

Roof Control at Intersections Exercise
Instructor's Copy

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¹ This latent image exercise was developed and field tested under U. S. Bureau of Mines research Contract No. H0348040. Information about the design and characteristics of the exercise and the field test results are available in the project technical reports filed with the Bureau of Mines Research Center in Pittsburgh, PA. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies or recommendations of the Interior Department's Bureau of Mines or the U. S. Government.

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Introduction

This document contains most of the materials needed to use the exercise. The main part of the document is the instructor's copy. It tells how to use the exercise, presents the objectives, the master answer sheet, the scoring key, and discussion notes to be used following the exercise. The last part of this booklet contains three appendices. Appendix A is the exercise problem booklet. The booklets are reusable and can be copied locally. One is needed for every person in the class. Appendix B is the answer sheet. Copies of this answer sheet must have the answers that appear in Appendix C printed on them.² Answer sheets are consumable. One is needed for each person or each small group of persons who work the exercise.

² You can do this yourself if you have the proper equipment, or you may obtain copies of preprinted latent image answer sheets from NIOSH, Pittsburgh Research Laboratory, Pittsburgh, PA phone 412-386-5901, fax 412-386-5902 or email to minetraining@cdc.gov.

Exercise Summary

Read this section first. It determines if the exercise is appropriate for your classes. If you choose to use the exercise, examine the table of contents and review the remainder of this document.

Type: Latent image

Audience: Underground coal miners

Length: Eleven questions (30 minutes for administration plus 30 for discussion)

Skills: Recognition of intersection noncompliance
Knowledge of methods to control intersection diagonal areas

Location: Underground coal mine

Problem: You and Andy are assigned to advance the power center, the mobile equipment, and trailing cables in the 1 Left section. While surveying your assignment, you notice coal spalling along the left rib of number 3 belt entry. You must investigate and determine if a problem exists with roof and rib conditions and the diagonal measurements of several intersections. You are to take any corrective actions that might be necessary.

How to Use This Exercise

1. Look at the performance objectives. Decide if the exercise is relevant for your use.
2. Work through the exercise with the special pen and score your own responses.
3. Read the master answer sheet for the exercise. Study all the answers.
4. Read the "Instructor's Discussion Notes" for the exercise.
5. Become thoroughly familiar with the problem and answers so you can present the exercise to your class without reading it.

6. When you present the exercise to the class:

- Give each small group of persons (or person, if working the exercise individually) an answer sheet and a developing pen. Working in small groups tends to get people discussing their views and causes the class members to think about the topic from other points of view.
- Give each person an exercise problem booklet.
- Go over the instructions for working the exercise with the whole group.
- Demonstrate how to select and mark answers using the developing pen.
- Explain the problem and the background information, making sure everyone understands the problem situation.

NOTE: Remind the class members that the last 3 questions are to be answered in pencil on the answer sheet.

- Have the class members work the exercise.
- When the class members finish, have them figure up their score using the instructions at the end of the exercise.
- When everyone has finished, discuss the exercise. Let class members discuss the merits of each answer. Add ideas from the instructor's notes and incorporate any of your own ideas.

Performance Objectives

Objective number	Capability verb(s)	Description of required performance and conditions under which it is to occur
1. HR*	Recognize	Existing roof and rib conditions, and diagonal measurements at intersections that could lead to hazardous situations
2. HR	Identify	Cues that indicate potential ground fall hazards
3. HR	Discriminate Assess	Roof and rib conditions that may be hazardous and require some type of corrective action
4. GC	Recall Comprehend	Basic information for maintaining diagonals at intersections
5. AP	Choose	From alternative actions, the most appropriate means to reduce risk to yourself and others

* Skill and knowledge domain abbreviations:

AP – Accident prevention

GC – Ground control

HR – Hazard recognition

Master Answer Sheet for Roof Control at Intersections

Use this answer sheet to mark your selections. Rub the developing pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get the information you need. The last part of the message will tell you what to do next.

Question A (Choose only ONE unless told to "Try again.")

1. [Conditions can change. Try again.]
2. [You are experienced miners and will be remaining in the area to work,
[so there is no need to danger off the area. Try again.]
3. [Correct. To assess the full extent of the hazard, close attention must
[be paid to the roof as well as the rib. Do the next question.]

Question B (Select as MANY as you think are correct.)

4. [Correct. You are both experienced miners and are able to handle
[the situation, however, you should inform the shift foreman.]
5. [Correct. Safe work practices, including proper tool selection, good
[footing and pry bar control should always be followed.]
6. [This would violate the roof control plan. You can't do this.]
7. [Correct. A plan of action is a very important first step before starting to
[scale the rib.]

Question C (Select as MANY as you think are correct.)

8. [Clean up is very important, however, you should not use the scoop to]
[to clean up the coal because you may knock down the posts in]
[the process.]
9. [Correct. Compliance with the roof control plan may now be a problem.]
[Depending upon how much rib coal was sloughed down, the exposed]
[roof might be considered unsupported and in need of temporary]
[or more permanent support.]
10. [Rock dusting is important but this can be done later.]
11. [Correct. After the condition has been made safe for travel, the foreman]
[should be included in any action taken such as permanent roof]
[support, rock dusting, etc.]
12. [Correct. To comply with the roof control plan, pins must be no farther]
[than 4 feet from the rib.]

Question D (Choose only ONE unless told to "Try again.")

13. [You do have enough information. Try again.]
14. [Even though the total distance of 60 feet is OK, the leg measuring 32]
[feet is too long. Try again.]
15. [Correct. The leg measuring 32 feet is too long. Do next question.]

Question E (Choose only ONE unless told to "Try again.")

16. [This will cut down the area and comply with the roof control plan, but]
[equipment must run through the area. Try again.]
17. [Overbolting is one solution, but may not be the best solution here.]
[Try again.]
18. [Correct. This will cut down the area of the intersection, and provides]
[the strongest roof support and is not likely to be knocked out by]
[equipment. Do next question.]
19. [The posts will form an artificial pillar corner but are likely to be]
[displaced or knocked down by equipment. Try again.]

Question F (Choose only ONE unless told to "Try again.")

20. [You do have enough information. Try again.]
21. [Even though the diagonal measurements are 31 feet, the total is more]
[than 60 feet. Try again.]
22. [Correct. The total is more than 60 feet. Do next question.]

Question G (Select as MANY as you think are correct.)

23. [This will cut down the area and comply with the roof control plan, but]
[equipment must run through the area to the feeder.]
24. [Overbolting may add additional support for the roof, however, it]
[does not reduce the area of the intersection.]
25. [Correct. This will cut down the area of the intersection.]
26. [Correct. The posts, if set no further apart than four feet from the rib]
[and four feet from each other, will form an artificial pillar corner and]
[will comply with most roof control plans.]

Question H (Select as MANY as you think are correct.)

27. [Correct. Sharing information is a very important safety practice.]
28. [Miners should almost always walk down the middle of any entry. Coal]
[falling from any rib can injure or kill.]
29. [This is not practical and probably not necessary. Awareness of the]
[situation is a good safety practice.]
30. [Correct. Spalling rib conditions should be monitored, but other hazards]
[should also be noted and corrected.]
31. [Correct. It is important to adhere to the roof control plan. It is easy to]
[underestimate the importance of maintaining intersection distances.]

Question I

Other than rib falls, list three causes of intersections being out of compliance.

Suggestions

1. equipment rounding corners & taking edges off _____
2. corners crumbling from roof/bottom loading _____
3. rounded by continuous miner beginning crosscut _____
4. continuous miner operator gets off sites and must adjust _____

Question J

What procedures could you use at your operation to bring an intersection into compliance with the roof control plan? List at least three.

Suggestions

1. set cribs at corners & rebolt _____
2. set timbers at corners to reduce distance & rebolt _____
3. set steel or wood beams, channels across entry & rebolt _____

Question K

Why is it important to maintain the roof control plan in intersections?

Suggestions

1. to maintain integrity of roof _____
2. great roof fall potential exists at intersections _____
3. comply with approved roof control plan _____
4. many injuries occur at intersections _____

Scoring your performance

1. Count the total number of responses you colored in that were marked "Correct". Write this number in the first blank on the answer sheet.
2. Count the total number of incorrect responses you colored in. Subtract this number from 16. Write the difference in the second blank on the answer sheet.
3. The best score is 31. The worst score is 0.

Instructor's Discussion Notes

Use the information presented here and on the master answer sheet, your own ideas and experience, and those of the miners in your class, to discuss the exercise after it is completed. Group discussion can strengthen knowledge and skills, correct errors, and relate the exercise content to the experiences of the miners. After they have worked the exercise, miners enjoy discussing the problem. They also frequently think of better ways to respond to a problem than those listed among the answers. The purpose of the exercise is to help miners think about and remember basic knowledge and skills they may someday need to deal with an emergency. The discussion following the exercise can contribute to this goal and tailor the exercise content to the needs of the group you are training.

It is helpful to show overhead transparencies of the master answer sheet during the discussion while the miners look at their problem booklets. This allows you to lead the group through the exercise and to disclose and discuss all the answers to each question. Most of the information about why particular answers are correct or incorrect is given on the master answer sheet.

The following notes provide additional information for you to discuss with your class. Read through and think about the notes before the class. Don't read the notes to the class members. This would be boring and ineffective. Rather, incorporate the ideas you find here with your own ideas and make these points at the appropriate place in the discussion of the exercise.

Question A - The correct answer is 3. You and Andy have already determined that corrective actions must be taken. Just because number 3 entry is a belt entry (1) and has additional posts for support, doesn't mean the area is safe. Roof and rib conditions must be monitored regularly regardless of locations throughout the mine. Use caution when inspecting roof and rib areas and do so from a safe distance. Never go under or near (where it could fall and hit you) the section of roof or rib you are attempting to evaluate. If you or Andy are going to be working in the immediate area, there is no need to danger off the area (2). However, if you were going to leave the area to gather tools or to get supplies, the area should be dangered off to prevent co-workers from entering a potentially hazardous area. Before barring any roof or rib area, miners should visually examine the area and sound the roof (3). Remain under supported roof when sounding a section of suspect roof. Roof and rib evaluations provide valuable information to you. You may be able to determine the extent of hazardous roof/rib conditions and be able to take appropriate safeguards before you begin barring down loose roof or rib. When barring down loose roof or rib, use safe barring practices and extra caution.

Question B - The correct answers are 4, 5 and 7. Calling the shift foreman (4) and informing him/her of the condition is always a good idea. This communicates the hazard and also lets the foreman know what actions you intend to take to correct the hazard. It is a good safety practice to let someone know that you are working in a

potentially dangerous area. Communicating that you are going to be taking corrective actions lets someone know what your intentions are. It also provides an opportunity for someone to periodically see how things are going and check to see if you and Andy are OK. It is always important to use the right tools for the job (5). Many injuries have occurred by using the wrong tool for the job. Don't use shovels or roof bolts to bar down loose coal and rock. Use a scaling bar that is made to do the job safely. Removing the posts before you begin barring could be dangerous (6). The posts are supporting the roof and if removed might increase the potential for roof falls. Developing a plan (7) prior to beginning to scale the rib is very important. It allows you to communicate and discuss you and your co-workers' intentions and plan a course of action.

Question C - The correct answers are 9, 11 and 12. Cleanup is important, but using a scoop to clean up materials that have been barred down might introduce additional hazards such as knocking down posts (8). You may be positioning yourself under unsupported roof. The posts are supporting the roof and must remain in place. After barring the rib, you should re-inspect the roof and rib area (9). If you removed a section of rib, you might now have an entry too wide and it might be out of compliance with the roof control plan. You should measure the distance between roof bolts and the rib, and also the width of the entry. The area will have to be rock dusted eventually. However, if you were to rock dust the area now (10), you might cover some clues that would allow others to recognize that the area may not comply with the roof control plan. After barring the rib, the area may be out of compliance with the roof control plan and it might be necessary to set temporary posts (11) for roof support until the area can be re-bolted. You must measure the distance from the last roof bolt to the rib to determine if additional posts or bolting is required to meet your roof control plan (12).

Question D - The correct answer is 15. You have measured the area and know that the diagonal measurements are 28 feet and 32 feet. You have enough information to determine whether the intersection is in compliance (13). Because one leg of the diagonal exceeds 31 feet, the intersection is not in compliance (14, 15) as stated in the mine's roof control plan. It is very important to maintain the area of an intersection. You must comply with the roof control plan and intersection maintenance can help reduce accidents and injuries.

Question E - The correct answer is 18. If you were to set posts on all four corners of the intersection, equipment running through the area would likely dislodge the posts. Trailing cables can also dislodge posts (16). This is not the best solution. Overbolting (17) is an additional precaution, but the main objective is to physically reduce the area of the intersection. Building a crib on the outby corner of the number 3 pillar is the best solution (18). Cribs are often stronger and resist displacement by equipment. You could build an artificial pillar corner by setting posts on the outby corner of number 3 pillar (19), but again, equipment running through the area may knock out the posts and the intersection would be out of compliance. A crib, properly set, should be more permanent.

Question F - The correct answer is 22. You measured the diagonal distances and found the each leg was 31 feet. You have enough information (20) to determine if the intersection is in compliance. Since the sum of the diagonals is 62 feet, the intersection exceeds the allowable (from the roof control plan) 60 feet and the intersection is not in compliance (21, 22).

Question G - The correct answers are 25 and 26. It would not be advisable to set posts across the mouth of the number 1 and number 3 pillars (23). Equipment might need to travel through these entries to reach the feeder. Overbolting (24) is an additional safeguard used at some mines, but the objective of intersection roof control is to physically reduce the area of an intersection to meet the roof control plan requirements. By building a crib (25) or posts (26) on the outby corner of the number 1 pillar and inby corner of the number 3 pillar, the intersection can be brought into compliance with the roof control plan. In cases where the roof is bad, crossbars might be set as additional support.

Question H - The correct answers are 27, 30 and 31. Anytime you see a situation or condition that might affect compliance with the roof control plan (27), you should communicate what you observed to management and co-workers so that either corrective action or monitoring can take place. Walking along the rib might not be the safest thing to do to insure your safety (28). Most miners usually travel near the center of an entry, testing the roof by sounding it. They feel that if you placed yourself near a rib, the potential for injury from rib roll might increase. Barring down all loose rib throughout the section (29) may not be appropriate; however, each situation is unique and should be investigated and corrected if necessary. Conditions and circumstances would dictate where and how much to bar down in a section. Once you observe a condition that could affect the stability of the roof, you should examine the roof and immediate area closely to evaluate what other conditions might compound the hazard (30). Communicate what you find to management and co-workers and take corrective measures if necessary. The fireboss and foreman should periodically measure entries and intersections (31) to determine if the roof control plan is being adhered to. Corrective measures might be necessary to meet compliance requirements.

Questions requiring answers using pen or pencil:

Question I - Other than rib falls, some of the other causes for intersections to be out of compliance include:

- Equipment rounding off corners while traveling throughout the mine.
- Pillar corners failing from top and bottom loading.
- Continuous miners beginning crosscuts.
- Section being off sights and continuous miner must adjust.
- Poor continuous miner operating practices.

Question J - What are some practices you could use at your mine to bring intersections back into compliance?

Set cribs at pillar corners to reduce intersection area.
Set posts at pillar corners to reduce intersection area.
Set steel or wood crossbars and cribs.
Rebolt areas where maximum placement of roof bolts has been exceeded.

Question K - It is very important to maintain the roof control plan, especially at intersections. Why?

Intersection maintenance helps maintain the integrity of the roof.
Intersections have the greatest potential for roof falls if not maintained.
To comply with the roof control plan.
To attempt to reduce the likelihood of injuries from fall of roof.

References

- Office of the Federal Register. (1996). Code of Federal Regulations, Parts 1 to 199, Part 75, Subpart C. Washington, DC: US Government Printing Office
- Cummins, Arthur B. and Given, Ivan A., SME Mining Engineering Handbook, Vol. 1, 1973.

Scoring Key

The correct answers are marked with an asterisk.³

Question

Answer Number

A	1	2	3*		
B	4*	5*	6	7*	
C	8	9*	10	11*	12*
D	13	14	15*		
E	16	17	18*	19	
F	20	21	22*		
G	23	24	25*	26*	
H	27*	28	29	30*	31*

³ This page may be duplicated and used as an overhead transparency.

Appendix A: Problem Booklet

Duplicate this copy of the problem booklet for use in your classes. **Booklets should be printed on only one side of the paper.** Each person in your class should have a problem booklet while they are working the exercise. The problem booklets are reusable. To save effort and money, ask the trainees to avoid marking in the booklets and collect all the booklets after the class.

You may obtain a copy of the problem booklet from NIOSH, Pittsburgh Research Laboratory. The telephone number for this agency is listed in the footnote on page three of this document.

Roof Control at Intersections

Problem Booklet

Mining Systems and Human Engineering
Pittsburgh Research Center
NIOSH
Pittsburgh, Pennsylvania

Instructions

Read the background information on the following page. It is information you would know if you worked at the Oak Leaf Mine. Read the problem situation described at the bottom of the same page. Then answer each of the 11 questions. Do them one at a time. Don't jump ahead, but you may look back to the background information or earlier questions and answers at any time. Some questions will ask you to choose only ONE answer, while others will ask you to select as MANY answers as you think are correct. Follow the directions for each question.

After you have selected a choice to a question, look up its number on the answer sheet. Select your answer(s) to each question by **slowly** and **gently** rubbing the developing pen between the brackets on the answer sheet. A hidden message will appear and tell you if you are right. When you have finished, you will learn how to score this exercise.

Background

You and Andy are general inside laborers on the midnight maintenance shift at the Oak Leaf Mine. You each have over 15 years of underground experience, all at this mine.

The average coal seam height is 84 inches (7 ft).

Entries and crosscuts are cut 20 feet wide, on 80 foot centers.

There are 5 working sections at this mine, each having 5 entries.

The bottoms are evenly cut, but they are wet and slippery.

There is a battery powered scoop in each section.

The roof control plan specifies the use of 6 and 8 foot mechanical roof bolts to be installed 5 bolts across the entry on maximum 4 foot centers with 4 foot spacing between rows and a maximum of 4 foot from the rib.

According to the roof control plan, the diagonal intersection measurement, the total of the two diagonal measurements cannot exceed 60 feet, and neither measurement can be greater than 31 feet.

Although a single row of posts is not required in the belt entry, mine policy is that posts be set in the belt entry. They are to be set on a maximum of 4 foot centers, no more than 4 feet from the rib.

Prior to entering the mine, all employees were given a safety talk. The toolbox topic covered was the increase of roof and rib problems due to the higher humidity levels of the summer air.

Problem

You and Andy are assigned to advance the power center, the mobile equipment, and the trailing cables in the 1 Left section. See Figure 1. While walking around the section surveying your assignment, you notice spalling along the left rib of the #3 belt entry. The spalling extends from the intersection, immediately inby the power center and continues, roughly the entire length of the block. The sloughing of the rib runs from roof to bottom. You and Andy decide the loose rib needs to be scaled down.

Study Figure 1. Now turn to Question A.

Face Area
No. 3 Entry

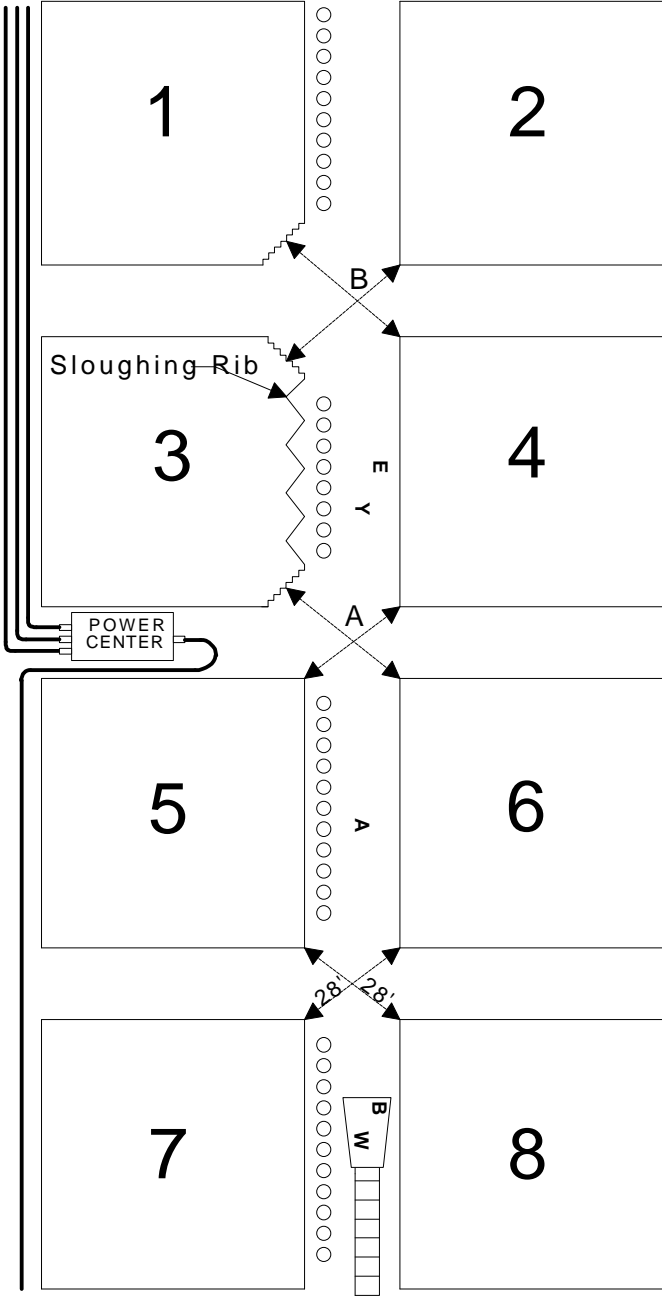


Figure 1

Question A

What is the most important thing to do before you and Andy begin barring the loose rib? (Choose only ONE unless told to "Try again.")

1. Nothing. The #3 entry is the belt entry, and roof conditions are constantly monitored so the roof and rib are probably OK.
2. Place danger signs at both ends of the rib.
3. Visually examine the rib and sound the roof.

Question B

You and Andy decide to start scaling the rib. What steps should you take before beginning to scale down the rib? (Select as MANY as you think are correct.)

4. Call the shift foreman to inform him of the condition.
5. Gather shovels to clean up the coal, and slate bars to begin barring.
6. Remove the posts running along the rib where you are going to begin scaling.
7. Set up a plan of action with Andy, so that you each know exactly what the other person is going to do.

When you have made your selection(s) do the next question.

Question C

After barring the rib, you and Andy take a short break before continuing your work. Everything has gone well and a large amount of loose coal has accumulated along the rib line. What steps should be taken first? (Select as MANY as you think are correct.)

8. Use the scoop to clean up the loose coal along the entire rib.
9. Re-inspect the roof and rib, paying particular attention to the newly exposed roof area.
10. Rock dust the area where the rib has been barred down.
11. Set temporary roof supports, if needed, and call the shift foreman to inspect the area.
12. Measure the distance between the rib and the first bolt to see if the distance is more than four feet.

When you have made your selection(s) do the next question.

Question D

After barring the rib, you determine the entry is still in compliance. The foreman asks you to check the diagonal measurements of the outby intersection to see if it is still in compliance with the roof control plan. If it is not in compliance, he tells you to fix the problem.

You find the two diagonal measurements to be 28 feet and 32 feet (see A on Figure 1). Is the intersection in compliance with the roof control plan? (Choose only ONE unless told to "Try again.")

13. You don't have enough information to make this decision at this time.
14. Yes, the intersection is in compliance with the roof control plan.
15. No, the intersection is not in compliance.

Question E

What is your best option to bring the intersection into compliance? (Choose only ONE unless told to "Try again.")

16. Set posts at the four corners of the intersection to minimize the area of the intersection.
17. Overbolt the intersection with bolts at least one foot longer than normal.
18. Build a crib on the outby corner of the #3 pillar.
19. Create an artificial pillar corner by setting posts on the corner of the #3 pillar to restore compliance.

Question F

You choose to build a crib on the outby corner of the #3 pillar. When it is finished, you measure the intersection and find that it is now in compliance. You measure the diagonals at the next inby intersection. Each leg is 31 feet (see B on Figure 1). Is this intersection in compliance with the roof control plan? (Choose only ONE unless told to "Try again.")

- 20. You don't have enough information to make this decision at this time.
- 21. Yes, the intersection is in compliance with the roof control plan.
- 22. No, the intersection is not in compliance.

Question G

What are some options for bringing this intersection into compliance? (Select as MANY as you think are correct.)

- 23. Set posts across the mouth of the crosscut between the #1 and #3 pillars.
- 24. Overbolt the intersection with bolts at least one foot longer than normal.
- 25. Build a crib on the outby corner of the #1 and the inby corner of the #3 pillar.
- 26. Create artificial corners on the outby corner of the #1 pillar and the inby corner of the #3 pillar by setting posts.

When you have made your selection(s) do the next question.

Question H

After bringing both intersections into compliance, you continue your assigned job. Once you find a situation which could effect the roof control plan, what additional safety precautions should be taken? (Select as MANY as you think are correct.)

27. You should inform other people in the section of this condition and tell them to closely monitor the situation.
28. You should walk along the safest looking rib.
29. You should begin barring down the loose rib coal all across the section.
30. You should visually examine all of the entries and pay particular attention to any additional potential hazards such as roof slips, clay veins, tripping hazards, etc.
31. The fireboss/foreman should periodically measure the width of the entries and diagonals and report any major changes.

When you have made your selection(s) do the next question.

On your answer sheet, please answer the following three questions:

Question I

Other than rib falls, list three causes of intersections being out of compliance.

Question J

What procedures could you use at your operation to bring an intersection into compliance with the roof control plan? List at least three.

Question K

Why is it important to maintain the roof control plan in intersections?

End of Problem

Scoring your performance

1. Count the total number of responses you colored in that were marked "correct". Write this number in the first blank on the answer sheet.
2. Count the total number of incorrect responses you colored in. Subtract this number from 16. Write the difference in the second blank on the answer sheet.
3. The best score is 31.

Appendix B: Answer Sheet Blanks

These are the answer sheet blanks. Copies of these blank answer sheets may be duplicated in the normal fashion. However, the answers that are found within the brackets must be printed on these blank answer sheets in invisible ink. These answers are found in Appendix C. If you have the capability to print invisible ink, make copies of the blank answer sheets. Make a master of the invisible ink answers that appear in Appendix C. Then print the invisible latent image ink on the blank answer sheets, being careful to make sure all pages print and that the appropriate answers line up with the appropriate blanks. The Master Answer Sheet shows all the answers in their proper place.

Most companies and trainers prefer to purchase preprinted answer sheets. You may obtain copies of preprinted latent image answer sheets from NIOSH, Pittsburgh Research Laboratory. The telephone number for this agency is listed in the footnote on page three of this document.

The exercise may be administered in small groups or individually. Used individually, you will need one answer sheet for each person in your class. If you use the exercise in small groups, you will need one answer sheet for each 3 to 5 persons in your class. The answer sheets are consumable. You will need a new set for each class.

Special developing pens are also needed by each person who marks an answer sheet. These may be obtained from the A. B. Dick Company, P.O. Box 1970, Rochester, New York 14692, phone 1-800-225-4835.

Answer Sheet for Roof Control at Intersections

Use this answer sheet to mark your selections. Rub the developing pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get the information you need. The last part of the message will tell you what to do next.

Question A (Choose only ONE unless told to "Try again.")

- 1. []
- 2. []
[]
- 3. []
[]

Question B (Select as MANY as you think are correct.)

- 4. []
[]
- 5. []
[]
- 6. []
- 7. []
[]

Question C (Select as MANY as you think are correct.)

8. []
[]
[]

9. []
[]
[]
[]

10. []

11. []
[]
[]

12. []
[]

Question D (Choose only ONE unless told to "Try again.")

13. []

14. []
[]

15. []

Question E (Choose only ONE unless told to "Try again.")

16. []
[]

17. []
[]

18. []
[]
[]

19. []
[]

Question F (Choose only ONE unless told to "Try again.")

20. []

21. []
[]

22. []

Question G (Select as MANY as you think are correct.)

23. []
[]

24. []
[]

25. []

26. []
[]
[]

Question H (Select as MANY as you think are correct.)

27. []

28. []
[]

29. []
[]

30. []
[]

31. []
[]

Use pencil or pen to write your answers for the following questions:

Question I

Other than rib falls, list three causes of intersections being out of compliance.

Question J

What procedures could you use at your operation to bring an intersection into compliance with the roof control plan? List at least three.

Question K

Why is it important to maintain the roof control plan in intersections?

Finding Your Score

Number of "Correct" answers you colored in = (1) _____

16 minus number of incorrect answers you colored in = (2) _____

Add lines one and two to get your total score = (3) _____

Highest possible score = 31

Lowest possible score = 0

Appendix C: Invisible Ink Answers

These pages contain the answers that must be printed in the blanks of the answer sheet in Appendix B. These answers are spaced and sequenced correctly so that they exactly match up with the appropriate blanks on the answer sheet blank.

Once the answers have been printed in the answer sheet blanks, the developing pen reveals the formerly invisible printed message.

You may purchase preprinted answer sheets or you may prepare your own copies. To learn more about this option, and to determine how many answer sheets and developing pens you will need, see the introductory section of the Instructor's Copy.

Conditions can change. Try again.

You are experienced miners and will be remaining in the area to work, so there is no need to danger off the area. Try again.

Correct. To assess the full extent of the hazard, close attention must be paid to the roof as well as the rib. Do the next question.

Correct. You are both experienced miners and are able to handle the situation, however, you should inform the shift foreman.

Correct. Safe work practices, including proper tool selection, good footing and pry bar control should always be followed.

This would violate the roof control plan. You can't do this.

Correct. A plan of action is a very important first step before starting to scale the rib.

Clean up is very important, however, you should not use the scoop to clean up the coal because you may knock down the posts in the process.

Correct. Compliance with the roof control plan may now be a problem. Depending upon how much rib coal was sloughed down, the exposed roof might be considered unsupported and in need of temporary or more permanent support.

Rock dusting is important but this can be done later.

Correct. After the condition has been made safe for travel, the foreman should be included in any action taken such as permanent roof support, rock dusting, etc.

Correct. To comply with the roof control plan, pins must be no farther than 4 feet from the rib.

You do have enough information. Try again.

Even though the total distance of 60 feet is OK, the leg measuring 32 feet is too long. Try again.

Correct. The leg measuring 32 feet is too long. Do next question.

This will cut down the area and comply with the roof control plan, but equipment must run through the area. Try again.

Overbolting is one solution, but may not be the best solution here. Try again.

Correct. This will cut down the area of the intersection, and provides the strongest roof support and is not likely to be knocked out by equipment. Do next question.

The posts will form an artificial pillar corner but are likely to be displaced or knocked down by equipment. Try again.

You do have enough information. Try again.

Even though the diagonal measurements are 31 feet, the total is more than 60 feet. Try again.

Correct. The total is more than 60 feet. Do next question.

This will cut down the area and comply with the roof control plan, but equipment must run through the area to the feeder.

Overbolting may add additional support for the roof, however, it does not reduce the area of the intersection.

Correct. This will cut down the area of the intersection.

Correct. The posts, if set no further apart than four feet from the rib and four feet from each other, will form an artificial pillar corner and will comply with most roof control plans.

Correct. Sharing information is a very important safety practice.

Miners should almost always walk down the middle of any entry. Coal falling from any rib can injure or kill.

This is not practical and probably not necessary. Awareness of the situation is a good safety practice.

Correct. Spalling rib conditions should be monitored, but other hazards should also be noted and corrected.

Correct. It is important to adhere to the roof control plan. It is easy to underestimate the importance of maintaining intersection distances.