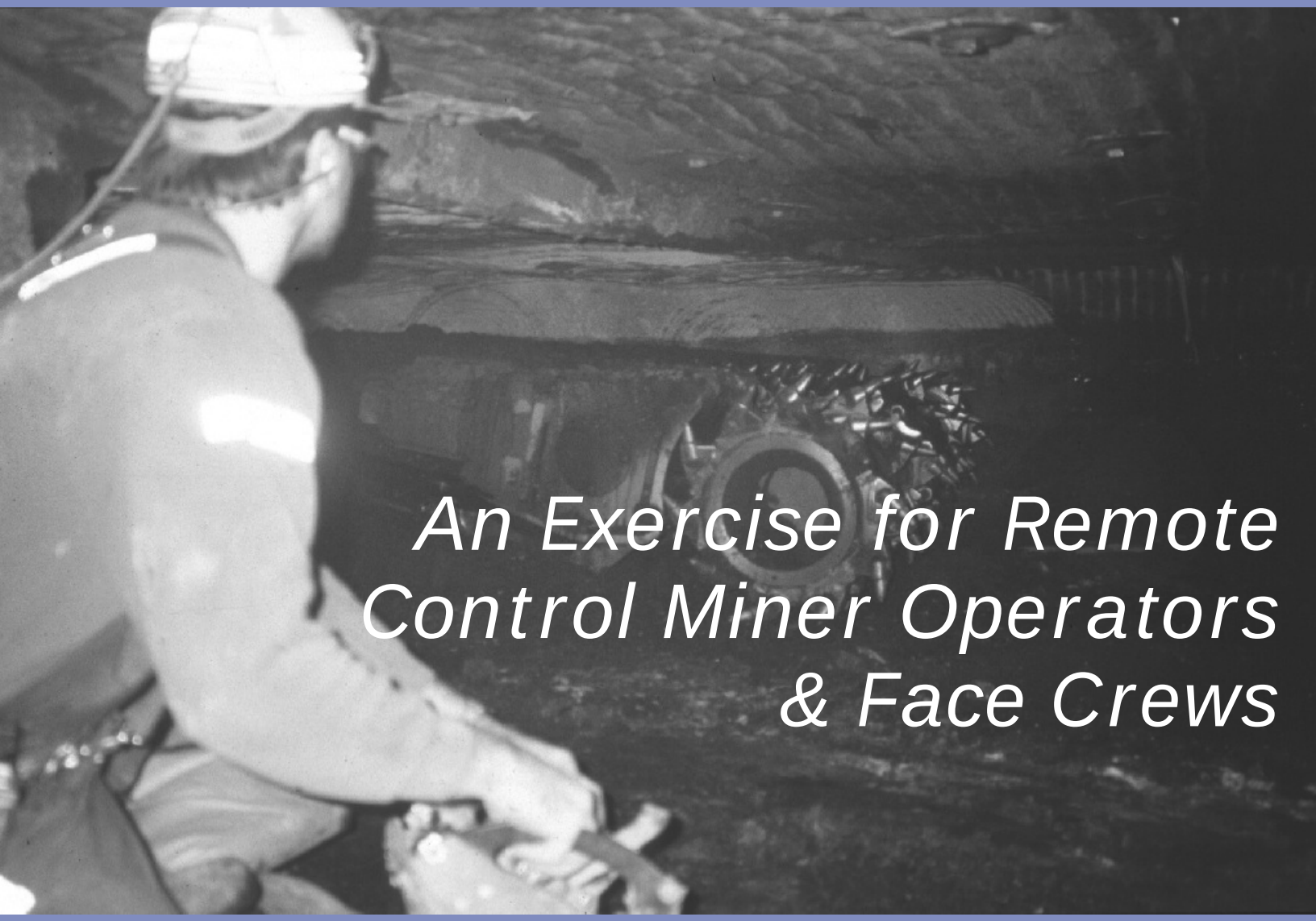
NIOSH

Cripple Creek Deep Cut



An Exercise for Remote Control Miner Operators & Face Crews

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

Cripple Creek Deep Cut:

An Exercise for Remote Control Miner Operators and Face Crews

Instructor's Copy

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
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National Institute for Occupational Safety and Health
Pittsburgh Research Laboratory
Pittsburgh, PA

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Contents

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 next section summarizes results from field tests of the exercise, and reports the miners' evaluation of the activity. The last part of this document is three appendices. Appendix A is the exercise problem booklet. This booklet can be duplicated locally. The booklets are reusable. One is needed for every person in the classroom. Appendix B is the answer sheet. Copies of this answer sheet must have the latent image (invisible) ink answers that appear in Appendix C printed on them.[3] Answer sheets are consumable. One is needed for each person or each small group of persons who work the exercise.

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: Invisible ink

Audience: Remote control and extended cut miner operators and face crews

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

Skills: Remote control mining procedures including remote control mining, taking extended cuts, resetting breaker on mining machine, and setting timbers. Communicating mine conditions, influencing safe behaviors when mine conditions are less than stable

Location: Underground coal mine, four section continuous mining operation
Average seam height is 48 inches

Problem: Your regular job is on the general labor crew at Cripple Creek #9 mine, a four section continuous mining operation. The mains are 9 entries wide and panels are 5 entries across. You and the rest of the crew had annual refresher training about 3 months ago.

For the past few days you have been sent to 2 South panel to fill in as the third shuttle car operator. This morning, however, your buggy is down. The face boss asks you to get the scoop and take seven or eight timbers to the number 5 entry because the last shift got off sight line. The miner will be working in entry 5 while the bolter crew pins entry 4. When you get up to the face you see that Mo, the remote control continuous miner operator, has rounded off the left inby corner in order to make his first cuts in the right hand rib. Now, he has squared around enough so that you and Red, the miner helper, can set some posts on the corner. The two of you set posts along the left inby rib of #5 entry while the shuttle car operator waits. You are in a tight spot when Mo decides to start mining. You must decide where the best place is to stand for safety and to be out of the way.

[3]You can do this yourself if you have the proper equipment, or you may obtain copies of preprinted answer sheets from MSHA, National Mine Health & Safety Academy, Dept. of Instructional Materials, 1301 Airport Road, Beaver, WV 25813-9426 phone 304-256-3257, fax 304-256-3368 or email to MSHAdistributioncenter@dol.gov .

How to Use This Exercise

1. Look at the performance objectives. Decide if the exercise is relevant for your annual refresher class.

2. Work through the exercise with the special pen and score your responses.

3. Read the master answer sheet for the exercise. Look at all the answers.

4. Read the "Instructor's Discussion Notes" for the exercise.

5. Become thoroughly familiar with the problem so you can present it to your class without reading it. Put the figures on an overhead projector so you can use these to help explain the problem.

6. When you present the exercise to the class:

   - Give each person an exercise booklet, an answer sheet, and a pen.

   - Demonstrate how to select and mark answers using the developing pen.

   - Go over the instructions for working the exercise with the whole group.

   - Explain the problem making sure everyone understands the problem situation.

   - 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 your own ideas.

Performance Objectives for Cripple Creek Deep Cut Exercise

Objective number	Capability verb(s)	Description of required performance and conditions under which it is to occur
1. HR[4]	Evaluate/ Identify	How work procedures change and what additional hazards might be present when switching from standard to deep cuts
2. HR	Evaluate	Roof conditions to determine if an extended cut should be taken
3. HR	Communicate	With face crew members about any changes in mining conditions or hazards on the section to make them aware
4. SW	Identify	Safe cm operator positioning which will reduce the incidence of cm operator being hit by falling top or hit by moving equipment
5. SW	Recognize	Where people are on the section at all times to avoid injury
6. SW	Implement	Safe work procedures that guide employees in working safely

[4] Skill and knowledge domain abbreviations
HR = hazard recognition
SW = safe work practices

Master Answer Sheet for Cripple Creek Deep Cut Exercise

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 you are directed to "Try Again!")

1. [You may be caught between the miner and the rib or timbers while Mo attempts to square up the entry. Try Again!]

2. [You would still be inby the operator, which could be dangerous. Try again!]

3. [Correct. You have finished setting the timbers and need to move to a safer safer location. Do the next question.]

4. [You might get caught between the miner or shuttle car and the rib. Try Again!]

5. [This would put you in danger of getting caught between the miner and a timber or rib. Try Again!]

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

6. [Although Mo will eventually have the miner in place to begin taking the first lift in #5, you are in a confined space. You could still be pinned or have your escape route from the face blocked.]

7. [Correct. You need to get to a safe location.]

8. [Even though you can see Mo, you are still not in a safe location because you are still inby the operator.]

9. [Correct. Red is also in a dangerous position and needs to move, but he chooses to move towards the face instead of moving outby.]

Question C (Choose only ONE unless you are directed to "Try Again!")

10. [Scooping entry #3 would result in a pile of spillage, blocking the entrance to the crosscut. Try Again!]

11. [You should talk to the boss first. The shuttle car operators won't be expecting you to be traveling to the feeder, and you might interrupt the ventilation. There is a better choice. Try Again!]

12. [Although this is where the miner is going next, the bolters are still bolting #4. Try Again!]

13. [Correct. Entry #3 needs to be scooped and the spillage can be put in the face of #2 to be loaded out later. Do the next question.]

14. [This is not needed and would be a waste of time. Try Again!]

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

15. [Correct. You notice that the last two cuts in entry #4 were bolted using 5 foot bolts instead of 4 footers.]

16. [You could cut into 3 Right crosscut before the bolters are finished.]

17. [You could cut into 3 Right crosscut before the bolters are finished.]

18. [You need to talk to the bolters in 3 Right to be sure they are done before you start mining.]

19. [Correct. They aren't finished, they still need to put in two rows of bolts.]

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

20. [With the top drummy in 3 Right, and the roof parting in #4, taking a deep cut is not a good idea. There are clear signs that bad roof exists.]

21. [Correct. The drummy top in 3 Right and the use of longer bolts indicate bad top. Taking this cut would violate the roof control plan.]

22. [This is dangerous since the top in 3 Right is drummy.]

23. [Correct. The foreman needs to know what's going on. Red should wait to hear from Dave.]

Question F (Choose only ONE unless you are directed to "Try Again!")

24. [You know from the bolters that the top in 3 Right may already be bad. You have a better option. Try Again!]

25. [Correct. This is the safest way to reach the breaker on the miner without exposing yourself to unsupported roof. Do the next question.]

26. [This is not an option. The ATRS is only to be used for setting permanent roof supports. Try Again!]

27. [This is not an option. Never go beyond permanent supports! Also, the bolters told you they saw a parting in the roof when they bolted #4. Try Again!]

Question G (Choose only ONE unless you are directed to "Try Again!")

28. [This is dangerous since the "cracking" you hear indicates the top is setting down on the timbers. You have a better option. Try Again!]

29. [The top is setting down on the posts as evidenced by the "cracking" sound. Try Again!]

30. [Correct. You need to get the miner out of the cut as soon as possible. Do the next question.]

31. [Since the top is setting on the posts, this could bring the top down and bury the miner. Try Again!]

Question H (Choose only ONE unless you are directed to "Try Again!")

32. [You would probably be wasting your time. Try Again!]

33. [Correct. Since Dave was outby, he needs to know exactly how this situation occurred to ensure it won't happen again. Do the next question.]

34. [There is a better way to approach this problem. Try Again!]

35. [You may want to leave, but this is not constructive. Try Again!]

36. [This type of action is normally reserved as a last resort. You should first try to resolve this locally with the mine safety personnel. Try Again!]

Question I (List your responses using pen or pencil.)

37. What are some signs that indicated Red should not have taken a deep cut?

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38. What are some other things miners should look for when deciding whether to take a deep cut?

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39. Why is clear, concise communication a key factor in the crew's safety, especially when taking deep cuts?

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Instructor's Discussion Notes for Cripple Creek Deep Cut Exercise

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) *signal Mo with your caplamp to shut down the machine.* A safer location would be outby the continuous mining machine away from the shuttle car and the rib. Placing yourself inby the continuous miner operator is not only illegal but also dangerous because the shuttle car operator and the continuous miner operator may not be able to see you (1). Also, if you are inby the continuous miner operator and a roof fall occurs, you are trapped in that area without an accessible escape route. Though many miners consider the pivot point of the mining machine to be a safe location, it is not (2). The mining machine could slide and pin you against the rib. Most accidents at the face area are from people going under unsupported top or being pinned between machinery and the rib.

Question B. The correct answers are (7) and (9). *Before the operator resumes mining, you should leave the face area and move to a safer position* (7) and *tell Red you both should get outby the continuous miner on the operator's side* (9). Since your job is finished at the face, you and Red need to move away from the face area. The face area is considered to be the most dangerous part of the mine. Never assume that the continuous miner operator or any other miners know that you are in the area (6). It is more important that others can see you rather than you seeing them (8).

Question C. The correct answer is (13) *scoop #3 and dump the spillage in the face of entry #2*. Entry #2 is bolted and dusted and is clear of any mining activity and equipment. While this may take some extra time, this is your best option. If you just scoop #3 and pile

the spillage at the face, you would partially block the entrance of 3 Right crosscut and you would not be able to get the roof bolter machine in the area (10). You could scoop #3 entry and dump the spillage at the tailpiece but you would need to coordinate this with the shuttle car operators and the foreman. The shuttle car operators would not be expecting you in their travel route (11). You could also interrupt the ventilation. Taking the spillage from #3 to #4 would not do you any good because the roof bolters are in # 4 entry (12). Just scooping the area that is bolted in 3 Right crosscut is a waste of time since the entire entry will eventually have to be scooped.

Question D. The correct answers are (15) and (19). *You should examine entry #4 from the first outby crosscut to the face, checking conditions and examining for hazards* (15) and *go over to the crosscut between #3 and #4 entries and ask the bolters if they are finished* (19*)*. Switching from 4 foot to 5-foot bolts indicates that there may be adverse roof conditions. To confirm this, you would want to talk to the roof bolters. Taking a cut of any length could put the roof bolters in danger since they are still bolting in the crosscut (16,17). Although you might see the bolter back out of the crosscut, it does not mean that they are necessarily finished bolting (18). The only way to be sure they are finished is to talk to them. Besides, you need to communicate with the bolters to get a better assessment of the roof conditions.

Question E. The correct answers are (21) and (23). *You may want to tell Red that he should not take a deep cut since there are signs that the top might be getting bad* (21) and *then go find the foreman, Dave, and tell him what the bolters told you about the top and ask him to check the face area in 3 Right* (23). Since you know that the top is giving you feedback as to its stability, watching the top will not prevent it from falling (20, 22). The cut needs to be curtailed. Curtailing the cut will also ensure that you will not be burying the miner causing a loss in production. You are inexperienced as a miner helper. If you really feel that the top is too bad to be mining and you don't feel that you can influence Red, you may need to let the foreman know about the situation so he can talk to the roof bolters and make an informed decision about the cut.

Question F. The correct answer is (25) *have the bolters pin entry #4 up to the boom of the miner; afterwards set a minimum of two rows of timbers on 4' centers up to the breaker on the miner.* It is very tempting to run out quickly under unsupported top and throw the breaker but this is how many fatalities occur (27). This is a particularly bad decision since you already had reports that the bolters saw a parting in the roof when they were bolting #4 entry. The safest way to reset the breaker is to pin the entry so far and timber out the rest of the way to the miner. Setting timbers all the way out and cribbing over the machine is not a good idea since you know that the top in 3 Right is bad (24). Also, you would not want to use the ATRS on the roof bolting machine for a temporary roof support since it is designed only to deflect roof debris when setting permanent roof supports (26).

Question G. The correct answer is (30) - *you suggest that Red tram the miner out of the cut. Once it is clear, evaluate the situation*. Time is of essence and you do not want to bury the miner. Since the timbers are cracking, you have a good idea that the top is unstable. Walking a cable or chain around the timbers would not be safe since you know the top is unstable (28). Taking the timbers out as you back the miner carefully out of the cut is not a good idea since those timbers may be the only thing supporting the top (31). Removing the timbers either with the miner or with sledge hammer may cause the top to fall burying you and/or the miner (29).

Question H. The correct answer is (33) to *inform Dave of the situation and how it occurred*. Obviously, reminding Red that he should have paid attention to the roof warning signals will do no good since your earlier warnings to Red had no effect (32). Going directly to the mine safety personnel or reporting the incident to MSHA at this point would be premature (34, 36). This type of incident needs to be reported to the section foreman and resolved locally first. If the problem has not been resolved locally within the crew, then additional action should be taken.

Question I. Ask your miners to discuss the answers to the following open-ended questions. The responses from the field tests (and the number of trainees who chose each response) are reported below. The more specific the responses are, the better. Specific answers help miner operators and crew members with less experience gain knowledge from those with experience. Encourage discussion of these topics with respect to the specific characteristics of your mine and experiences of your miners. It is important that crew members understand that everyone in the section should be able to identify poor mining conditions, should be familiar with the mining plan and that communication between crew members is essential to a safe and productive workplace.

37. What are some signs that indicated Red should not have taken a deep cut?

The switch to 60” bolts in #4 entry (42)
The face in 3 Right is drummy (35)
The 1" separation in the roof (35)
Roof is bad (33)
Timbers cracking (7)
Corners were rounded off (3)
Sound, vibration, sight (3)
Helper did not have enough experience (1)
Roof control plan (1)

38. What are some other things miners should look for when deciding whether to take a deep cut?

Roof (39), rib conditions (25), methane checks (20), adequate ventilation (14), location of crew members (8), water from the roof (6), test roof at last row of bolts (6),

examine the bolts (6), cutters in the roof (5), communication with the roof bolters (5), visual inspection (4), sound of the roof (4), look for weight on ribs (3), are there clay veins (3), kettle bottoms (3), loose and flaking rock (3)?, width of entry (2), keep on centers (2), stay away from pinch points (1), and timbers taking on pressure (1)

39. Why is clear, concise communication a key factor in the crew's safety, especially when taking deep cuts?

Everyone is involved somehow (18)
To know where everyone is located (13)
Communicating hazards when you are unsure of conditions (9)
Communicating is the only way to get things
accomplished safely without overlooking problems (6)
Listen to bolters - they test the roof (5)
Communication creates harmony among crew (2)
Communicate when you think something is not right (2)
Other responses:

Let the operator know where you are at all times, do not make decisions without all the information, know your area, communicate the roof control plan, extended cuts create additional safety concerns (limited vision, sounds, test roof).

References

Preventing Coal Mine Groundfall Accidents: How To Identify and Respond to Geologic Hazards and Prevent Unsafe Worker Behavior (1992). IC 9332. Proceedings: U.S. Bureau of Mines Technology Transfer Seminar. U.S. Department of Interior, Bureau of Mines.

E.R. Bauer, D.M. Pappas, and J.M. Listak. IC 9372 (1993). Ground Control Safety Analysis of Extended Cut Mining. U.S. Department of Interior, Bureau of Mines.

F.C. Turin, L.J. Steiner, and K.M. Cornelius. "Evaluation of Mining Activities Using a Scenario Interview Approach". Published in the Proceeding for the 42nd Annual Human Factors and Ergonomics Society Meeting, October 5-9, 1998.

L.J. Steiner, K.M. Cornelius, and F.C. Turin, D. Stock. "Work Sampling Applied to a Human Factors Analysis of Mine Worker Positioning". Published in the Proceeding for the 42nd Annual Human Factors and Ergonomics Society Meeting, October 5-9, 1998.

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L.J. Steiner, F.C. Turin, and C.A. Hamrick (1994). Ergonomic and Statistical Assessment of Safety in Deep-Cut Mining. Published in Improving Safety at Small Underground Mines (pp. 124-132), Special Publication 18-94. U.S. Department of Interior, Bureau of Mines.

Scoring Key for the Cripple Creek Deep Cut Exercise

The correct answers are marked with an asterisk.[5]

Question	Answer Number				
A	1	2	3*	4	5
B	6	7*	8	9*	
C	10	11	12	13*	14
D	15*	16	17	18	19*
E	20	21*	22	23*	
F	24	25*	26	27	
G	28	29	30*	31	
H	32	33*	34	35	36

[5] This page is printed in large type so that it may be copied and used as an overhead transparency.

Demographics and Training Performance

The exercise was field tested at both union and non-union mines. There were 80 participants with an average age of 43.3 years and 19.4 years of mining experience. The job titles included: mine laborers (57.7%), maintenance and technical workers (19.7%), supervisors and managers (21.1%) and other (1.4%). The exercise demonstrated face validity in that 97.2% of participants thought that this type of situation could definitely happen at their mine. Participants (87.4%) thought the exercise would help them to remember safety aspects associated with remote control and extended cut mining. Fifty-three percent said that they learned at least one thing from the exercise. This number may seem a little low but considering that the participants were very experienced, this is a worthwhile exercise for inexperienced remote control mine workers.

The exercise was moderately difficult for most of the participants since 62% scored greater than 80% (a mean score of 81.2%) on the exercise. Again, given that the exercise was field tested with miners with experience with deep cuts, these figures were not surprising. The exercise should promote good discussion and debate among miners with less experience in this area.

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.

You may obtain a copy of the problem booklet from MSHA, National Mine Health & Safety Academy, Dept. of Instructional Materials, 1301 Airport Road, Beaver, WV 25813-9426 phone 304-256-3257, fax 304-256-3368 or email to MSHAdistributioncenter@dol.gov .

Cripple Creek Deep Cut Exercise

Problem Booklet

NIOSH
Pittsburgh Research Laboratory
Pittsburgh, Pennsylvania

Instructions

Read the problem situation described on the next page. Next, answer each of the 8 questions. Do them one at a time. Don't jump ahead, but you may look back to earlier questions and answers. Some questions ask you to select ALL of the answers that you think are correct. Other questions ask you to select only ONE answer unless you are told to "Try again!" 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 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 your performance.

Background

Your regular job is on the general labor crew at Cripple Creek #9, a four section continuous mining operation. You and the rest of the miners had annual refresher training about 3 months ago.

Entries and crosscuts are 20' wide and pillars are on 80' centers. Average seam height is 48".

Mains are 9 entries wide while panels are 5 entries across.

Blowing ventilation is used at the face. All remote controlled continuous miners are equipped with scrubbers.

The approved roof control plan allows for extended cuts up to 40’ in depth from the last full row of undisturbed permanent roof supports. A 4 cut sequence of 20’ lifts is used. The mine plan calls for a reduction in cut depth when poor roof conditions are encountered.

The mine uses 48" mechanical anchor roof bolts under normal mining conditions and 60" mechanical anchor bolts when adverse roof conditions are encountered. Bolt lengths are marked in inches on the bolt heads.

Each section has one twin boom roof bolter.

The mine uses track haulage for moving personnel, equipment, and supplies, while coal is transported from sections on 48" belt.

Shuttle cars with operator compartments on the outby end of the machine are used for face haulage, and three cars are run when a section is taking deep cuts.

All sections have a scoop for cleaning the runways and bringing supplies from the end of the track.

All sections have first aid equipment stored in the dinner hole.

All miners carry a person-wearable self-contained self-rescuer.

There is a sump pump located at the mouth of the section.

Problem

For the past few days you have been sent to 2 South panel to fill in as the third shuttle car operator. This morning, though, your buggy is down. Dave, the face boss, asks you to get the scoop and take seven or eight timbers to the number 5 entry. The last shift got off sight line. (See Figure 1.) The miner will be working in entry 5 while the bolter crew pins entry 4.

When you get up to the face you see that Mo, the miner operator, has rounded off the left inby corner in order to make his first cuts in the right hand rib. Now, he has squared around enough so that you and Red, the miner helper, can set some posts on the corner. The two of you prepare to set posts along the left inby rib of #5 entry. Now turn to Question A.

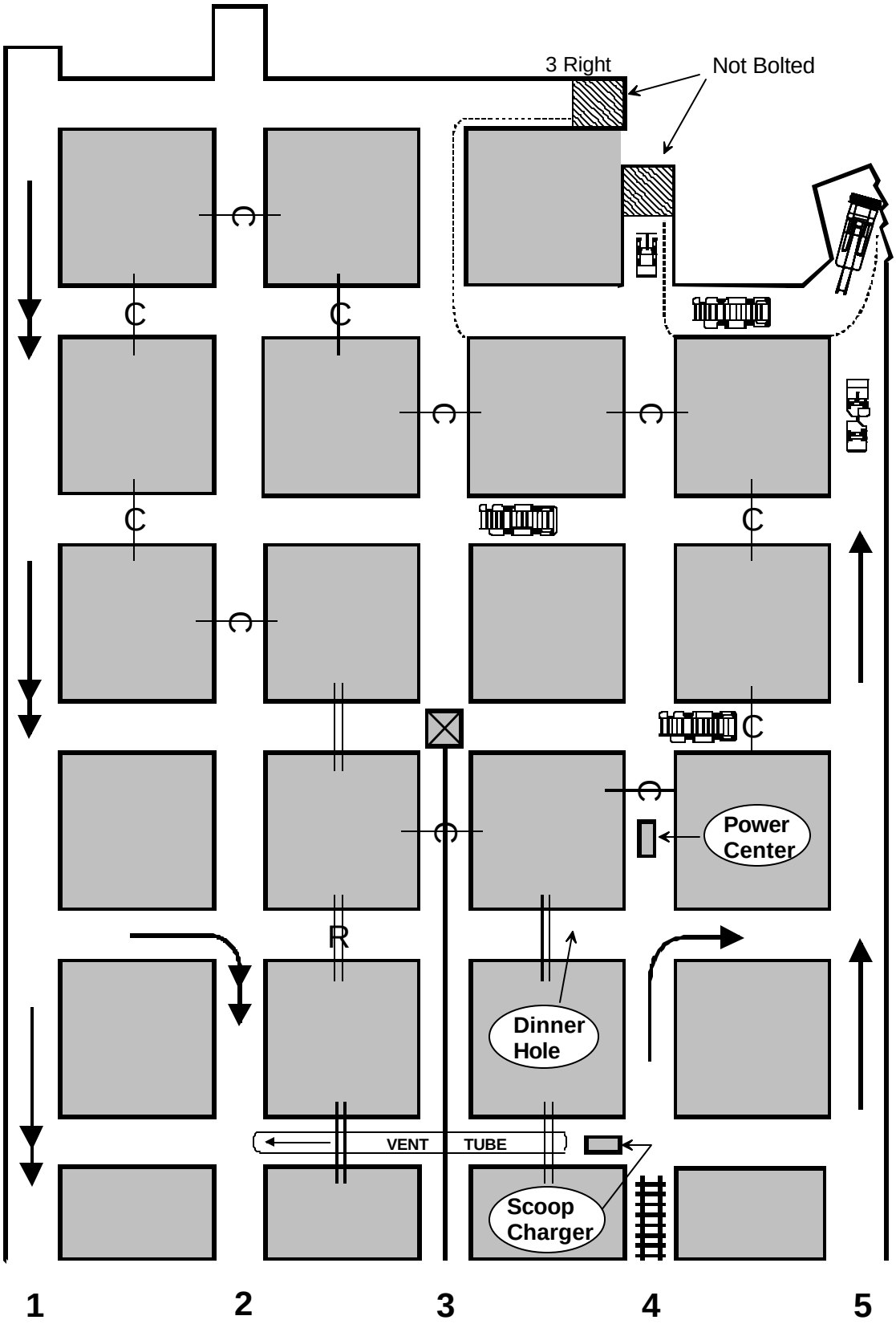
3 Right
Not Bolted
Power Center
Dinner Hole
VENT TUBE
Scoop Charger
1
2
3
4
5

Figure 1

Question A

You and Red quickly set timbers along the left rib. The shuttle car that has been waiting pulls under the boom of the miner. (See Figure 2.) Mo resumes positioning the machine. Red suggests you move closer to the face to get out of the way. What should you do? (Choose only ONE unless told to "Try Again!")

1. Stay with Red while Mo positions the miner.

2. Stay near the pivot point of the miner.

3. Signal Mo with your caplamp to shut down the machine.

4. Squeeze back around the corner between the timbers so that you're out of the way.

5. Shut the miner down by hitting the panic button on the left rear side of the machine so you can get out of the way safely.

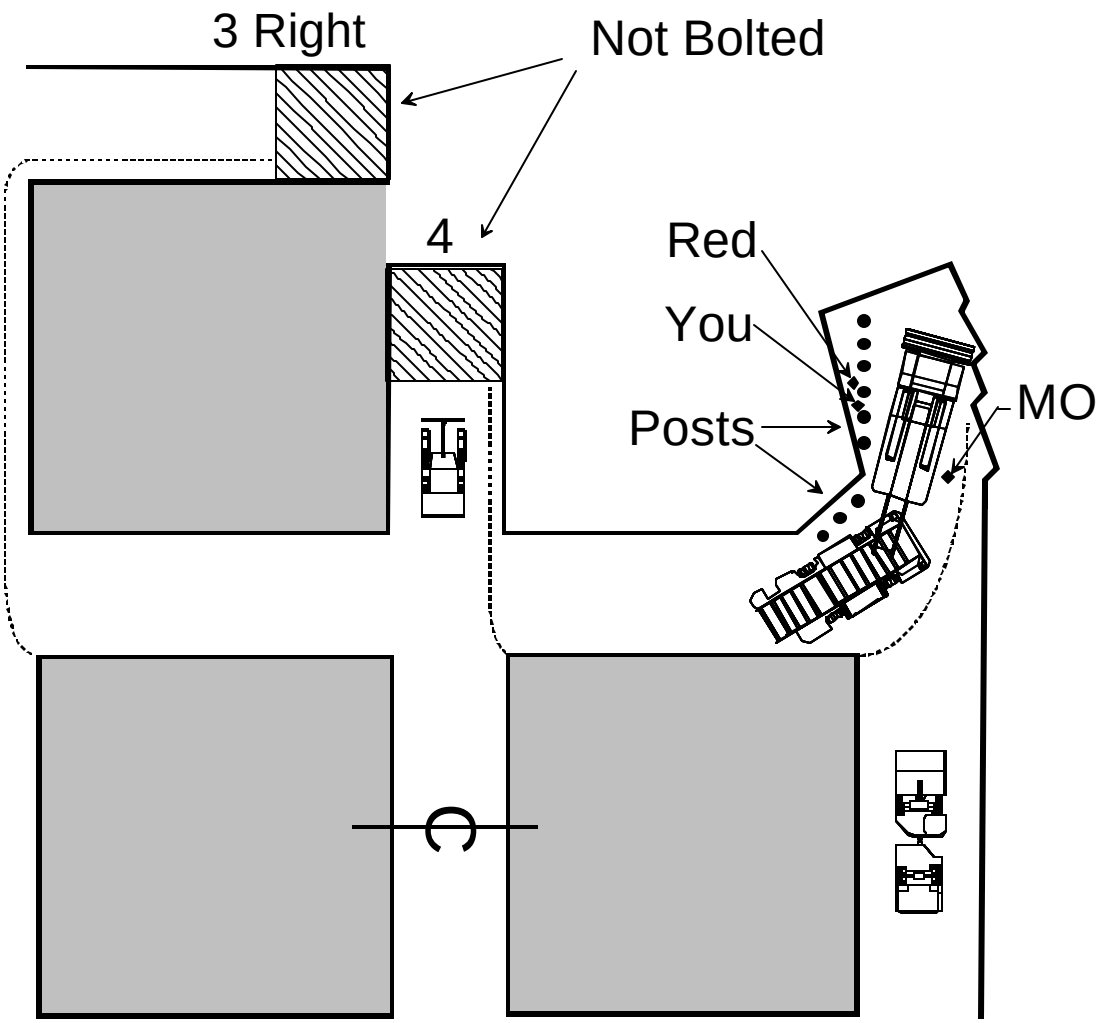

Figure 2

Question B

You tell Mo that you and Red are finished setting posts and need to get outby the miner. Red says "Nah ... I always stay up on this side when I don't have to handle cable. Stick around." What should you do? (Select as MANY as you think are correct.)

6. Since the miner operator now knows your location, go ahead and stay with Red.

7. Before the operator resumes mining, leave the face area and move to a safer position.

8. Position yourself so that you can always see Mo's caplamp.

9. Tell Red you both should get outby the continuous miner on the operator's side.

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

Question C

Before Mo resumes mining, you move outby and position yourself on the machine operator's side. The foreman, Dave, comes by and tells you to scoop the faces. You scoop and dust entries #1 and #2. You then make your first pass in #3. As you reach the crosscut between entries 3 & 4, you see it hasn't been bolted all the way in. There is a "Danger Unsupported Roof" sign on the last row of bolts about 20 feet back from the face. What should you do now? (Choose only ONE unless told to "Try Again!".)

10. Go ahead and scoop entry #3 and dump at the face of #3. Then wait to scoop #3 Right until after it is bolted.

11. Scoop #3 entry and dump the spillage on the belt feeder.

12. Take what spillage you have in your bucket over to #4 entry and scoop it.

13. Scoop # 3 and dump the spillage in the face of entry #2.

14. Set several timbers in the 3 Right crosscut. Then scoop the area that has been bolted.

Question D

You finish scooping the faces and park the scoop out of the way. You go to the dinner hole for a drink of water. Dave stops and tells you that Mo was called out of the mine for an emergency at home, and that Red will run the miner the rest of the shift and you are to be the miner helper. You go get the scoop and take it back to the charger station. By the time you return to the face, Red has trammed the miner to #4 and is ready to mine. He says "Come on let's go - we're takin' a deep cut!" (See Figure 3.) What should you and Red do? (Select as MANY as you think are correct.)

15. Examine entry #4 from the first outby crosscut to the face, checking conditions and examining for hazards.

16. Begin mining and take a full deep cut.

17. Begin mining and take a standard 20' cut.

18. Wait until the roof bolting machine comes out of 3 Right into the straight.

19. Go over to the crosscut between #3 and #4 entries and ask the bolters if they are finished.

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

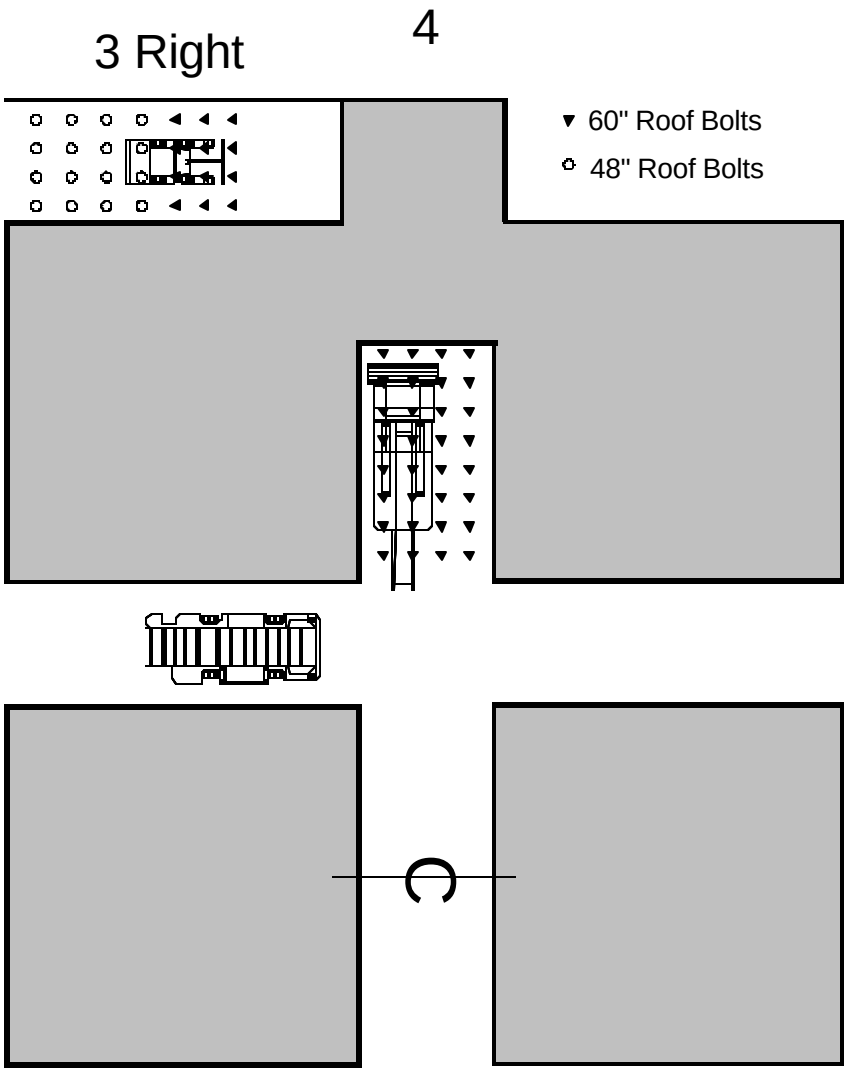

Figure 3

Question E

You convince Red to wait until you can make sure the bolters are out of 3 Right. The bolters come by and tell you the top was drummy near the face of 3 Right. They also tell you they noticed a 1 inch separation in the top about 4 feet above the coal when they bolted in #4. The bolters tell you they switched to 5 foot bolts. Red says, "These guys are wimps - let's get it in the coal and take a deep cut!" What should you do now? (Select as MANY as you think are correct.)

20. Help Red mine the deep cut, being careful to watch the top when taking out the left side lifts.

21. Tell Red that he should not take a deep cut since there are signs that the top may be getting bad.

22. While Red takes a deep cut and removes the left side lifts, watch the top from 3 Right and see what it does.

23. Go find the foreman, Dave, and tell him what the bolters told you about the top and ask him to check the face area in 3 Right.

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

Question F

You tell Red that he shouldn't take a deep cut but he ignores you. You look for Dave and are told by the mechanic that he is outby checking the section pump. When you come back to the face, Red is starting the third 20' lift in entry #4. He finishes this lift and starts mining the fourth 20' lift. The miner cuts through into 3 Right. (See Figure 4.) With less than 10 feet to cut in this lift, the onboard circuit breaker on the miner trips. Red says, "It's that blasted breaker on the miner again!" What should be done now? (Choose only ONE unless told to "Try Again!".)

24. Set timbers from 3 Right over to the miner and then use cribbing over the miner to get to the breaker.

25. Have the bolters pin entry #4 up to the boom of the miner; afterwards set a minimum of two rows of timbers on 4' centers up to the breaker on the miner.

26. Have the bolter come to 3 Right and set the ATRS next to the miner so you can then reset the breaker on the miner.

27. Sound the top and if it rings solid, quickly go up and reset the breaker.

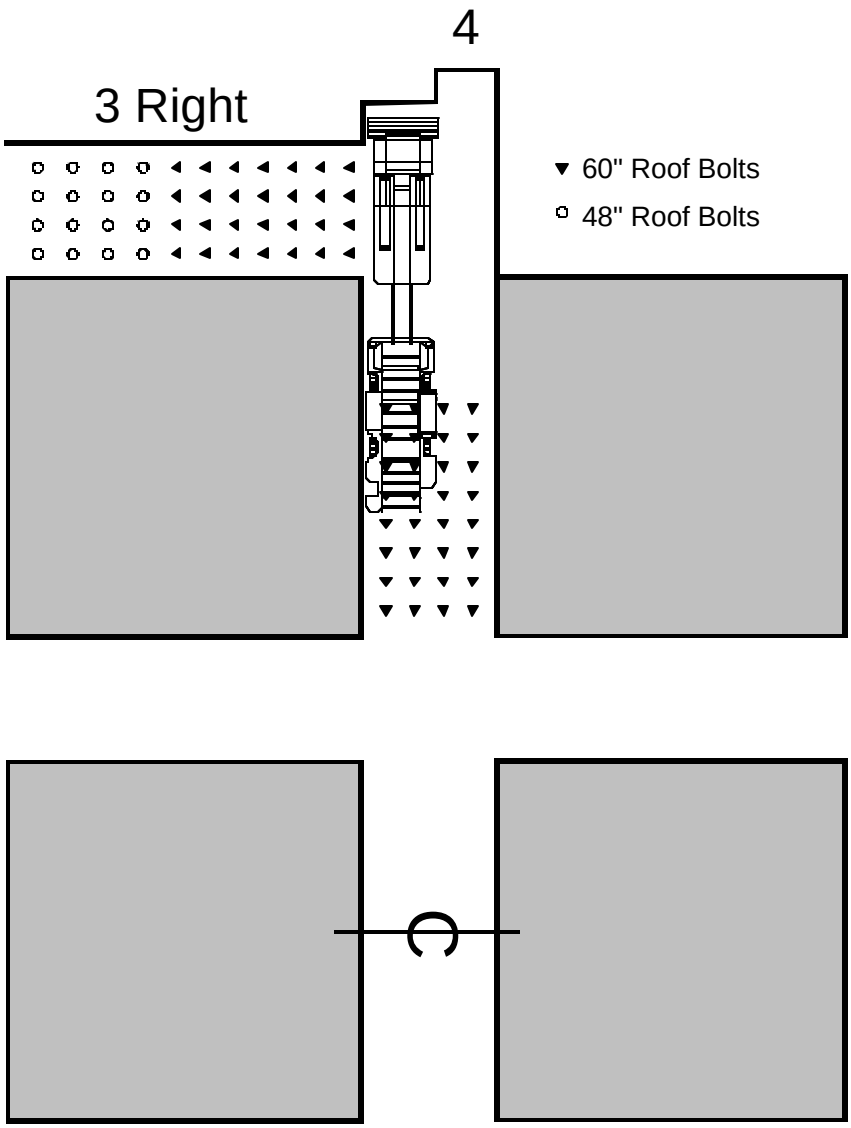

Figure 4

Question G

The bolters install a row of pins behind the boom of the miner and then you set 3 rows of timbers up to the machine. (See FIGURE 5.) Red resets the breaker and as he comes back toward permanent support, you hear the timbers start to "crack". You suddenly realize that no cable or chain was laced around the timbers to remove them remotely. You know they need to be removed before you resume mining. What should be done now? (Choose only ONE unless told to "Try Again!".)

28. You and Red walk a cable or chain around the timbers so they can be pulled remotely.

29. You knock the timbers out with the sledgehammer that's kept at the belt feeder.

30. You suggest that Red tram the miner out of the cut. Once it is clear, evaluate the situation.

31. You suggest that Red back the miner out taking the timbers as he goes.

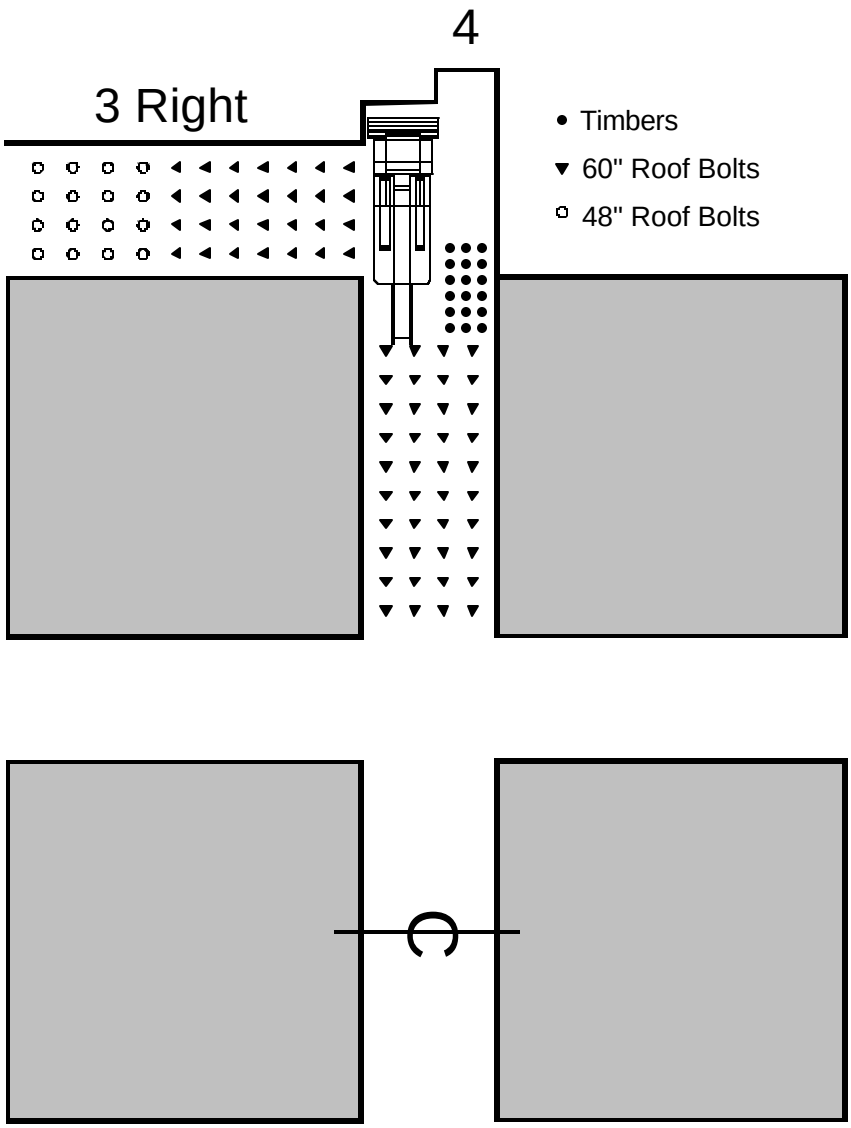

Figure 5

Question H

Red begins backing the miner out but takes down several timbers in the process. As he continues to maneuver the miner out, the intersection comes in, partially covering the miner. You will be helping to clean up the fall the rest of the shift. Dave, the foreman, returns. You are unhappy about the situation and want to do something, but what? (Choose only ONE unless told to "Try Again!".)

32. Wait until you get Red alone and remind him he should have paid more attention to the danger signals before taking a deep cut.

33. Inform Dave of the situation and how it occurred.

34. Tell Dave that you are going to take this issue to the mine safety personnel to ensure that this situation doesn't happen again.

35. Tell Dave to call you a ride; you're sick and want to go home.

36. Call the MSHA hotline to report this situation.

Question I

The following day, your mine safety director gathers the 2 South panel crew at the start of the shift for a brief safety talk. The discussion topic is deep cut mining and what happened yesterday. Since you are not a regular member of the crew, you want to learn more. There are some questions that need to be answered about deep cut mining. (List your responses on the answer sheet using a pen or pencil.)

37. What are some signs that indicated Red should not have taken a deep cut?

38. What are some other things miners should look for when deciding whether to take a deep cut?

39. Why is clear, concise communication a key factor in the crew's safety, especially when taking deep cuts?

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 25. Write the difference in the second blank on the answer sheet.

3. The best score is 36. The worst score is 0.

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 answers that appear in Appendix C. Then print the invisible 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 obtain copies of the preprinted answer sheets from MSHA, National Mine Health & Safety Academy, Dept. of Instructional Materials, 1301 Airport Road, Beaver, WV 25813-9426 phone 304-256-3257, fax 304-256-3368 or email to MSHAdistributioncenter@dol.gov.

The exercise is designed to be used in small groups. You will need one answer sheet for each group of 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 are “PENIB” and may be obtained from SICPA Customer Service, 8000 Research Way, Springfield, VA 22153, phone 1-888-742-7287.

Answer Sheet for Cripple Creek Deep Cut

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 you are directed to "Try Again!"**)**

1. [ ]
   [ ]

2. [ ]

3. [ ]
   [ ]

4. [ ]
   [ ]

5. [ ]
   [ ]

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

6. [ ]
   [ ]
   [ ]

7. [ ]

8. [ ]
   [ ]

9. [ ]
   [ ]

Question C (Choose only ONE unless you are directed to “Try Again!”)

10. [ ]
    [ ]

11. [ ]
    [ ]
    [ ]

12. [ ]
    [ ]

13. [ ]
    [ ]

14. [ ]

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

15. [ ]
    [ ]

16. [ ]

17. [ ]

18. [ ]
    [ ]

19. [ ]

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

20. [ ]
    [ ]

21. [ ]
    [ ]

22. [ ]

23. [ ]
    [ ]

Question F (Choose only ONE unless you are directed to "Try Again!")

24. [ ]
    [ ]

25. [ ]
    [ ]

26. [ ]
    [ ]

27. [ ]
    [ ]

Question G (Choose only ONE unless you are directed to "Try Again!")

28. [ ]
    [ ]

29. [ ]
    [ ]

30. [ ]
    [ ]

31. [ ]
    [ ]

Question H (Choose only ONE unless you are directed to "Try Again!")

32. [ ]

33. [ ]
    [ ]

34. [ ]

35. [ ]

36. [ ]
    [ ]

Question I (List your responses using pen or pencil.)

37. What are some signs that indicated Red should not have taken a deep cut?

_____

_____

_____

_____

_____

38. What are some other things miners should look for when deciding whether to take a deep cut?

_____

_____

_____

_____

_____

39. Why is clear, concise communication a key factor in the crew's safety, especially when taking deep cuts?

_____

_____

_____

_____

_____

Finding Your Score

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

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

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

Highest possible score = 36

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 obtain 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.

You may be caught between the miner and the rib or timbers while Mo attempts to square up the entry. Try Again!

You would still be inby the operator, which could be dangerous. Try Again!

Correct. You have finished setting the timbers and need to move to a safer location. Do the next question.

You might get caught between the miner or shuttle car and the rib. Try Again!

This would put you in danger of getting caught between the miner and a timber or rib. Try Again!

Although Mo will eventually have the miner in place to begin taking the first lift in #5, you are in a confined space. You could still be pinned or have your escape route from the face blocked.

Correct. You need to get to a safe location.

Even though you can see Mo, you are still not in a safe location because you are still inby the operator.

Correct. Red is also in a dangerous position and needs to move, but he choses to move towards the face instead of moving outby.

Scooping entry #3 would result in a pile of spillage, blocking the entrance to the crosscut. Try Again!

You should talk to the boss first. The shuttle car operators won't be expecting you to be traveling to the feeder, and you might interrupt the ventilation. There is a better choice. Try Again!

Although this is where the miner is going next, the bolters are still bolting in #4. Try Again!

Correct. Entry #3 needs to be scooped and the spillage can be put in the face of #2 to be loaded out later. Do the next question.

This is not needed and would be a waste of time. Try Again!

Correct. You notice that the last two cuts in entry #4 were bolted using 5 foot bolts instead of 4 footers.

You could cut into the 3 Right crosscut before the bolters are finished.

You could cut into 3 Right crosscut before the bolters are finished.

You need to talk to the bolters in 3 Right to be sure they are done before you start mining.

Correct. They aren’t finished, they still need to put in two rows of bolts.

With the top drummy in 3 Right, and the roof parting in #4, taking a deep cut is not a good idea. There are clear signs that bad roof exists.

Correct. The drummy top in 3 Right and the use of longer bolts indicate bad top. Taking this cut would violate the roof control plan.

This is dangerous since the top in 3 Right is drummy.

Correct. The foreman needs to know what's going on. Red should wait to hear from Dave.

You know from the bolters that the top in 3 Right may already be bad. you have a better option. Try Again!

Correct. This is the safest way to reach the breaker on the miner without exposing yourself to unsupported roof. Do the next question.

This is not an option. The ATRS is only to be used for setting permanent roof supports. Try Again!

This is not an option. Never go beyond permanent supports! Also, the bolters told you they saw a parting in the roof when they bolted #4. Try Again!

This is dangerous since the "cracking" you hear indicates the top is setting down on the timbers. You have a better option. Try Again!

The top is setting down on the posts as evidenced by the "cracking" sound. Try Again!

Correct. You need to get the miner out of the cut as soon as possible. Do the next question.

Since the top is setting on the posts, this could bring the top down and bury the miner. Try Again!

You would probably be wasting your time. Try Again!

Correct. Since Dave was outby, he needs to know exactly how this situation occurred to ensure it won't happen again. Do the next question.

There is a better way to approach this problem. Try Again!

You may want to leave, but this is not constructive. Try Again!

This type of action is normally reserved as a last resort. You should first try to resolve this locally with the mine safety personnel. Try Again!

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Fax: (513) 533-8573
Email: pubstaft@cdc.gov

Or visit the NIOSH web site at www.cdc.gov/niosh

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