

Belt Fire Injury Exercise

Instructor's Copy

Mining Systems and Human Engineering
U.S. Bureau of Mines
Pittsburgh Research Center
Pittsburgh, Pennsylvania¹

¹The 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 U. S. Government.

Contents

Introduction	3
Exercise summary	4
Objectives	4
How to use this exercise	5
Master answer sheet	6
Instructor's discussion notes	12
References	16
Scoring Key	17
Appendices	
Appendix A: Problem booklet (duplicate this copy for use in class)	
Appendix B: Answer sheet blanks (print the invisible ink answers on these)	
Appendix C: Invisible ink answers (print these on the answer sheet blanks)	

Introduction

This instructor's copy contains most of the materials needed to use the exercise. It tells how to use the exercise, presents the objectives, the master answer sheet, discussion notes to be used following the exercise, and the scoring key. The last part of this booklet is three appendices. Appendix A is the exercise problem booklet. The booklets are reusable and can be duplicated locally. One is needed for every person in the class. Appendix B is the answer sheet. Copies of this answer sheet must have the invisible ink answers that appear in Appendix C printed on them.² Answer sheets are consumable. One is needed for each group of 3 to 5 persons who work the exercise.

² You can do this yourself if you have the proper equipment, or you may obtain copies of preprinted 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: Invisible ink

Audience: Underground miners & section foremen

Length: Thirteen questions (40 to 45 minutes for administration)

Skills: First aid
Emergency Evacuation

Location: Underground coal mine section

Problem: You are the section foreman. After you complete your methane check at the face of #2 entry, you think you hear someone yelling "Fire!" You run down #2 entry and through the last open crosscut to entry #3. You see Louie, the section mechanic, running up #3 entry. Louie informs you that there is a fire along the belt, 2 crosscuts outby the tailpiece. He also tells you that he has found Ollie lying injured along the belt just outby the fire. You examine the situation and determine that Ollie suffered a spinal injury when he fell while trying to fight the fire. As the section foreman and only EMT, you must treat Ollie's injuries plus direct fire fighting efforts.

- Objectives:
- Choose an alternative action given a seriously injured miner in the vicinity of a serious fire in a belt entry.
 - Recognize and select the proper procedures for stabilizing, immobilizing and transporting an injured miner with possible spinal injury.
 - Recognize and select the proper methods and procedures for improvising first aid care when needed materials are missing from the first aid kit.
 - Prioritize fire fighting, first aid, and escape actions and strategies given a serious belt fire and a seriously injured miner.
 - Choose the safest and most rapid escape method and route from a mine section, given an out-of-control fire in neutral air, and a seriously injured miner.
 - Recognize the importance of supporting the mine roof and staying in fresh air outby the fire, while fighting the fire.
 - Recognize when it is no longer safe or effective to fight a fire.

How to Use This Exercise

1. Look at the performance objectives. Decide if the exercise is relevant for your mine training class.
2. Work through the exercise with the developing 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 that you can present it to your class without reading it. Put the maps 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 a problem booklet, and each group of 3 to 5 persons an answer sheet, and a developing 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 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.

Master Answer Sheet for Belt Fire injury 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.

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

1. [Correct! Other miners on the section must be warned of the fire and supplies]
[from the first aid kit may be needed to treat Ollie's injuries.]
2. [You need to do something else first.]
[]
3. [You are in fresh air.]
[]
4. [Correct! The roof around Ollie looks good and sounds solid when struck with]
[a hammer.]
5. [You don't know what types of injuries Ollie has or their severity. You could]
[cause additional injuries.]
6. [Correct! You need to see if Ollie is conscious, has an open airway, is]
[breathing, and has a pulse.]

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

7. [Correct! He moans and says, "I tried to put it out ... but I got dizzy! My head]
[and neck hurt!"]
8. [You need to do something else first or you may hurt Ollie. Besides, the fire is]
[fire is burning toward the belt tailpiece away from you and you are in fresh air.]
9. [Correct! You find a 1 inch cut on the side of Ollie's head. Bleeding has nearly]
[stopped and you note dried blood through his hair. You also note tenderness]
[and a slight deformity along the back of his neck.]
10. [Correct! You find no other injuries except a small abrasion on his right hand]
11. [Correct! His grip strength is not equal in both hands and he complains of]
[tingling in his fingers, hands, and arms. He presses his feet against your]
[hands with little difficulty.]

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

12. [You noted a small cut on the side of Ollie's head with some blood loss.]
[However, bleeding had nearly stopped. Severe blood loss is unlikely.]
13. [Correct! Ollie's breathing, level of consciousness, pulse, and skin]
[characteristics suggest shock.]
14. [No abdominal tenderness or rigidity was noted during the survey you]
[conducted.]
15. [Correct! Ollie has a small cut on his head. Tenderness and deformity along]
[the back of the neck indicate a possible cervical spine injury. Tingling in the]
[upper limbs also suggests a possible spinal injury.]
16. [The survey you have conducted revealed his airway was open and clear]
[There was no evidence of smoke inhalation or inhalation of hot gasses.]

Question D (Choose only ONE unless you are told to "Try Again!")

17. [Try again!]
[]
18. [Try again!]
[]
19. [Correct! You can't safely move Ollie until he is stabilized on a]
[backboard. The posts can provide a margin of safety for you and Ollie.]
20. [Try again!]
[]

Question E (Choose only ONE unless you are told to "Try Again!")

21. [Try again!]
22. [Try again!]
23. [Correct! You need to do a head count to be sure other crew members are]
[safe and accounted for, and Ollie must also be watched so that he doesn't]
[become injured any further.]
24. [Louie doesn't know what to do to help Ollie, and he is needed to help set]
[supports. Try again!]

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

25. [You need to do some other things first.]
26. [Correct! Other sections of the mine need to be evacuated. You need to]
[report the conditions of the fire, and you need help fighting the fire.]
[]
27. [Correct! Good communications need to be kept between the section and the]
[outside at all times.]
28. [This would be dangerous!! Remember, SCSR's are designed for escape only.]
[Besides, the fire is burning toward the belt tailpiece and there is heavy smoke]
[in this area.]
29. [Correct! You must try to fight the fire, take care of Ollie's injuries, get him to a]
[safe place, and transport him out of the mine.]

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

30. [Try again!]
31. [Try again!]
32. [Correct! The fire needs to be fought and Ollie needs his injuries]
[treated. The firefighters should use the outby fire tap at crosscut 40.]
33. [This would fan the fire. Try again!]

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

- 34. [Ollie has a possible spine injury. He needs to be secured to the backboard]
[before he is carried out.]
- 35. [Correct! To prevent further injury to Ollie's spine, light traction needs to be]
[held to stabilize the head and neck until he is secured to the backboard.]
- 36. [Correct! Brattice cloth cut in long strips and about 2 to 3" wide can be used to]
[tie Ollie to the backboard.]
- 37. [Correct! Even though the bleeding from the head laceration has nearly]
[stopped, the wound needs to be protected.]
- 38. [Ollie already show signs of moderate shock. Telling him this may make his]
[condition worse, even life threatening.]
- 39. [Correct! Even though you have no backboard "straps", you can still position]
[the board next to Ollie and have it ready.]

Question I (Choose only ONE unless you are told to "Try Again!")

- 40. [Ollie must be cared for properly. Try again!]
- 41. [You need to take charge and act now based on your knowledge of the]
[situation. Try again!]
- 42. [Correct! Cletus can do this and then begin tying the strips to the backboard]
[as they are cut while you maintain traction on Ollie's head.]
- 43. [Ollie needs your help. You are the only EMT present. Try again!]

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

44. [It's too late for that. Besides, you need help getting Ollie ready to move out.]
45. [Correct! You will need several people to log roll Ollie over so that the]
[backboard can be slid under him while keeping his head, neck and body]
[in line.]
46. [Correct! Since Ollie has a spine injury, he must be rolled as a unit on your]
[command, with one person holding traction on his head.]
47. [Correct! Ollie must be rolled slowly with every person rolling his area of the]
[body at the same time to keep his head, neck and body in line to prevent]
[further injury.]
48. [Before you move him, you must tie off the straps to secure him to the]
[backboard, making sure his head and neck are fully immobilized.]
49. [Correct! The blanket will help keep his head from moving sideways which]
[might cause further injury.]
50. [Correct! Ollie needs to be secured tightly to the backboard, with ties at the]
[head, just under the armpits, hips, and upper and lower legs.]

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

51. [You need to get Ollie and the other miners out of the mine as the fire is]
[becoming too large for you to fight.]
52. [A check curtain here will do little good since the fire is beginning to burn]
[toward the face.]
53. [Correct! The fire is becoming too large. Trying to fight the fire any longer]
[would be dangerous.]
54. [Correct! Everyone should have an SCSR before leaving the section.]
55. [This would be dangerous. You would encounter heavy smoke and you know]
[that the fire is burning toward the faces.]
56. [Correct! You need to tell the surface that you are leaving the section so that]
[someone knows the status of the fire and what you are doing.]

Question L (Choose only ONE unless you are told to "Try Again!")

57. [Fire may have burned through the belt stopping across from the scoop]
[charger. Also, it would be hard to carry Ollie over to #5 entry. The scoop may]
[not have enough charge to get you out. Try again!]
58. [This is dangerous. It is too far to walk all the way out and too slow. The fire is]
[bad. Try again!]
59. [Correct! The track entry is in fresh air. As you travel outby, check for any]
[smoke coming through the stoppings between #1 and #2 entries.]
60. [There is a better and safer option. Try again!]

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

61. [Correct! More miners fighting the fire earlier might have stopped it sooner.]
62. [Correct! Excess coal can serve as fuel and can be ignited by a hot belt roller]
[bearing.]
63. [The ventilation arrangements are proper and are not a factor.]
64. [It was hard for the foreman to take charge of the fire fighting and care for Ollie,]
[but both tasks were performed as well as possible given the circumstances.]

Finding your score

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

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

Add lines (1) and (2) to get your total score = (3)_____

Highest possible score = 64

Lowest possible score = 0

Instructor's Discussion Notes for Belt Fire Injury 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.

Field tests conducted have shown that this exercise is an excellent way to involve participants in a situation and teach them sound principles. The purpose of this exercise is to generate thinking and discussion and help reinforce proper behaviors in the mining industry.

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 answers are 1, 4, and 6. The other miners who are working on the section must be warned (1) that there is a fire so that they can retreat outby the fire. The fire can be fought by the other miners whom Louie went to warn. Since Ollie is injured, you need to attend to his needs, but the roof around Ollie must be checked (4). You want to be certain that the roof over him is sound so that you don't endanger your life. While it is important to begin fire fighting efforts as soon as possible (2), you need to assess Ollie and determine the extent of his injuries first. A primary survey is conducted (6) to determine if Ollie is conscious, is breathing, and has a pulse. Even though the fire is raging, the last thing you want to do is to drag Ollie from the area (5). He is in fresh air and in no immediate danger from the fire or a roof fall, and since you don't know the extent of his injuries, you may cause additional injuries or aggravate existing ones by dragging him to the mandoor. There is no need to don your FSR (3) since you are in fresh air.

Question B - The correct answers are 7, 9, 10, and 11. Questioning a patient (7) may provide insight as to the location, type, and extent of his injuries. By conducting a hands-on survey of his head, neck (9), torso, and limbs (10), you can determine what injuries a patient has and how extensive they are. Since you found that Ollie has deformity and tenderness along the back of the neck, unequal grip strength (11), and tingling in the

fingers, hands and arms, you suspect that he may be suffering from an upper spinal injury. You would not want to help Ollie get up and attempt to escape the area (8). By doing so, he may suffer spinal cord damage if he is moved in this manner without his spine being immobilized.

Question C - The correct answers are 13 and 15. The patient surveys revealed that Ollie has a small cut on his head but has little blood loss (12). However, because of his partial level of consciousness, he may be suffering from a head injury. His lungs and airway appear clear (16) indicating that he didn't inhale smoke or hot gasses. He also doesn't appear to have any abdominal injuries (14). His pulse, respiration rate, and skin characteristics, however, indicate that he may be suffering from shock (13). The tenderness and deformity along the neck indicate that Ollie has a cervical spine injury (15).

Question D - The correct response is 19. Posts or other supports need to be set between Ollie and the flaking roof. These supports will provide roof fall protection while you are caring for Ollie. In addition, when you encounter a person with a spinal injury, the patient must be immobilized to a spine board before being moved (17) (18) to prevent further injury to the spinal cord. A patient with a suspected spinal injury or head injury of any type should never be helped to walk (20).

Question E - The correct answer is 23. Since the fire continues to burn and the top is working, the miners setting the posts must continue their work so that Ollie can be treated as quickly and safely as possible. Neither one of them can be charged with watching over Ollie. As the section foreman, you are responsible for the safety of all the workers on the section and must be certain that all are accounted for. Besides this, you will need additional help in fighting the fire and caring for Ollie. Before you leave Ollie (23), you should assure him you will be right back and that two other miners are nearby and watching over him. While you need to make the roof over Ollie safe as quickly as possible (21), helping set the posts uses valuable time that can be better spent checking on the other crew members. If you take Louie away from the job of setting posts (24), you will slow down the process. Besides, there is not much that Louie can do to help Ollie. You will need to recruit some of them to help you care for Ollie and fight the fire. Although someone needs to fight the fire (22), you need to do something else right now.

Question F - The correct responses are 26, 27, and 29. Since there is a fire, the communications person outside needs to know what is happening (26) so that he can notify the other sections in the mine, supervisory personnel, and other support workers. A miner needs to be posted at the mine pager phone (27) to ensure proper communications are maintained with the outside. The remaining miners are needed to help in fighting the fire and in treating Ollie (29). In addition, before you leave the section, you must treat his injuries and stabilize him. Sending miners in by the fire (28) to fight it is dangerous since all fire fighting must be done from the outby side of the fire where workers can be in fresh air. There is no need at this time to put on your SCSRs (25) since you are still in fresh air. In addition, SCSR's are designed for self-rescue. They should not be used by miners for fighting fires.

Question G - The correct answer is 32. The fire needs to be fought while Ollie's injuries are cared for as he cannot be moved (30) until this is done. Sending someone to knock down the last inby stopping between Entry 4 and Entry 5 (31) would be dangerous. In addition, knocking down the stopping (33) at the mandoor between Entry 3 and Entry 4 would take time. Besides, bringing additional fresh air from the No. 3 intake into the belt would fan the fire and make it worse.

Question H - The correct answer choices are 35, 36, 37, and 39. Stability of the head must be maintained (35) to help prevent further damage when a person is suffering from a possible cervical spine injury. Traction cannot be released until the patient is secured to the backboard and the head and neck snugly immobilized to the board. Since no backboard straps are available, rescuers can improvise and make straps from strips of brattice cloth (36). All wounds need to be protected with sterile dressings and bandages (37) to prevent further damage, even though bleeding has stopped. Even though time is required to prepare backboard straps from brattice cloth, the backboard can be positioned (39) while you are waiting. This will reduce the time required to treat Ollie. Never tell a patient that he is badly hurt (38). If a patient asks what has happened or how serious his injuries are, be as honest as possible without frightening the him. Your patient survey results indicate that Ollie may have a cervical spine injury. Before he is moved (34), he needs to be properly secured to the backboard with his head and neck immobilized.

Question I - The correct response is 42. Again, Ollie must be properly secured to a backboard before he is moved (40) to prevent further injury to his neck. Even though the fire is spreading, you need to make a reasonable attempt to properly secure Ollie to the backboard. You may cause further injuries to Ollie if you move him and he is not properly secured. There is no need to call the superintendent (41) for advice. First, this would waste valuable time. More importantly, you are holding traction on Ollie's head and neck. Once you begin holding traction on the cervical spine, you are committed and cannot release the traction until the patient's head and neck are secured to the backboard. Since a cervical collar isn't available, and folded blanket can be used to provide lateral support for the neck and head. The fire is getting worse and Ollie should be properly treated as quickly as possible. Using more miners to fight the fire (43) would hinder your ability to treat Ollie.

Question J - The appropriate answers are 45, 46, 47, 49, and 50. When a person has a spinal injury of any type, at least three people (45), in addition to the person maintaining traction, are needed to log roll the patient for positioning the backboard (46). The patient must be rolled as a unit (47) with the back and neck in line. The patient must be centered on the backboard so that he can be secured properly to it. He must also be tightly secured (50) to a backboard. Any shifting of the patient when transporting could cause additional injury. Since the fire is spreading, connecting another fire hose (44) will waste valuable time. You need to get Ollie secured to the backboard as soon as possible. Although you get Ollie on the backboard (48), his head and neck must be securely immobilized before you can release traction. This is done by using the folded blanket around his head and securing head and blanket to the board with straps (49), You may cause additional injury if you release traction too soon.

Question K - The correct answers are 53, 54, and 56. Since the injured miner has been fully treated and can now be safely transported, you need to take measures to evacuate the section (53) as the fire is becoming too large to safely fight. Besides, Ollie needs to be transported to a medical facility as soon as possible. Before leaving the section, be sure to take all of the SCSRs with you (54) in the event you would need them. Also, the communications man on the outside needs to know that you are leaving the section (56) so that support people on the outside can be expecting your arrival. At the same time, the fire is becoming worse. Since the fire is largely burning toward the faces, there is a chance that methane gas may be ignited causing an explosion. You need to get your crew out of the mine as soon as possible (51). Installing a check curtain would across entry #3 would waste time (52) and not be helpful in containing the fire. While it would be nice to know how much the fire has spread (55) in the section, walking in by the fire would be dangerous. Although you have SCSR's at your disposal, they are for self-rescue only. You could be overcome by smoke and there is the danger of a methane explosion. Besides, you could be caught in by if the fire spreads quickly across the section.

Question L - Item 59 is the correct answer. Using the mantrip to transport the crew and Ollie out of the section is the fastest and most practical way to evacuate the section. Remember that smoke from the fire will be sweeping the faces and be exhausted out the #1 and #5 entries. Since there is the chance for leakage across stoppings, some smoke may be encountered in the track entry. Everyone must be prepared to don their SCSRs and take other appropriate action as necessary. Although entry #5 is intake air, the track is also on intake air. There is no need to try to get to the scoop (57) and use it for transportation out of the section via #5 entry. There is no need to don your SCSR's (58) and walk out the track entry. The track is on intake air. Riding out on the mantrip is the fastest way to get your crew and Ollie out of the mine. There is no need to walk the belt entries (60) out of the mine while carrying Ollie. This would take more time and it would be difficult to carry Ollie long distances in the belt entry.

Question M - The appropriate answer choices are 61 and 62. As soon as a fire is discovered, it should be reported and additional help sought in fighting it unless the fire is extremely small. In this case, excessive coal spillage contributed to the fire. Spillage along belts and in other areas of the mine should be cleaned up as soon as possible. Belt lines, especially, should be as free as possible of spillage and thoroughly rockdusted. The section ventilation pattern (63) had no bearing on the fire situation. Air is brought into the section via three intake air courses and is returned down each side of the section through two return airways. The belt entry is on a separate split of "neutral" air that is vented to the right return. This type of situation is difficult to deal with as there are many details that the section foreman must consider. In this case, the foreman had to direct fire fighting and emergency operations, and oversee care provided to a seriously injured victim. Had there been additional qualified EMT's on the section to care for Ollie, the section foreman (64) may have had more time to spend directing fire fighting activities. However, depending on the quantity of combustibles available to fuel the fire, any effort to fight the fire may have proved futile.

Reference

Caroline, Nancy L. 1983. Emergency Care in the Streets, Ed. 2. Little, Brown and Company, 603 pp.

Scoring Key for Belt Fire Injury Exercise

The correct answers are marked with an asterisk³.

<u>Question</u>	<u>Answer Number</u>					
A	1*	2	3	4*	5	6*
B	7*	8	9*	10*	11*	
C	12	13*	14	15*	16	
D	17	18	19*	20		
E	21	22	23*	24		
F	25	26*	27*	28	29*	
G	30	31	32*	33		
H	34	35*	36*	37*	38	39*
I	40	41	42*	43		
J	44	45*	46*	47*	48	
	49*	50*				
K	51	52	53*	54*	55	56*
L	57	58	59*	60		
M	61*	62*	63	64		

³This 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.

You may obtain a copy of the problem booklet from NIOSH, Pittsburgh Research Laboratory, Pittsburgh, PA phone 412-386-5901, fax 412-386-5902 or email to minetraining@cdc.gov.

Belt Fire Injury Exercise

Problem Booklet

Instructions

Read the problem situation on the next page. Study the figure until you understand the location of the miners and equipment in the problem. Next, answer each of the 13 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. You will find that broad, smooth strokes work better than grinding the pen into the paper. 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

You are the section foreman on the 16 South panel at Black Hole No. 3 Mine. In addition to being section foreman, you are also the only certified EMT on the crew.

It is 12:15 P.M. and you are at the face of #2 entry making your on-shift section check.

The 16 South panel is located off the 6 West Mains about 6,500 feet from the portal.

The average seam height in 16 South is 60 inches.

The mine is dry and 16 South is poorly rockdusted since the duster on the scoop is out of service.

The fire boss on the midnight shift reported excessive spillage along the 16 South panel belt for a distance of 300 feet outby the tailpiece.

The shift foreman instructed you to clean up the spillage and rockdust the area if the opportunity presented itself. Your crew is having a good day and they are mining their fifth cut.

A water line, with fire taps and 200 feet of 1 1/2 inch fire hose located at 300 foot intervals, extends the full length of the belt.

A total of 8 miners are working on the crew today.

Battery powered rail haulage vehicles are used to transport men and supplies to the section.

Problem

After you complete your methane check at the face of #2 entry, you think you hear someone yelling "Fire!" You run down #2 entry and through the last open crosscut to entry #3. You see Louie, the section mechanic, running up #3 entry. Louie informs you that there is a fire along the belt, 2 crosscuts outby the tailpiece. He also tells you that he has found Ollie, one of your shuttle car operators, lying injured along the belt just outby the fire. Study Figure 1 on the next page and then turn to the following page and read the first question.

Question A

You and Louie start back to the fire area. As soon as you go through the check curtain in #3 entry, you hit moderate smoke. You continue out to the first mandoor at crosscut #40 leading to the belt entry. Entry 3 in the area of the mandoor is clear of smoke. When you get into the belt entry, you see an orange glow inby your position. You approach the pillar near the fire tap and see flames engulfing the belt and entry and Ollie lying on his back beside the belt. What should you do now? (Select as MANY as you think are correct.)

1. Send Louie to warn the bolter and miner crews of the fire, and tell him to return with help and the first aid kit.
2. While waiting for Louie to return, begin fighting the fire with the fire hose Ollie had apparently been using before he was injured.
3. Put on your FSR.
4. Check the mine roof around Ollie to see if it is OK.
5. Grab Ollie under the arms and drag him outby to the crosscut #40 near the mandoor.
6. Conduct a primary survey to assess Ollie's condition.

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

Question B

Louie has not yet returned from warning the other miners on the section and getting the first aid kit. Your primary survey on Ollie shows he is dazed and doesn't recognize you; his airway is open and clear and his respirations are rapid (32/min) and shallow. His pulse is 120 and regular, but weak. You note that the skin on Ollie's face is pale, cool, and moist. What would you do now? (Select as MANY as you think are correct.)

7. Ask Ollie what happened and to tell you where he is hurt.
8. Help Ollie get up and get out of the belt entry to the safety of the track entry.
9. Feel Ollie's skull and neck with your fingertips.
10. Feel Ollie's chest, abdomen, pelvis, middle and lower spine, and his upper and lower limbs for injuries.
11. Check Ollie's grip strength in both hands simultaneously and ask him to press his feet against the palms of your hands.

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

Question C

Your primary and secondary surveys of Ollie's injuries have taken about a minute. Ollie complains of tingling in his fingers, hands and arms. Ollie's face and lips are not burned, and there is no swelling of his lips and mouth. Based on your findings, what is wrong with him? (Select as MANY as you think are correct.)

- 12. Severe blood loss.
- 13. Shock.
- 14. Internal injuries and bleeding.
- 15. Possible head and/or spinal injuries.
- 16. Possible injury to his lungs and airway.

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

Question D

Louie comes back with the first aid kit and backboard. He tells you that the other miners have been warned and are going to cut the power to all equipment including the face fans. Louie says he told the other miners to meet at the dinner hole. Cletus, the other shuttle car operator, is with Louie. Just as they arrive, you notice that the roof over the fire area begins to flake. The roof over Ollie still appears stable. What should you do now? (Choose only ONE unless you are told to "Try again!")

17. Have Louie and Cletus help you drag Ollie around the corner to crosscut #40 near the mandoor.
18. Keep watching the roof. If it gets worse, have Louie and Cletus move Ollie to a safer location.
19. Have Louie and Cletus begin setting support posts between Ollie and the working roof, using the posts that are lying in the crosscut near the mandoor.
20. Help Ollie get up and walk back to the dinner hole.

Question E

Louie and Cletus are setting posts. The fire continues to burn, feeding on coal spillage, belting, and debris. It is advancing toward the tailpiece. What should you do now? (Choose only ONE unless you are told to "Try Again!")

21. Help Louie and Cletus set posts so that the work can be done faster.
22. Grab the hose line and start to fight the fire.
23. Tell Ollie to lie still, that Louie and Cletus will be keeping an eye on him while you go back to the dinner hole and check on the other crew members. Also tell Louie and Cletus to keep an eye on Ollie.
24. Tell Louie to help Ollie while Cletus continues to set posts.

Question F

You go to the dinner hole and find that the other four crew members have arrived. One of the roof bolter operators tells you that the power has been cut. He also tells you that the smoke is very heavy in by the fire (see Figure 2). What should you do now? (Select as MANY as you think are correct.)

25. Have everyone put on their SCSRs, then go get Ollie and the others, and leave the section.
26. Call out to the surface. Report the conditions on the section and ask for help.
27. Assign one man to stay by the pager phone in the dinner hole to maintain communications with the surface.
28. Have both roof bolter operators put on SCSRs and go to the belt tailpiece to connect a fire hose and begin fighting the fire from there.
29. Take the remaining three miners with you into the belt entry and assign duties accordingly.

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

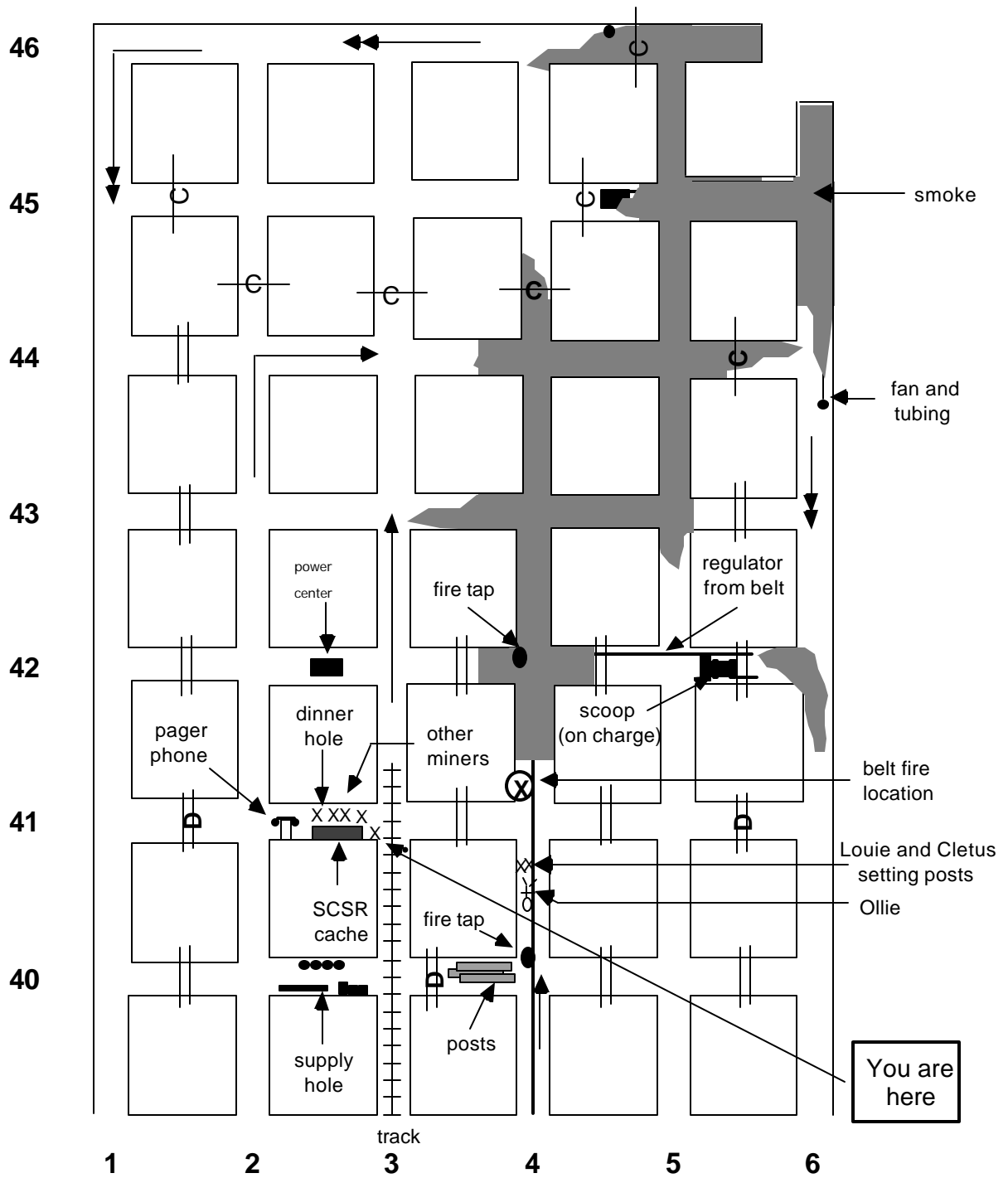


Figure 2: 16 South section, 15 minutes into the fire

Question G

You assign the continuous miner helper to be communications man and tell him to stay at the dinner hole near the pager phone. You take the other three miners to help in the belt entry. When you return to the fire area, you see that the fire is worse. Louie and Cletus still have several more posts to set. Ollie is still lying beside the belt. What should you do now? (Choose only ONE unless you are told to "Try Again!")

30. Have three miners help you drag Ollie through the mandoor at crosscut #40 into the track entry.
31. Send someone into #5 entry to the scoop charger, get the scoop, and knock down the stopping behind the charger and the last inby stopping between the belt and #5 entry to send the smoke and fire toward the right return.
32. Assign fire fighting duties to two miners while Louie and Cletus finish setting posts. Have another miner help you begin treating Ollie's injuries.
33. Have two miners, using sledge hammers, knock down the stopping at the mandoor to get more fresh air into the belt entry and to the fire fighting area.

Question H

Two miners begin fighting the fire with the 1 1/2" hose line while Louie and Cletus finish setting posts. You and another miner start treating Ollie's injuries. You find that the backboard straps are missing from the first aid kit. What should you do now? (Select as MANY as you think are correct.)

34. Have the others help you lift Ollie on the backboard and quickly carry him out of the belt entry without securing him.
35. Place yourself at Ollie's head, directly behind him, and begin holding light traction on his head to help stabilize his neck.
36. Send Louie out to the supply hole to get a roll of brattice cloth from which you can cut strips for making straps.
37. Have someone cover Ollie's head wound with several gauze pads and gently secure the pads with cravat bandages.
38. Tell Ollie that he is badly hurt and that you'll try to get him out of the mine before the fire gets worse.
39. Have someone take the backboard and place it beside Ollie while you are waiting for Louie to return with the roll of brattice curtain.

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

Question I

Louie returns with a section of brattice cloth. While you hold traction on Ollie's head, you tell another miner to cut 5 strips of brattice cloth 8 feet long and about 3 inches wide. A miner fighting the fire yells and tells you that he isn't sure how much longer he and his buddy can fight the fire as it is continuing to spread slowly. What should you do now? (Choose only ONE unless you are told to "Try Again!")

40. Forget about treating Ollie further; have the other miners help you carry him to the mantrip and evacuate the section.
41. Go to the mine phone and call to the surface to see what the superintendent wants you to do.
42. Instruct Cletus to fold one of the blankets so it forms a horseshoe about 8" wide that can be placed around Ollie's head to stabilize it.
43. Go with Cletus and Louie to connect up another fire hose line and help the others fight the fire.

Question J

Cletus has folded the blanket as instructed and all of the brattice strips are in place on the backboard. Ollie is still on his back on the mine floor. Now the fire is advancing outby as well as inby. A miner yells "We can't fight this fire too much longer. Hurry up!" The communications man then comes and tells you that the stopping across from the dinner hole at crosscut #41 is beginning to burn through into the #3 entry. What should you do now? (Select as MANY as you think are correct.)

44. Have Cletus and Louie hook up another hose line and help fight the fire.
45. Have the miners not fighting the fire position themselves along Ollie on the side opposite the backboard and have one stay on the other side.
46. Continue holding traction on Ollie's head. Tell the three miners to roll Ollie slowly, and together on your command. Have the other miner slide the backboard under Ollie as far as possible.
47. Once the board is under Ollie's back as far as possible, on your command, have the three miners helping you roll Ollie back over on his back and finish positioning him on the backboard.
48. After you get Ollie on the backboard, release your traction on Ollie's head, pick up the backboard and carry Ollie to the track entry.
49. While you maintain traction on Ollie's head, have another miner place the horseshoe-shaped blanket around Ollie's head and secure his head and blanket wrap to the backboard.
50. While you hold traction on Ollie's head, have the other miners securely tie the straps over the full length of Ollie's body to secure him to the board.

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

Question K

Ollie is secured to the backboard and you are carrying him out through the mandoor to the track entry. Two miners are still fighting the fire but had to retreat 40 feet outby since the fire is now spreading rapidly and heavy smoke and flames are rolling back. You also hear the roof falling over the fire. The communications man tells you that the stopping at crosscut #41 has burned through near the right rib. What should you do now? (Select as MANY as you think are correct.)

51. Carry Ollie outby a couple of crosscuts, lay him down along the track entry and tell him to wait, while you and the other miners continue to fight the fire.
52. Put up a check curtain in #3 entry at crosscut #41, outby the burning stopping to prevent additional fresh air from reaching the fire.
53. Tell the miners fighting the fire to quit and prepare to evacuate the section.
54. Have several miners go to the dinner hole and pick up all the SCSRs to take with you as you prepare to evacuate the mine.
55. Walk to the face of #1 entry and across the faces to assess the spread of the fire inby the belt tailpiece.
56. Call outside to inform the communications man of conditions in the section and tell him that you are leaving the section.

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

Question L

You and the crew are ready to leave the section. What route should you take and how should you travel? (Choose only ONE unless you are told to "Try Again!")

57. Have everyone go to the scoop charging station, get in the bucket, and ride the scoop out #5 entry since it is in fresh air.
58. Put on your SCSRs and start walking out the track entry since it is the primary escapeway.
59. Take all the SCSR's, load Ollie and the others into the mantrip and follow the usual route out of the section.
60. Take the crew, carry Ollie and walk the belt entries out of the mine.

Question M

Ollie and the other miners were safely evacuated from the mine. Ollie was taken to the hospital where he was found to have both a cracked cervical vertebrae and a fractured skull. He thinks he fell against the conveyor belt support structure while he was fighting the fire. Your good first aid may have saved his life and prevented him from being paralyzed. The mine section had to be sealed to control the fire, and the mine was closed for six weeks.

Now think about the whole problem and answer the following question. What conditions contributed to the seriousness of this fire? (Select as MANY as you think are correct.)

61. When Ollie first found the fire, he should have immediately reported it and called for help.
62. Excessive coal spillage along the belt near the tailpiece probably contributed to the fire and its rapid development.
63. The section ventilation plan was improper and contributed to the rapid spread of the fire.
64. Because the section foreman (you) had to take care of Ollie, the fire got out of hand.

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 33. Write the difference in the second blank on the answer sheet.
3. The best score is 64. 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 places.

Most companies and trainers prefer to obtain copies of the preprinted answer sheets from NIOSH, Pittsburgh Research Laboratory, Pittsburgh, PA phone 412-386-5901, fax 412-386-5902 or email to minetraining@cdc.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.

A developing pen is 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 Belt Fire injury

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.

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

- 1. []
[]
- 2. []
[]
- 3. []
[]
- 4. []
[]
- 5. []
[]
- 6. []
[]

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

- 7. []
[]
- 8. []
[]
- 9. []
[]
[]
- 10. []
- 11. []
[]
[]

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

12. []
[]

13. []
[]

14. []
[]

15. []
[]
[]

16. []
[]

Question D (Choose only ONE unless you are told to "Try Again!")

17. []
[]

18. []
[]

19. []
[]

20. []
[]

Question E (Choose only ONE unless you are told to "Try Again!")

21. []

22. []

23. []
[]
[]

24. []
[]

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

25. []

26. []
[]
[]

27. []
[]

28. []
[]
[]

29. []
[]

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

30. []

31. []

32. []
[]

33. []

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

- 34. []
[]
- 35. []
[]
- 36. []
[]
- 37. []
[]
- 38. []
[]
- 39. []
[]

Question I (Choose only ONE unless you are told to "Try Again!")

- 40. []
- 41. []
[]
- 42. []
[]
- 43. []

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

- 44. []
- 45. []
[]
[]
- 46. []
[]
- 47. []
[]
[]
- 48. []
[]
- 49. []
[]
- 50. []
[]

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

- 51. []
[]
- 52. []
[]
- 53. []
[]
- 54. []
- 55. []
[]
- 56. []
[]

Question L (Choose only ONE unless you are told to "Try Again!")

57. []
[]
[]

58. []
[]

59. []
[]

60. []

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

61. []

62. []
[]

63. []

64. []
[]

Finding your score

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

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

Add lines (1) and (2) to get your total score = (3)_____

Highest possible score = 64

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 these options, and to determine how many answer sheets and developing pens you will need, see the introductory section of the Instructor's Copy.

Correct! Other miners on the section must be warned of the fire and supplies from the first aid kit may be needed to treat Ollie's injuries.

You need to do something else first.

You are in fresh air.

Correct! The roof around Ollie looks good and sounds solid when struck with a hammer.

You don't know what types of injuries Ollie has or their severity. You could cause additional injuries.

Correct! You need to see if Ollie is conscious, has an open airway, is breathing, and has a pulse.

Correct! He moans and says, "I tried to put it out ... but I got dizzy! My head and neck hurt!"

You need to do something else first or you may hurt Ollie. Besides, the fire is burning toward the belt tailpiece away from you and you are in fresh air.

Correct! You find a 1 inch cut on the side of Ollie's head. Bleeding has nearly stopped and you note dried blood through his hair. You also note tenderness and a slight deformity along the back of his neck.

Correct! You find no other injuries except a small abrasion on his right hand

Correct! His grip strength is not equal in both hands and he complains of tingling in his fingers, hands, and arms. He presses his feet against your hands with little difficulty.

You noted a small cut on the side of Ollie's head with some blood loss. However, bleeding had nearly stopped. Severe blood loss is unlikely.

Correct! Ollie's breathing, level of consciousness, pulse, and skin characteristics suggest shock.

No abdominal tenderness or rigidity was noted during the survey you conducted.

Correct! Ollie has a small cut on his head. Tenderness and deformity along the back of the neck indicate a possible cervical spine injury. Tingling in the upper limbs also suggests a possible spinal injury.

The survey you have conducted revealed his airway was open and clear. There was no evidence of smoke inhalation or inhalation of hot gasses.

Try again!

Try again!

Correct! You can't safely move Ollie until he is stabilized on a backboard. The posts can provide a margin of safety for you and Ollie.

Try again!

Try again!

Try again!

Correct! You need to do a head count to be sure other crew members are safe and accounted for, and Ollie must also be watched so that he doesn't become injured any further.

Louie doesn't know what to do to help Ollie, and he is needed to help set supports. Try again!

You need to do some other things first.

Correct! Other sections of the mine need to be evacuated. You need to report the conditions of the fire, and you need help fighting the fire.

Correct! Good communications need to be kept between the section and the outside at all times.

This would be dangerous!! Remember, SCSR's are designed for escape only. Besides, the fire is burning toward the belt tailpiece and there is heavy smoke in this area.

Correct! You must try to fight the fire, take care of Ollie's injuries, get him to a safe place, and transport him out of the mine.

Try again!

Try again!

Correct! The fire needs to be fought and Ollie needs his injuries treated. The firefighters should use the outby fire tap at crosscut 40.

This would fan the fire. Try again!

Ollie has a possible spine injury. He needs to be secured to the backboard before he is carried out.

Correct! To prevent further injury to Ollie's spine, light traction needs to be held to stabilize the head and neck until he is secured to the backboard.

Correct! Brattice cloth cut in long strips and about 2 to 3" wide can be used to tie Ollie to the backboard.

Correct! Even though the bleeding from the head laceration has nearly stopped, the wound needs to be protected.

Ollie already show signs of moderate shock. Telling him this may make his condition worse, even life threatening.

Correct! Even though you have no backboard "straps", you can still position the board next to Ollie and have it ready.

Ollie must be cared for properly. Try again!

You need to take charge and act now based on your knowledge of the situation. Try again!

Correct! Cletus can do this and then begin tying the strips to the backboard as they are cut while you maintain traction on Ollie's head.

Ollie needs your help. You are the only EMT present. Try again!

It's too late for that. Besides, you need help getting Ollie ready to move out.

Correct! You will need several people to log roll Ollie over so that the backboard can be slid under him while keeping his head, neck and body in line.

Correct! Since Ollie has a spine injury, he must be rolled as a unit on your command, with one person holding traction on his head.

Correct! Ollie must be rolled slowly with every person rolling his area of the body at the same time to keep his head, neck and body in line to prevent further injury.

Before you move him, you must tie off the straps to secure him to the backboard, making sure his head and neck are fully immobilized.

Correct! The blanket will help keep his head from moving sideways which might cause further injury.

Correct! Ollie needs to be secured tightly to the backboard, with ties at the head, just under the armpits, hips, and upper and lower legs.

You need to get Ollie and the other miners out of the mine as the fire is becoming too large for you to fight.

A check curtain here will do little good since the fire is beginning to burn toward the face.

Correct! The fire is becoming too large. Trying to fight the fire any longer would be dangerous.

Correct! Everyone should have an SCSR before leaving the section.

This would be dangerous. You would encounter heavy smoke and you know that the fire is burning toward the faces.

Correct! You need to tell the surface that you are leaving the section so that someone knows the status of the fire and what you are doing.

Fire may have burned through the belt stopping across from the scoop charger. Also, it would be hard to carry Ollie over to #5 entry. The scoop may not have enough charge to get you out. Try again!

This is dangerous. It is too far to walk all the way out and too slow. The fire is bad. Try again!

Correct! The track entry is in fresh air. As you travel outby, check for any smoke coming through the stoppings between #1 and #2 entries.

There is a better and safer option. Try again!

Correct! More miners fighting the fire earlier might have stopped it sooner.

Correct! Excess coal can serve as fuel and can be ignited by a hot belt roller bearing.

The ventilation arrangements are proper and are not a factor.

It was hard for the foreman to take charge of the fire fighting and care for Ollie, but both tasks were performed as well as possible given the circumstances.