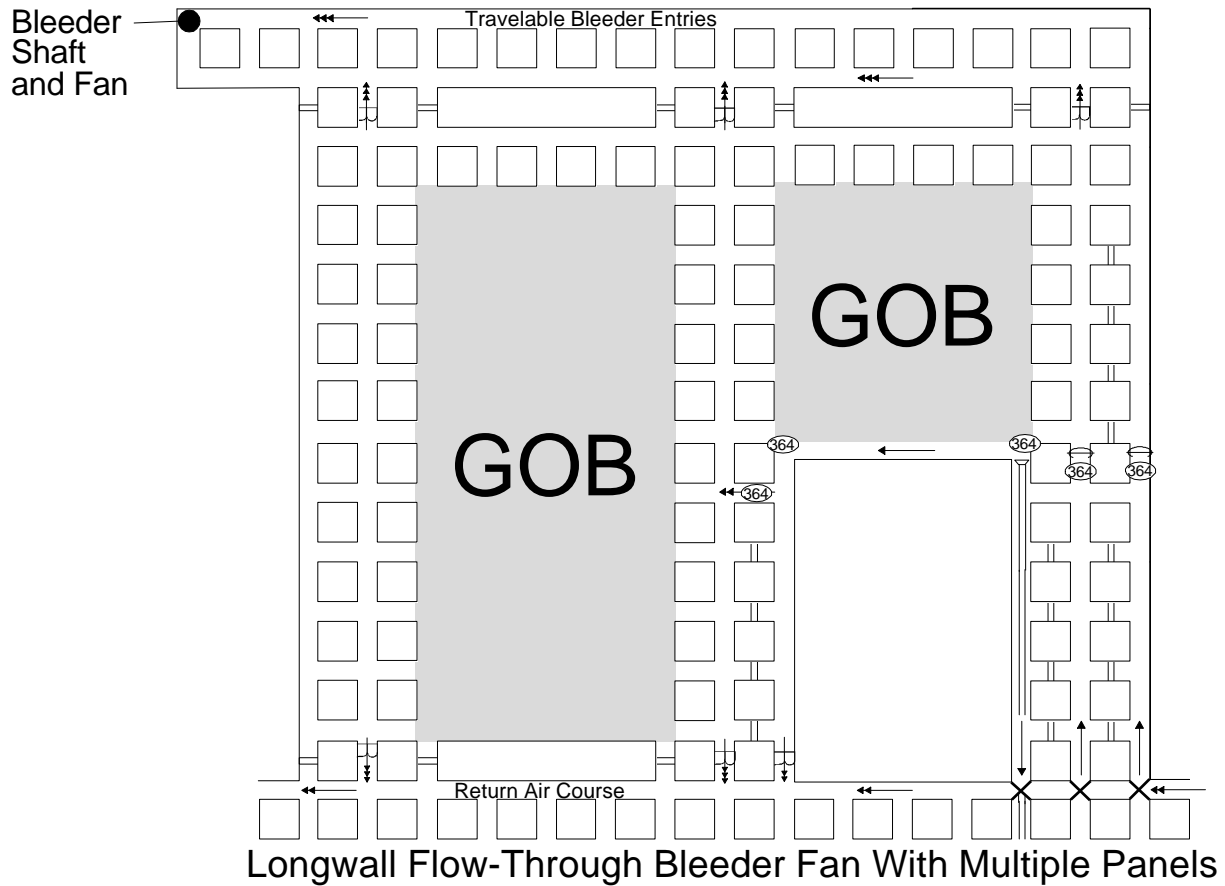


Figure 2. Example of inlet examination locations for a simple longwall bleeder system.

Before Air Enters a Return Split of Air

Section 75.364 (a)(2)(ii) requires measurements and tests immediately before the air leaving a bleeder split enters a return split of air. The term "immediately before" refers to the point where a representative air sample can be taken in the bleeder split which will not be affected by the airstream which the bleeder split is joining. However, it must be recognized that portions of or the entire bleeder split leaving certain bleeder systems do not enter a return air course. The air instead is exhausted through openings directly to the surface. Measurements and tests are required in these openings and are part of the means for determining the effectiveness of a bleeder system.

Figure 3 is a simplified example of a room-and-pillar borehole system in which the bleeder split exits directly to the surface. The example shows the locations where these examinations are required.

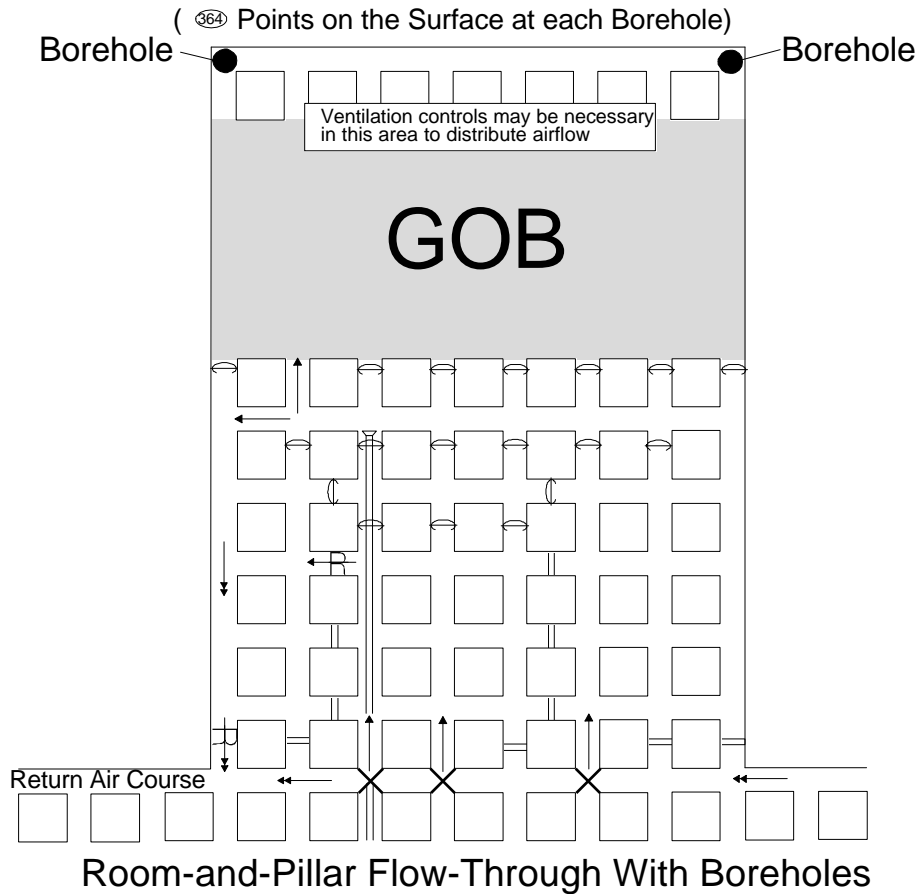


Figure 3. Example of outlet examination locations for a simple room-and-pillar bleeder system.

Figure 4 is a simplified example of a longwall wrap-around system. The example shows the locations where these examinations are required.

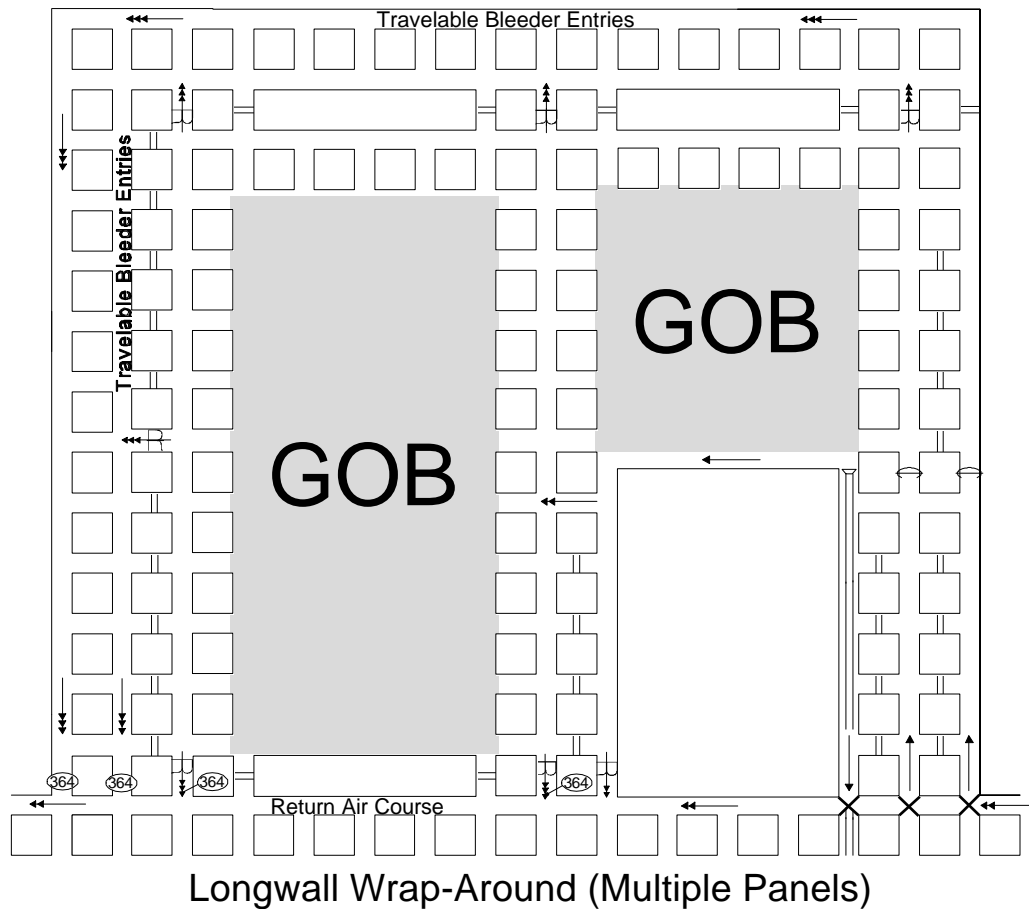


Figure 4. Example of outlet examination locations for a simple longwall bleeder system.

The tailgate entries of longwalls may be ventilated by intake or return air. If there are locations where air enters or exits the worked-out area from the tailgate entries, then Section 75.364(a)(2)(i) or 75.364(a)(2)(ii) applies to these locations and tests and examinations are then required at each location.

Bleeder Entries

Section 75.364(a)(2)(iii) states that at least one entry of each set of bleeder entries used as part of the bleeder system shall be traveled in its entirety. Measurements of methane and oxygen concentrations and air quantities and a test to determine if the air is moving in the proper direction shall be made at the measurement point locations specified in the mine ventilation plan to determine the effectiveness of the bleeder system.

The specific measurement point locations must be included in the mine ventilation plan. The amount of information needed to evaluate the

ventilation of the worked-out area depends upon the complexity of the system. These locations identify where examiners will conduct measurements and tests. These locations are not in lieu of traveling the system. They are the locations within the bleeder system where the examiners will measure the methane and oxygen concentrations and air quantities and perform tests to determine whether the air is moving in the proper direction to evaluate the effectiveness of the system while traveling the system.

It should be clear that just traveling in the bleeder entries does not constitute an evaluation. Required information collected at sufficient measurement point locations, observations of the condition of the entries, the condition of the ventilation controls, and a concept of normal conditions are necessary to evaluate the continued effectiveness of the system. Only in the least complicated bleeder systems would observations made while simply traveling the bleeder entries be sufficient.

The choice of the necessary measurement point locations depends on the conditions of the individual system. However, as examples of possible measurement point locations, Figures 5 and 6 show different sets that might be appropriate for the multiple panel room-and-pillar flow-through with bleeder entries system shown in Figure 1.

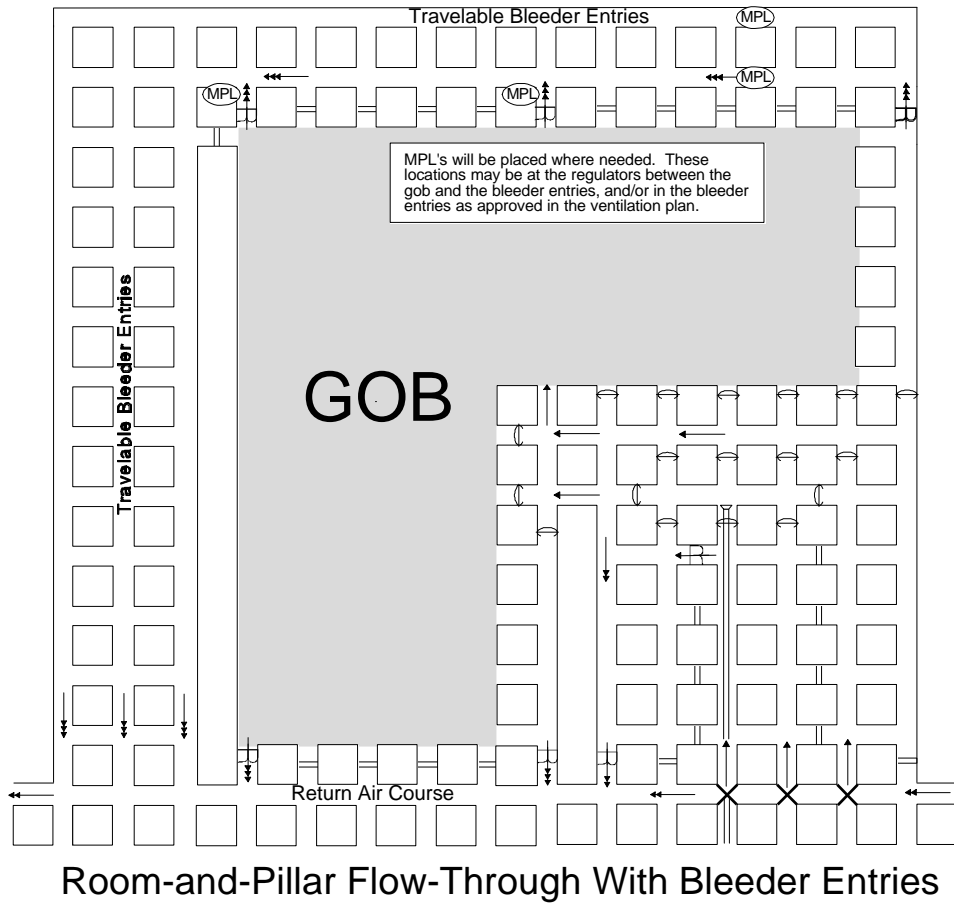
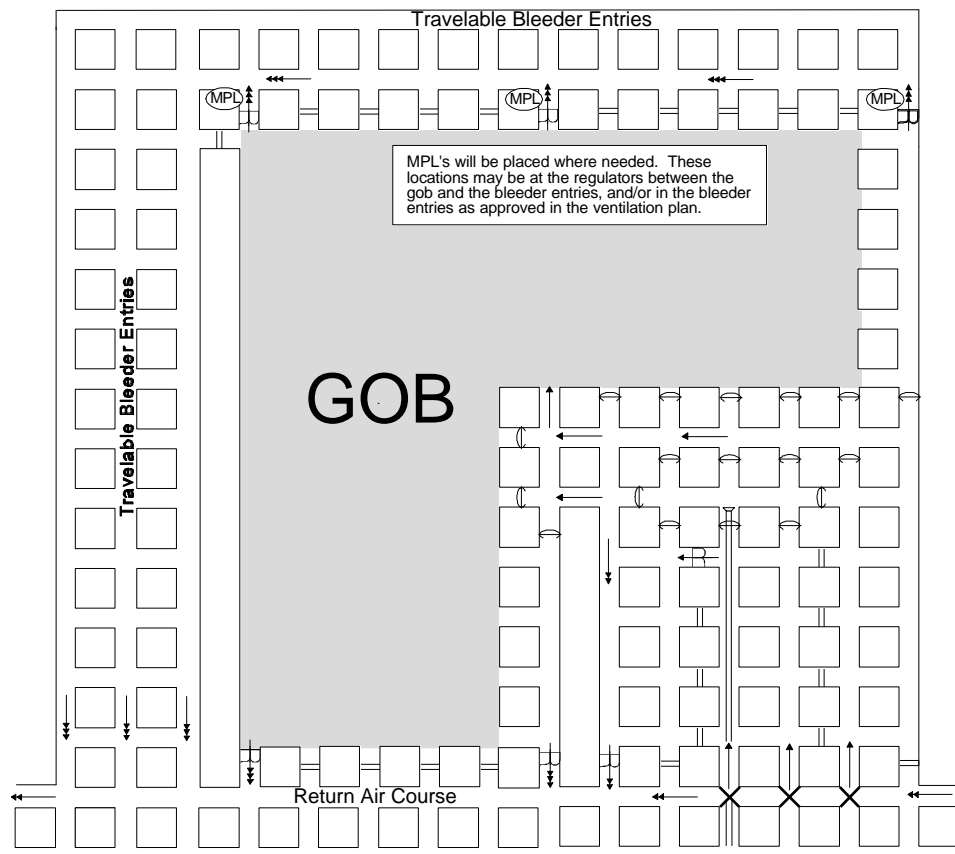


Figure 5. Example of a set of typical measurement point locations that might be appropriate for a room-and-pillar bleeder system.



Room-and-Pillar Flow-Through With Bleeder Entries

Figure 6. Example of another set of typical measurement point locations that might be appropriate for a room-and-pillar bleeder system.

Mine examiners or any persons working or traveling alone in remote areas, especially in bleeder entries, should always be alert for changing conditions such as accumulations of methane or oxygen deficient air. Persons should not enter areas of the gob unless they are well informed about the area to be entered, have sufficient detection equipment, and have discussed their intent with other persons who will know their whereabouts.

Alternate Method of Evaluation

Section 75.364(a)(2)(iv) provides for an alternative method of evaluation to be specified in the ventilation plan in lieu of making tests and measurements where air enters the worked-out area (Section 75.364 (a)(2)(i)) and in lieu of traveling at least one entry of each set of bleeder entries and making measurements and tests at specified locations (Section 75.364(a)(2)(iii)), provided the alternative method results in proper evaluation of the effectiveness of the bleeder system.

As part of this alternative method of evaluation, evaluation points may be approved in the mine ventilation plan if the evaluation points are fully adequate to demonstrate that the area is ventilated. These evaluation points are not the same as, nor do they serve the same function as, the measurement point locations referred to in Section 75.364(a)(2)(iii). Evaluation points must be included in the mine ventilation plan. They may be included in the written body of the plan or incorporated on the mine map.

Records

Section 75.364(h) requires the results of each weekly examination to be recorded. These records include the results and location of air and methane measurements and a record of the hazardous conditions found and their locations, and corrective action taken. The results of methane tests shall be recorded as a percentage of the methane measured by the examiner.

Responsible mine officials and examiners need to have knowledge of the bleeder system they are inspecting or evaluating. They may be depended upon to recognize existing and potential deficiencies in the bleeder system. Observing and gathering information beyond the minimum requirements of the regulations provides a base of knowledge that facilitates problem detection. This information may include: air direction, air quantities, gas concentrations, roof conditions, water accumulations, and the location and settings of regulators.

Other required examinations, not directed at bleeder systems, can also provide additional information about ventilation of the worked-out area. Records of the results of the weekly examinations required by Section 75.364(c)(1) and Section 75.364(c)(2) contain information about the volume of air entering each intake split (including belt and track splits) and the volume of air and methane concentration in each return split immediately before it enters the main returns. These records may provide information about the amount of air entering the gob from the working section if the measurements are taken in a direct line across the section entries.

Records should be kept in a clear and organized manner. A record of pertinent information about the system will allow those responsible to

become aware of trends or changes in the system and more easily evaluate the system's performance.

Summary

Bleeder systems are part of a mine ventilation network used to ventilate pillared areas of underground coal mines. They are used to protect miners from the hazards associated with methane and oxygen-deficient air which may accumulate in these mined out areas. The weekly examination specified in the regulations contains the minimum requirements to evaluate the continuing effective performance of the bleeder system.