Problem 1- Five Heading Panel Familiarisation

Objectives

The objectives of this task are to,

1. Complete a baseline survey quiz, to assess your knowledge knowledge before solving the Problem 1.
2. Introduce you to the concept of an Underground Room and Pillar Coal Mine. The Room and Pillar method is used extensively in Australia and elsewhere both as a primary mining method and as a development method to provide access and ventilation to Longwall Mine Panels.
3. View the mine plan presented on online and in the figure and understand the mine layout.
4. Download an interactive virtual reality mine model that can you can explored.
5. Place you at a location within the mine and so that you may explore the five heading mine panel and look at the infrastructure, equipment and mine layout. Something that you could not easily do at in a real mine.
6. Have you complete a post simulation quiz online to demonstrate your acquired knowledge after interacting with the simulation and completing Problem 1.

Learning Outcomes

Within the simulation, you will be presented with a realistic mine model and via an online quiz, you must solve several small problems via quiz questions. You will only be able to answer the questions by interaction with and investigation of the virtual reality mine model.

The main learning outcomes will be,

1. Understand the navigation of a photorealistic virtual reality mine model.
2. Visualise the mine environment and understand the location of mine infrastructure and why the mine layout is as it.
3. Gain a basic understanding of the,
    a. Scale of the operation.
    b. Ground support.
    c. Mining equipment.
    d. Safety mechanisms.
    e. Production capacity.
    f. Ventilation equipment employed.

This is an introductory problem and the overriding learning outcome will be that students begin to develop an understanding of the complexity of operations and the safety and logistics issues that must be managed by them as mine managers or deputies.

Problem to be solved

Problem 1 - Five Heading Panel Familiarisation

Mine Plan

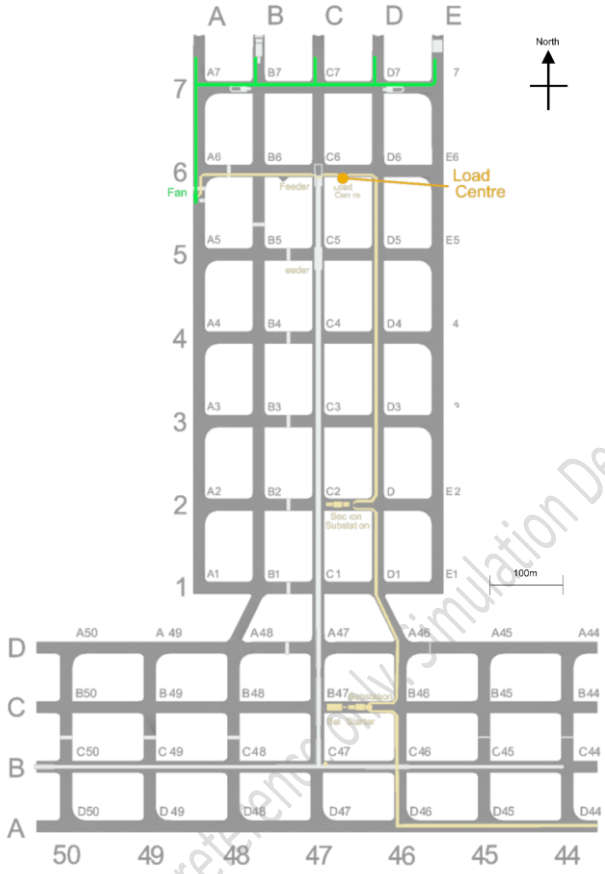

Figure 1. A generic layout of a five heading coal mine development panel.

Figure 1 shows a generic layout of a five heading coal mine development panel. The panel is derived from a real underground coal mine. The headings are designed as a room and pillar configuration. This method may be used for production and also as a method for developing access to longwall coal mine panels located elsewhere in the mine and access via two heading development panels. This will be discussed later in other problems that students must solve.

The Task.

1. First, log into the online training system if you are not already logged in.
2. Complete QUIZ 1 – Baseline knowledge assessment. You must complete this first to establish your knowledge prior to the exercise. This will also demonstrate to you what you have learned through interaction with this simulation. The baseline knowledge assessment covers this entire mine simulation exercise. That is, all of the problems you must solve, not just this one.

Next,

3. Study the mine plan of Figure 1 and try to build a picture of what this may look like in real life. Start to think about what equipment may be present and why? Think about the layout and why it is like it is? What issues may need to be managed and so-on?
4. Go to the UNIT MATERIALS folder.
    a. Download the “Five Heading Mine Plan” Unity executable file onto your machine.

b. Open the file, once loaded, you should have a scene similar to that in Figure 2.
c. Make sure that you can navigate using either,
    i. The W,A,S,D, keys on your keyboard, or,
    ii. The up, down, left, right arrow keys on your keyboard.

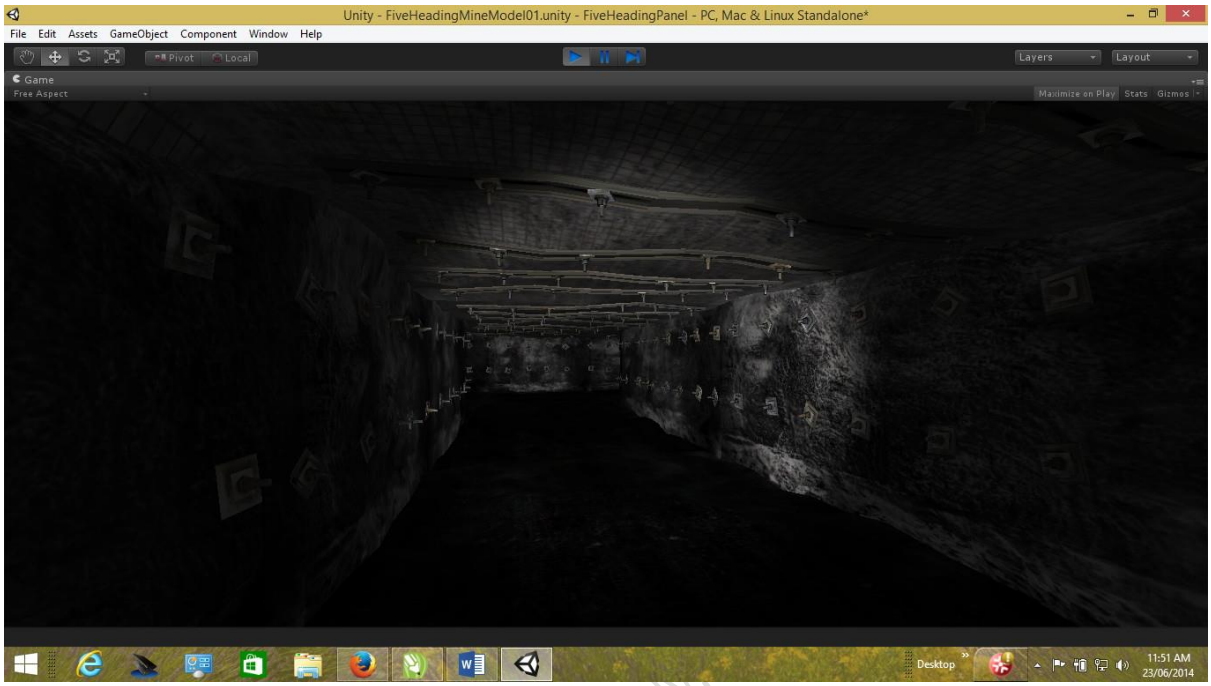

Figure 2. Example loaded mine model image.

5. Background to the Problem,

Mine production operations were suspended following the long weekend and a period of routine shutdown maintenance. You are a new underground mine manager at the colliery. You are now responsible for the risk management, safety and operation of this mine panel. As this is your first day in this area of the mine, you have a new team. You must ensure that they are safely and efficiently managed. You must re-establish production in a safe and timely manner.

You have a basic mine plan shown in Figure 1 and have been briefed on the surface by the Mine Manager who wants production established as soon as possible. However, you are a responsible undermanager and you need to investigate the mine panel and understand what infrastructure and equipment is available within the panel and assess how the mine deputy has been running the operations.

When you start the mine model simulation, you will find yourself in the mine at a specific location. Mining operations have ceased. No equipment is moving about the mine and everything is switched off - at the moment. All the miners and operators in your team are waiting at the Crib Room for instructions on what they have to do next. They understand that this is your first day and an inspection is underway. However, they are anxious to get production going again.

The Mine Deputy who would probably accompany you on this exercise in real life has already tested for gas concentrations and they are within safe levels. He is also keen to re-establish operations. However, before you can authorise the Mine Deputy to do this, you

need to familiarise yourself with the operations via a visual inspection and report back to the Mine Manager what you have found within the mine panel.

6. What you have to do.

   To solve this problem, you will need to navigate the mine model inspect it at various location and answer the quiz questions located under ASSESSMENTS.

   Start the Five Heading Panel Familiarisation model in Unity if you haven't already done so.

   From the starting point, move around the mine at visually inspect the mine panel.

   Complete the Quiz Questions presented in PROBLEM 1 QUIZ.

Assessment

PROBLEM 1 QUIZ QUESTIONS

Q1. Where did the simulation commence, that is, when you started the simulation what was your location within the mine?

Answers

A. Underground next to the Continuous Miner.
B. The Crib Room.
C. Crosscut between pillar A1 and B3.
D. D heading, at the intersection between pillar C3 and D3.

Q2. What is the Crib Room used for?

Answers

A. A meeting place.
B. A location where personnel meet at the beginning of the shift prior to commencing work and at the end of the shift before leaving the mine panel.
C. A place to park the personnel carrier.
D. A place to store tools only.

Q3. What information is located on the Crib Room table and notice board?

Answers

A. Reading materials and magazines.
B. The safety management plan and mine plan, job safety analysis, safe work procedures.
C. Newspapers.
D. Graffiti.

Q4. As you head out of the Crib room, what is located on the Pillar Rib (Mine Wall) of D4 intersection?

Answers

A. Rubbish on the floor.
B. The Crib room entrance.
C. The Deputies Production Panel Board.

D. Rib gaskets.

Q5. What information is recorded on the Deputies Production Panel Board?

Answers

A. Noxious gases, roof conditions, state of ventilation, state of roof and sides, general safety, date and time, initials.
B. 24hour inspections.
C. Mine plan, Noxious gases, roof conditions, state of ventilation, state of roof and sides, general safety, date and time, initials.
D. 24 hour inspections, noxious gases, roof conditions, state of ventilation, state of roof and sides, general safety, date and time, initials, mine manager.

Q6. As you head north along D heading, what hazard is present in as you approach the face at D7 intersection?

Answers

A. There is a roof fall.
B. There is a pool of deep water.
C. No hazard is present.
D. No rib or roof bolts are present.

Q7. What piece of mining equipment is located at intersection D7 and what is this doing?

Answers

A. A water powered pump is pumping water to the water pod.
B. A pump.
C. A compressed air powered pump is pumping water to the water pod.
D. A Continuous Miner machine is parked there.

Q8. What piece of mining equipment is located just north of intersection D8 and what would this machine be doing if it was operating?

Answers

A. An LHD would be removing mud.
B. A Continuous Miner would be extending the roadway.
C. A compressed air powered pump is pumping water to the water pod.
D. A Roof Bolter is installing roof bolts.

Q9. What piece of mining equipment is located along crosscut 7, what shape is it, what are its approximate dimensions and what is this doing?

Answers

A. Auxiliary ventilation pipes are present, they are circular and approximately 600mm in diameter and extend from the working faces to the auxiliary fan in heading A.

B. Auxiliary ventilation pipes are not present, they are oval and approximately 100mm in diameter and extend from the working face E to the auxiliary fan in heading A.
C. Auxiliary water pipes are present, they are circular and approximately 600mm in diameter and extend from the working faces to the auxiliary fan in heading A.
D. Water pipes are present, they are circular and approximately 600mm in diameter and extend from the working faces to the auxiliary fan in heading A.

Q10. What piece of mining equipment is located at the B heading working face, what is this doing when it is operational?

Answers

A. A Roof Bolter is installing roof bolts.
B. A Shuttle Car is extending the development.
C. A Remote Controlled Continuous Miner is cutting coal and developing the B heading.
D. A Battery Powered Remote Controlled Continuous Miner is cutting coal and developing the C heading.

Q11. What piece of mining infrastructure is located in the midway along intersection A6?

Answers

A. A brick stopping.
B. A Shuttle Car.
C. A temporary Brattice.
D. A Portaloo.

Q11. What is present in each of the Brick Stoppings and what is there function?

Answers

A. A set of rules providing operational instructions.
B. A metal door of sufficient size to allow air to pass through.
C. A metal door of sufficient size to allow a person to pass through.
D. A metal door of sufficient size to allow a person to pass through wearing compressed air breathing apparatus.

Q12. What is present in the area around intersection C6?

Answers

A. The feeder breaker and shuttle cars.
B. The feeder breaker, shuttle cars and load centre.
C. The feeder breaker, drop switches, shuttle cars, LHD and load centre.
D. Drop switches.

Q13. What is voltage at the load centre (DCB), how many cable outlets does it have and what is its identification number?

Answers

A. 11000V, 17, LCM01.
B. 1000V, 6, LC1.
C. 1000V, 6, LC11.

D. 415V, 6, LC11.

Q14. How many cables are connected to the load centre (DCB)?

Answers

A. None.
B. Five.
C. Three.
D. 415V,

Q15. What is safety equipment is located run parallel to the conveyor belt and what is its purpose?

Answers

A. Compressed airline to provide power for tools.
B. A water pipe providing water to fire hydrants, to assist in fighting belt fires.
C. An 1100 volt cable.
D. A water pipe providing water hydrants for drinking water.

Q16. What is safety equipment is located at the intersections?

Answers

A. Wheelie bins containing fire-fighting equipment.
B. Wheelie bins containing supplies.
C. Wheelie bins containing sans.
D. A water pipe providing for the wheelie bins.

Q17. Which roadway heading contains the Main Cables, Air, Potable Water and Waste Pipes?

Answers

A. D heading.
B. A heading.
C. G heading.
D. C crosscut.

Q18. What is the issue that must be managed between intersection E6 and E 7?

Answers

A. The continuous miner is not isolated.
B. There is an oil spill.
C. The roof is unstable.
D. The ribs are not stone dusted.

Q19. Use the TARP example and examine the roadways. What conclusion would you draw, from the numbers of roof bolts installed about mining conditions with respect to the ground control?

Answers

A. Mining conditions are Normal.

B. Mining conditions are Irregular.
C. Mining conditions are advancing nicely.
D. Mining conditions are poor.
E. Cable bolting is required.

Q20. Does the bolting pattern in the TARP comply with that shown in the TARPS?

Answers

A. YES.
B. NO.

Q21. When you are navigating the intersections what can you notice about them why do you think that is?

Answers

A. The intersections are all the same for ease of modelling?
B. The intersections are sharper on the south ribs due to the arc that the continuous miner makes when cutting the intersections?
C. Having irregular intersections is easier to manage.
D. Intersections with irregular ribs are easier to control and need les ground support.
E. The shuttle car can navigate the intersections easier.

Q22. At the intersection next to the Drive head there is a voltage substation what is the voltage of the red section of the substation and what is next to the voltage sign?

Answers

A. 415v, a spanner.
B. 11000V and an electric shock emergency first aid sign.
C. 11500V and an electric shock emergency first aid sign.
D. 10V and an electric shock emergency second aid sign.
E. A shovel.

Q23. What is present in the roof of the intersection of B7 intersection?

Answers

A. Roof bolts, 'W' straps and Mesh.
B. A sign showing the intersection location number.
C. A sign warning that lasers are in use in the panel.
D. A long wait and a shovel.
E. Roof bolts, 'W' straps and Mesh, a sign showing the intersection location number, a sign warning that lasers are in use in the panel.

Q24. What is present next to the Auxiliary fan, what is its purpose?

Answers

A. Roof bolts, ‘W’ straps and Mesh.
B. Stone dust in bags.
C. Concrete in bags.
D. A pick.
E. Plastic tubing.

Q25. What facilities are available to the miners in crosscut 5 between B and C headings?

Answers

A. A portaloo.
B. None.
C. Personnel Carrier, PJB.
D. Rails.
E. Gas stove.

Q26. What are the approximate dimensions of the roadways?

Answers

A. 10m wide by 15.125m high.
B. 5.3m wide by 3.3m high.
C. 3.3m wide by 5.3m high.
D. 5.5m by 4.2m.
E. 4.87m by 3m.