

**Northern Invitational Mine Rescue Contest
Batavia, New York
September 10, 1999**



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PROBLEM SOLUTION

Note: the field problem involves a raging fire in the underground shop area. At this time, the cause of the fire cannot be determined, because all of the eyewitnesses are dead or unconscious. The teams will be required to seal the fire, locate all missing miners (3), administer first aid to one of the victims, and explore the mine in its entirety. There is no methane gas, water accumulations, loose roof, nor impassable roof falls included in the problem. However, at a designated location underground, one of the rescue team members (map man) will experience a simulated accident which will not allow him/her to continue. The team must, again, administer first aid (to one of their own team members) and remove him/her from the mine. Therefore, the alternate (No. 6) team member must be used in order for the team to complete the problem. Attachment 1 shows the conditions in the mine that the teams will encounter as they explore.

1. The team captain introduces the team to the official-in-charge (mine manager). The mine manager then introduces himself and the field judges, reads the problem orientation sheet, and answers the team's questions.

When the team verifies that they understand the instructions, the mine manager will provide the captain and fresh air base attendant each with a copy of the team mine map, the mine information sheet, and the team briefing statement (attachments 2 - 4). The captain immediately starts the official clock. He writes the month, day, year, and the team position number on the sign-in board.
[Applicable Contest Rules: Judge 1 - Surf 8]

2. After starting the clock, the team discusses the conditions presented by the problem and the map. The team then checks all the equipment to be used to work the problem and goes under oxygen.
Note: the lifeline signals must be presented to the lifeline judge.
[Judge 1 - Surf 1-7, & 9] [Judge 2 - Surf 1-5] [Judge 3 - Surf 1]
3. When ready, the team must examine the mine openings. The first stop should be the INTAKE SHAFT. Here, the team will find that the air is clear (placard Q1). *Note: see page 6 for placard gas concentrations.* The conveyance will be at the top of the shaft and the team will place combustible material on the cage and send it down, using the posted Nevada hoist signal codes. The team must then signal the cage to return to the surface. *Note: the No. 1 Judge will allow 10 seconds for the cage to get to the bottom, and 10 seconds more to return to the top.* The combustible material will be intact and dry. **[Judge 1 - UG 3 & 8b.1] [Judge 2 - UG 1]**
4. The second stop must be the RETURN SHAFT (exhaust). *Note: the team must perform an apparatus and personnel check before entering smoke, since the team briefing statement had stated that there was heavy black smoke exiting this shaft.* At the shaft, they find heavy black smoke with 16.0% O₂, 5000 ppm CO, 0.0% CH₄, 0 ppm NO₂ (placard Q4). *Note: if the team asks for additional gas detectors, the mine manager can supply Dräger stain tubes for SO₂ and other gases.*
[Judge 1 - UG 10] [Judge 2 - UG 1]

The conveyance will be at the top of the shaft and the team can place combustible material on the cage and signal it down. *Note: again using the posted Nevada hoist signals and Judge 1 allowing 10 seconds down and 10 seconds for return.* When the material is checked, it will be intact and dry. **[Judge 1 - UG 3, 8b.1] [Judge 2 - UG 1]**

Note: as the team checks the shafts, they will discover 3 sets of brattice material stored on the surface and a placard stating that the Main Exhaust Fan is “off.”

5. The team is now ready to enter the mine. They should enter the mine via the INTAKE SHAFT. Once in the mine, at the shaft station, the team will find a working mine phone and they will encounter clear air (placard Q1). Here, the team must make a personnel and apparatus check, or they must do it within 50 feet of this location as they stop along ENTRY 3. When their exploration begins, they will find a permanent stopping located in X-CUT 1 to the left. The stopping is “hot” to the touch. *Note: as per the team briefing statement, all electrical power in the mine is off, the Main Exhaust fan (on the surface) is off, and electrical power has only been restored to the shafts.* **[Judge 1 - UG 4b.1, 4d, & 6] [Judge 3 - Surf 4 & 5 and UG 5]**

Note: after the first 50 feet apparatus check, the team must stop at 20-minute intervals to examine their apparatuses. **[Judge 1 - UG 12]**

Note: while underground, the team must make gas checks at face areas and stoppings. When stops are made at the openings of crosscuts, rooms, or drifts turned off the drift that is being traveled, separate gas tests shall be made rib to rib across each entry and at each opening to places turned off the entry. No place shall be passed without first checking the condition of that place. **[Judge 2 - UG 1]**

Note: during exploration of the mine, the team captain must verbally indicate that he/she is checking the back or roof: 1) at intersections, shaft stations, rooms, faces, and mine openings; 2) at all points of furthest advance; 3) before building or erecting any structure; 4) upon passing through any barricade, stopping, bulkhead, air lock, door, check curtain, or similar barrier; and 5) at the location of fire or intense heat. **[Judge 1 - UG 4b]**

Note: team captain must also mark the date and his/her initials at the point of furthest advance of the team in any direction such as at stoppings, faces of rooms and drifts, water over knee deep, impassable falls, barricades, fires out of control, and at locations of any live persons or bodies. **[Judge 1 - UG 5]**

Note: at all times the team must travel at normal walking speed. **[Judge 2 - UG 4]**

6. The team advances along ENTRY 3 to X-CUT 2 where they will find clear air (placard Q1). X-CUT 2 is open and free of obstruction. The team must proceed through X-CUT 2 to ENTRY 2. *Note: the team cannot advance beyond 3 feet past the second crosscut, because they have not tied in the entries behind them.* **[Judge 1 - UG 9]**

7. As the team enters the intersection of ENTRY 2 and X-CUT 2, they will enter heavy black smoke with 16.0% O₂, 6000 ppm CO, 0.0% CH₄, 0 ppm NO₂ (placard Q2). The team must make a check immediately before entering the smoke. **[Judge 1 - UG 10] [Judge 3 - UG 5]**
8. In ENTRY 2, the team will find a permanent stopping at X-CUT 2 (between ENTRY 2 and ENTRY 1), two used fire extinguishers, and intense heat as they approach the shop. The team must seal this side of the fire without undue delay. *Note: in order to obtain brattice material for the seal, the team must retreat to the surface. If the team performs any travel other than described, this will be considered undue delay.* **[Judge 1 - UG 11]**
9. On the surface, the team must make a decision as to how much brattice material to take underground. No matter how much material they take, they must return to the intense heat on the north end of the shop and construct a seal (with a built-in regulator). *Note: if the team does not leave a regulator in the seal, then this constitutes a major ventilation change that was made without knowing the affect that it may have had on unexplored areas. That is, the stopping with man door on the west side of the shop has been destroyed and air is passing through the shop. At this point, the team has not explored far enough to know this.* **[Judge 2 - UG 4b.3 & 10]**
10. At this time, the team must, without undue delay, find all other approaches to the fire. **[Judge 1 - UG 11]**
11. **NOTE - At this juncture, there are two possible scenarios (12A - 13A or 12B - 13B), based on how the teams try to find the other approaches to the fire:**
 - 1) if the team decides to return to the surface and re-enter the mine through the RETURN SHAFT, continue with #12A; or
 - 2) if the team initially brought extra brattice material underground and decides to explore ENTRY 1 by breaking through the permanent stopping in X-CUT 2, continue with #12B.

- 12A. Before entering the RETURN SHAFT, the team must make an apparatus and personnel check prior to entering the smoke. Once the team rides the conveyance to the bottom, they can continue exploring the mine. At the shaft station underground, the team will find a broken mine phone and heavy black smoke with 16.0% O₂, 5000 ppm CO, 0.0% CH₄, 0 ppm NO₂ (placard Q4). **[Judge 1 - UG 3, 4d + 10][Judge 3 - UG 3]**
- 13A. As the team advances northward in ENTRY 1 and approaches X-CUT 1, they will be able to see a victim, two used fire extinguishers, and a placard denoting “intense heat” near the west side of the shop. At this time the team must simultaneously attend the victim and construct the second seal near the intense heat. After a primary and secondary survey (placard: *patient is unconscious and breathing*), the victim must be fitted with an apparatus and secured to the stretcher. Other team members, can fan out and build the seal. The team must then exit the mine through the RETURN SHAFT. Continue with #14. **[Judge 1 - UG 4, 5, 9 & 11][Judge 2 - UG 10][Judge 3 - UG 1, 2, 3, 5, 9, 10, 12, & 14d.]**

Note: the team is in smoke and cannot leave the lifeline. Additionally, the team must leave a regulator in the seal in order to keep from making a major ventilation change. If the team only attends to the victim, they will be assessed 75 docks for team endangerment. If they only address the fire, they will be assessed 6 docks for not attending the victim and 50 docks for improperly protecting a survivor from toxic mine gases.

- 12B. The team must construct an airlock in X-CUT 2, near the permanent stopping between ENTRY 2 and ENTRY 1. They can then break through the stopping and explore ENTRY 1, toward the Return Shaft, in order to locate the other approaches to the fire. **[Judge 2 - UG 6 & 10]**
- 13B. As the team advances southward in ENTRY 1 and approaches X-CUT 1, they will be able to see a victim (*patient is unconscious and breathing*), two used fire extinguishers, a stopping with an open door, and a placard denoting “intense heat” near the west side of the shop. At this time the team must simultaneously attend the victim and construct the second seal near the intense heat. After a primary and secondary survey (placard: *patient is unconscious and breathing*), the victim must be fitted with an apparatus and secured to the stretcher. Other team members, can fan out and build the seal. The team must remove the patient via the INTAKE SHAFT. *Note: when the team does this, they must rebuild the stopping which they had knocked down, so that there is not a major ventilation change. They can then, tear down the temporary airlock and travel to the INTAKE SHAFT.* Continue with #14.
[Judge 1 - UG 4, 5, 9 & 11][Judge 2 - UG 10][Judge 3 - UG 1, 2, 3, 5, 9, 10, 12, & 14d.]

Note: the team is in smoke and cannot leave the lifeline. Additionally, the team must leave a regulator in the seal in order to keep from making a major ventilation change. If the team only attends to the victim, they will be assessed 75 docks for team endangerment. If they only address the fire, they will be assessed 6 docks for not attending the victim and 50 docks for improperly protecting a survivor from toxic mine gases.

14. Once the fire has been sealed and the victim removed from the mine, the team must complete their systematic exploration of the mine. **[Judge 1 - UG 9]**
15. Depending on which way the team continues exploration (from the RETURN SHAFT or the INTAKE SHAFT, at a pre-determined location underground (ENTRY 1 / X-CUT 2 or ENTRY 3 / X-CUT 2, respectively), Judge 1 will instruct the map man to lie on the ground and hold his/her hands together simulating severe pain. The captain will be informed that the map man has taken a nasty fall, face-first onto the ground. He is injured and will require first aid. After a primary and secondary survey of the injured team member (map man), the team will be handed a placard which reads:

The patient is experiencing extreme pain and tenderness in both hands, which appear swollen and discolored, with enlarged joints. Patient is able to walk, but because of his/her injuries he/she will no longer be able to perform his/her duties as a team member.

The symptoms indicate that the map man has suffered fractures of both hands from his/her fall. He/she cannot continue with the exercise and must be removed from the mine. Before removing him/her, the team must properly administer first aid. At this time, the team can escort the patient out of the mine and he/she can walk out. However, if the team chooses to carry him/her, the map man must be properly secured to the stretcher. **[Judge 3 - UG 1, 2, 9, 10, 12 & 14]**

16. The team can now re-enter the mine with the alternate filling in. From this point on, the exercise is basically exploration and mapping. **[Judge 1 - Surf 1- 7, & 9]**

Note: the rest of the solution follows the route of the team that chose option #1 in Item 11. The team must enter the RETURN SHAFT and explore ENTRY 1 and tie-in up to X-CUT 2 before advancing.

17. As the team enters the RETURN SHAFT and advances northward in ENTRY 1 past X-CUT 2, gas concentrations are 18.0 % O₂, 900 ppm CO, 0.0 % CH₄, 0 ppm NO₂ with light smoke (placard Q3). Inby X-CUT 2, they will find an LHD. At X-CUT 3 they will find that the check curtain is missing and the X-CUT is free of obstructions. They must then proceed through X-CUT 3 and tie in behind. **[Judge 1 - UG 9]**
18. Advancing to the intersection of ENTRY 2 / X-CUT 3, the team will find the 480 volt power cord and 18.0 % O₂, 900 ppm CO, 0.0 % CH₄, 0 ppm NO₂ with light smoke (placard Q3). They can proceed to tie in ENTRY 2 to the south. Then, they can retreat to the intersection and advance through X-CUT 3 to ENTRY 3. Along the way, they will find a power center (with the cutting machine and roof bolter switches "off"), a second 480 volt power cord, and clear air (placard Q1) at the intersection of ENTRY 3 / X-CUT 3. They can then tie in ENTRY 3 to the south. **[Judge 1 - UG 9]**
19. Now, they can retreat to the intersection and then advance northward to the face area of ENTRY 1. At the face, they will locate the roof bolter and will find heavy black smoke with 16.0% O₂, 5000 ppm CO, 0.0% CH₄, 0 ppm NO₂ (placard Q4). They should then retreat to the intersection of ENTRY 2 / X-CUT 3. **[Judge 1 - UG 9]**
20. Advancing northward to the face of ENTRY 2, they will find the cutting machine and heavy black smoke with 16.0% O₂, 5000 ppm CO, 0.0% CH₄, 0 ppm NO₂ (placard Q4). They should then retreat to the intersection of ENTRY 1 / X-CUT 3. **[Judge 1 - UG 9]**
21. They can then advance northward in ENTRY 1. At X-CUT 4, the team will find one of the missing miners, two tool boxes, a second LHD, and a partial barricade (5' x 8'). Upon primary survey, the placard will reveal that the victim is dead (*patient shows no vital signs*). At X-CUT 4, the gas concentrations found will be 16.0 % O₂, 5000 ppm CO, 0.0 % CH₄, 0 ppm NO₂ with heavy smoke (placard Q4). As the team advances into the face area of ENTRY 1, past the barricade, they will find the last missing miner. Upon primary survey, the placard will reveal that the victim is dead (*patient shows no vital signs*). This completes their exploration activities. **[Judge 1 - UG 5 & 9]**

*Note: in order to preserve their lifeline, the team must leave the mine via the RETURN SHAFT, since this is their last route of entry into the mine. When the team reaches the surface, they must

count off and report to the mine manager. If they feel that they have successfully completed the problem, they can stop the clock. **[Judge 3 - Surf 5]**

THE END

***Final Note (Judge 1): If the team chooses, at any time, to re-ventilate the mine to clear out fire gases, this action will be allowed. However, to proceed safely, the following steps must be taken:**

- 1) the entire mine must be explored;**
- 2) the missing check curtain at X-CUT 3 between ENTRY 1 and ENTRY 2 must be rebuilt; and**
- 3) the fresh air base must be asked to turn the main fan on.**

If the team omits any of these steps, they will be docked accordingly [Judge 2 - UG 10], because this would be a major ventilation change without proper precautions. Additionally, re-ventilating is not necessary to complete the problem.*

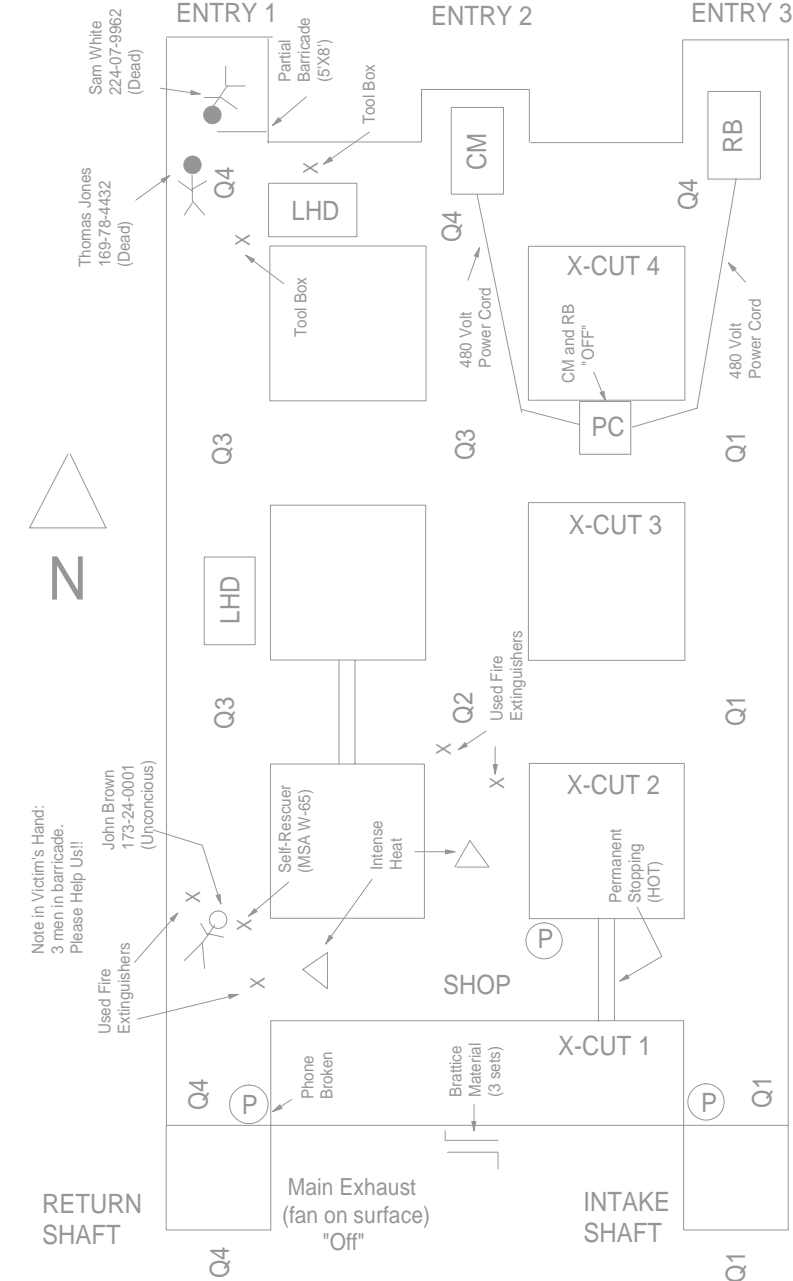
Key to Gas Placards:

Q1 - 20.9 % O₂, 3 ppm CO, 0.0 % CH₄, 0 ppm NO₂
(Clear Air)

Q2 - 16.0 % O₂, 6000 ppm CO, 0.0 % CH₄, 0 ppm NO₂
(Heavy Black Smoke)

Q3 - 18.0 % O₂, 900 ppm CO, 0.0 % CH₄, 0 ppm NO₂
(Light Smoke)

Q4 - 16.0 % O₂, 5000 ppm CO, 0.0 % CH₄, 0 ppm NO₂
(Heavy Smoke)



LEGEND:

Airflow Direction	→
Permanent Stopping	
Stopping w/ mandoor	D
Check Curtain	- C -
Mine Phone	(P)
Power Center	PC

Answer Map

The Denkster Mine
 Fosdenk Salt Company
 Fed. ID No. 30-66669
 August 27, 1999
 Scale: 1 in. = 10 ft.

**Northern Invitational Mine Rescue Contest
Batavia, New York
September 10, 1999**

**MINE INFORMATION SHEET
FOSDENK SALT COMPANY, THE DENKSTER MINE**

Mining & Equipment:

The newly opened 1,075-foot deep single-level shaft mine uses a conventional room and pillar method to extract rock salt from the main Retsof Bed. The broken ore is transported to the RETURN SHAFT using diesel-powered LHD's. The ore is then transported to the surface via the production skip. The average mining height is 8 feet and the typical mine entries are 10-feet wide. The face drill, cutting machine, and roof bolting machine are all electrically powered.

Gas:

In accordance with Title 30 CFR § 57.22003, the mine is classified as a Category IV mine, that is, any methane concentrations liberated are not explosive and are not capable of forming explosive mixtures with air, based on the geological area in which the mine is located. However, MSHA's and the company's industrial hygiene sampling histories have shown methane to be non-existent.

Water:

The mine has no history of water problems in the active workings.

Pumps:

Each shaft is equipped with a ten-foot deep sump. The main water pumps, located on the surface, can easily handle the volume of water produced in the shafts. The main water pumps have been activated along with the power to the shafts.

Electricity:

The underground electrical power is off. A 4160-volt power feeder cable supplies power to the main power center, located in X-CUT 3 between ENTRY 2 and ENTRY 3. The roof bolter, face drill, and cutting machine are all supplied with 440-480 volt power from the power center.

Ventilation:

The main fan is an exhaust fan, located on the surface, and is reversible. The electrical power to the fan is off, locked out, and guarded, but can be restarted if needed. The air enters the mine through the INTAKE SHAFT, and exhausts out of the RETURN SHAFT. Air is directed to the faces using permanent and temporary ventilation controls.

Roof Support:

The immediate roof is supported by 8-foot long roof bolts, installed on 4-foot centers. Wooden timbers are available for additional support in problem areas.

Recovery:

No recovery work has been performed.

Mine Map:

The mine map was updated last month.

Other Mines:

There is one abandoned salt mine in the area. However, this mine does not connect to the abandoned mine.

Explosives:

Explosives are used in the mining cycle, but only enough for a day's use are stored underground.

Communications:

Three pager phones are available in the mine and normally have contact with the surface. The current phone locations are marked on the mine map. At this time, we do not know the status of the communication system and there has been no contact with the missing miners.

**Northern Invitational Mine Rescue Contest
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TEAM BRIEFING STATEMENT

You are located on the surface of the Fosdenk Salt Company's Denkster Mine. The mine is a single-level underground mine opened by two shafts 1,075 feet deep. The RETURN SHAFT is the exhaust shaft and is used for hoisting ore from the mine, and as the emergency escape way. The INTAKE SHAFT is used to transport people and supplies. Rock salt is mined by the room and pillar method. The entries are initially driven approximately eight feet high and ten feet wide. The immediate roof, or back, is supported by eight-foot roof bolts. The roof is fairly competent, but problem areas are supported by wooden posts or cribs.

Last evening (11:00 p.m. - 7:00 a.m. shift), the maintenance foreman and two crew members went underground on a routine maintenance shift. At about 6:30 a.m. when the dayshift crew arrived at the mine, heavy black smoke was observed coming from the RETURN SHAFT. All of the mine power and the Main Exhaust Fan had failed. At this time, we have been unable to establish contact with anyone underground. Electrical power has been restored to the shafts and the fan, but the fan has not been restarted.

I have called all of the government agencies for help. Guards have been posted at both shaft entrances to the mine and at the main fan. There is a fully equipped mine rescue team ready to be your team's backup, and another team will be sent in to replace you after two hours.

It is now 9:00 a.m. If your team is willing to help, we would like you to locate and rescue the three missing miners, explore and map all accessible areas of the mine, and seal or extinguish any fires. All materials needed to work this problem are located in the mine or on the surface and are identified with placards.

**Northern Invitational Mine Rescue Contest
Batavia, New York
September 10, 1999**

**PROBLEM ORIENTATION
STATEMENT OF “OFFICIAL IN CHARGE”**

1. Introduce yourself to the team as the mine manager and then introduce the #1, #2, #3, and lifeline judges to the team.
2. Read the following team briefing statement to the team:

You are located on the surface of the Fosdenk Salt Company’s Denkster Mine. The mine is a single-level underground mine opened by two shafts 1,075 feet deep. The RETURN SHAFT is the exhaust shaft and is used for hoisting ore from the mine, and as the emergency escape way. The INTAKE SHAFT is used to transport people and supplies. Rock salt is mined by the room and pillar method. The entries are initially driven approximately eight feet high and ten feet wide. The immediate roof, or back, is supported by eight-foot roof bolts. The roof is fairly competent, but problem areas are supported by wooden posts or cribs.

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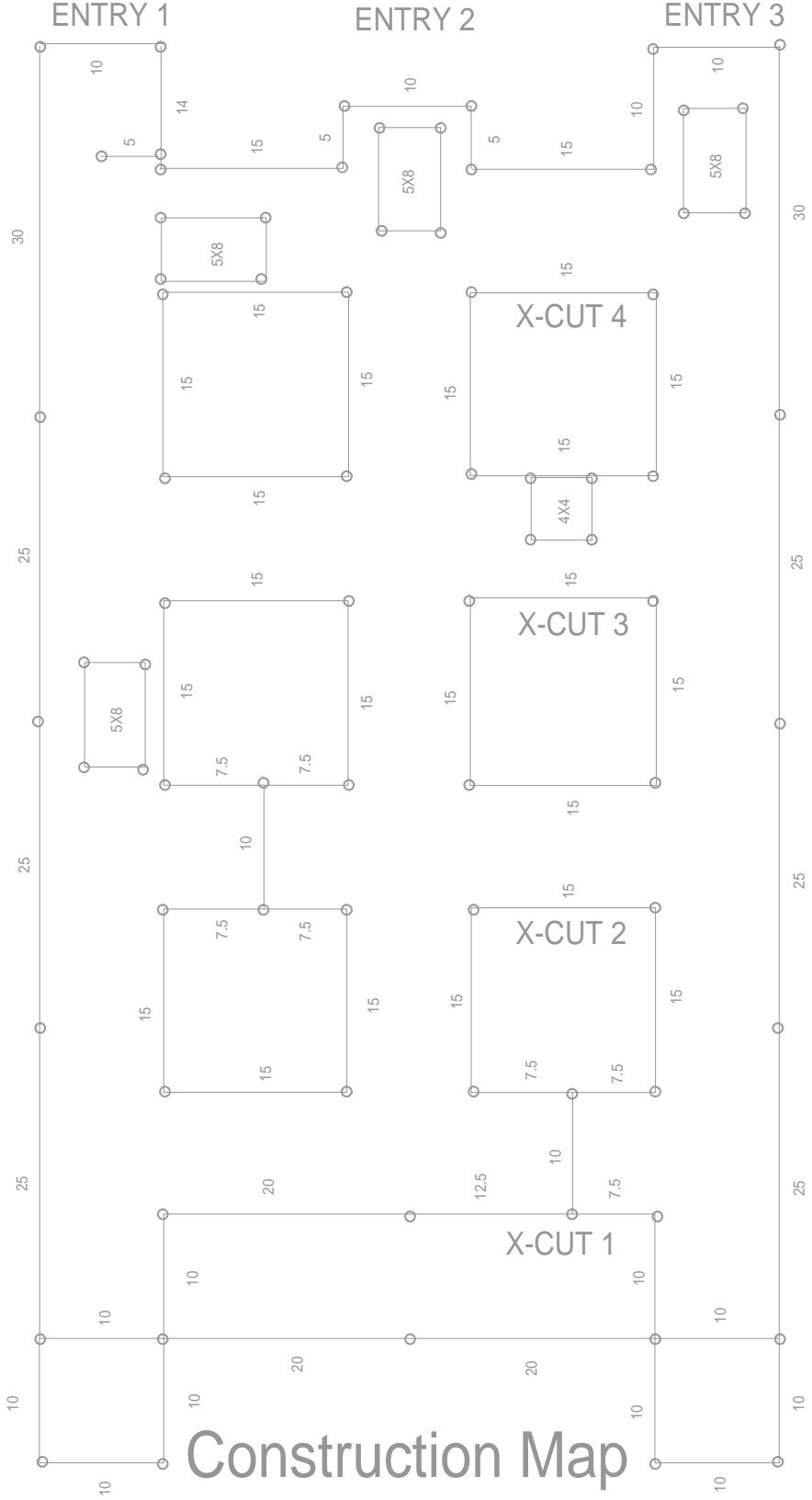
It is now 9:00 a.m. If your team is willing to help, we would like you to locate and rescue the three missing miners, explore and map all accessible areas of the mine, and seal or extinguish any fires. All materials needed to work this problem are located in the mine or on the surface and are identified with placards.

3. Answer the team’s questions. Only provide information that is consistent with the mine information sheet.
4. Provide the team with the following instructions:
I will give you two copies of the team briefing statement, the mine information sheet, and the mine map after you start the clock. Further, the fresh air base attendant may not communicate with anyone except the team or the mine manager.

Construction Map

- 58 Roofbolts
- 20 Stakes

NOTE - use string between roofbolts and stakes with surveyor tape streamers.



Total Discounts _____

1999 Northern Invitational Mine Rescue Contest
Benchman's Contest - Written Examination

Name _____

Company Name _____

Team Name _____

Team Draw Order _____

Directions: Circle the correct answer for each multiple choice question.

1. A full 4-hour oxygen cylinder (3135 psi) would have to be exposed to heat (at what temperature?) before the cap will burst at the danger limit.
A. 200°F B. 300°F C. 400°F
2. The pressure reducer is located where on the oxygen control group?
A. Front B. Center C. End
3. To activate the pressure gauge shutoff valve, lift the lever approximately _____ to _____ degrees from the horizontal to the stopping point.
A. 10° - 15° B. 15° - 30° C. 30° - 45°
4. The bypass valve can deliver up to _____ liters of oxygen per minute to the breathing bag.
A. 35 liters B. 50 liters C. 60 liters
5. The chest gauge and cylinder gauge are marked in increments of _____ p.s.i.
A. 200 p.s.i. B. 300 p.s.i. C. 400 p.s.i.
6. When you hear the warning whistle, you will have approximately _____ liters of oxygen remaining.
A. 70 liters B. 80 liters C. 90 liters

7. A factory-packed rescue canister has a shelf life of about ____ years.
- A. 2 years B. 3 years C. 4 years
8. The pressure relief valve takes excess oxygen in the system and _____ .
- A. returns it to the regenerative canister.
B. returns it to the low pressure side.
C. exhausts it to the outside atmosphere.
9. Saliva dripping from the breathing hoses as they are being disconnected can damage the _____.
- A. demand valve B. pressure relief valve C. warning whistle
10. The temperature in the system won't rise much beyond _____ degrees Fahrenheit.
- A. 85°F B. 95°F C. 105°F
11. When washing the apparatus, water must be kept out of the _____ .
- A. pressure reducer B. demand valve C. warning whistle
12. Near the neck of the oxygen cylinder is the pressure service rating. If a (+) is stamped next to the most recent hydrostatic test date, then the cylinder can hold another ____ % of pressure.
- A. 5% B. 10% C. 15%
13. At least _____ p.s.i. of oxygen should be left in the cylinders at all times.
- A. 100 p.s.i. B. 300 p.s.i. C. 500 p.s.i.
14. Federal law requires that the apparatus be tested and inspected once every ____ days.
- A. 30 days B. 45 days C. 60 days
15. The bypass valve should fill the breathing bag with oxygen in _____ seconds or less.
- A. 10 seconds B. 20 seconds C. 30 seconds

Benchman's Contest - Written Examination

**** ANSWER SHEET ****

- | | | | |
|----------------------------------|---------|--|--------|
| 1. (B) 300°F | Pg. 18 | 21. (C) drop | Pg. 86 |
| 2. (B) Center | Pg. 19 | 22. (B) it is skin absorbed | Pg. 9 |
| 3. (C) 30° - 45° | Pg. 21 | 23. (A) smoke & (C) fumes | Pg. 11 |
| 4. (B) 50 liters | Pg. 23 | 24. (B) the size of the wearer &
(C) the physical shape of the wearer | Pg. 14 |
| 5. (A) 200 p.s.i. | Pg. 24 | | |
| 6. (C) 90 liters | Pg. 28 | 25. (A) moisture out | Pg. 16 |
| 7. (C) 4 years | Pg. 31 | | |
| 8. (C) outside | Pg. 35 | | |
| 9. (A) demand valve | Pg. 50 | | |
| 10. (B) 95° low
(C) 105° high | Pg. 55 | | |
| 11. (B) demand valve | Pg. 62 | | |
| 12. (B) 10 % | Pg. 66 | | |
| 13. (C) 500 p.s.i. | Pg. 70 | | |
| 14. (A) 30 days | Pg. 73 | | |
| 15. (A) 10 seconds | Pg. 103 | | |
| 16. (B) 57 p.s.i. | Pg. 104 | | |
| 17. (A) 6 months | Pg. 111 | | |
| 18. (B) 2 years | Pg. 111 | | |
| 19. (B) 3 years | Pg. 112 | | |
| 20. (C) 6 years | Pg. 112 | | |

Name _____ Team Name _____

Contest Position Number _____ Team Member Number _____

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1. Even very tiny amounts of _____ (.001% or less) will irritate your eyes and respiratory tract.
 - A. sulfur dioxide
 - B. nitrogen dioxide
 - C. carbon monoxide
 - D. carbon dioxide

2. _____ causes you to breathe faster and deeper.
 - A. 15% oxygen
 - B. 17% oxygen
 - C. 2% or higher carbon dioxide
 - D. Both B and C

3. When you are judging the toxicity of a gas by its TLV, the rule of thumb is the lower the number (ppm), the more toxic the gas is.
 - A. True
 - B. False

4. Elevated hydrogen readings in the vicinity of a battery charging station would most likely indicate:
 - A. faulty batteries
 - B. inadequate ventilation
 - C. normal conditions
 - D. a fire somewhere

5. Hydrogen sulfide is flammable and explosive in concentrations from 4.3 to 45.5% in normal air. It is most explosive at ____%.
 - A. 5
 - B. 12.1
 - C. 9.5
 - D. 14.2

6. The airflow in cubic feet per minute will be calculated by the mine rescue team.
 - A. True
 - B. False

7. In natural ventilation, air flows because of the natural pressure. This pressure can only be supplied by thermal energy due to temperature differences.
 - A. True
 - B. False
8. Electrical malfunctions can produce oxides of nitrogen.
 - A. True
 - B. False
9. Sealing a mine fire can also be done to isolate the fire so that normal mining operations can be resumed in other areas of the mine.
 - A. True
 - B. False
10. Hazards of direct firefighting include all of the following except:
 - A. explosive gases
 - B. toxic gases
 - C. elevated oxygen readings
 - D. bad ground conditions
 - E. all are hazards of direct firefighting
11. Dry chemical agents work to _____ the immediate products of the flame reaction.
 - A. smother
 - B. cool
 - C. remove
 - D. inactivate
12. Usually, the measured distance using a smoke tube is _____ feet.
 - A. 100
 - B. 50
 - C. 75
 - D. 25
13. Permanent bulkheads should be built to replace temporary bulkheads _____.
 - A. as soon as possible
 - B. whenever the command center says
 - C. in good air
 - D. as soon as possible after ventilation has been restored
14. In addition to personal equipment, the only items of team equipment required are: two detecting devices for any oxygen they may encounter, two oxygen indicators, and a communication system.
 - A. True
 - B. False

15. Dry chemical extinguishers put out the fire by stopping the chemical reaction between the:
- A. fuel and ignition
 - B. oxygen and ignition
 - C. oxygen and fuel
 - D. ignition and heat
16. Low expansion foam works to extinguish a fire by:
- A. cooling the fire
 - B. smothering the fire
 - C. simultaneously smothering and cooling
 - D. none of the above
17. If heat, smoke, and ventilating currents permit, _____ is the most desirable and efficient means of fighting a fire.
- A. high expansion foam
 - B. water
 - C. low expansion foam
 - D. ABC fire extinguisher
18. Inhalation of poisonous gases is an example of second priority.
- A. True
 - B. False
19. Sort these conditions according to *triage*:
- A. third degree burns over 5% of body, fractured foot, dismembered hand
 - B. third degree burns over 5% of body, dismembered hand, fractured foot
 - C. dismembered hand, fractured foot, third degree burns over 5% of body
 - D. dismembered hand, third degree burns over 5% of body, fractured foot
20. Sort these conditions according to *triage*:
- A. unconsciousness, abrasions, moderate shock
 - B. abrasions, unconsciousness, moderate shock
 - C. moderate shock, unconsciousness, abrasions
 - D. unconsciousness, moderate shock, abrasions
21. Sort these conditions according to *triage*:
- A. second degree burns on 13% of body, breathing problems, back injury with spinal injury
 - B. breathing problems, back injury with spinal injury, second degree burns on 13% of body
 - C. second degree burns on 13% of body, back injury with spinal injury, breathing problems
 - D. back injury with spinal injury, second degree burns on 13% of body, breathing problems

22. Smoke is a product of any type of combustion.
A. True
B. False
23. The stream of dry chemical of a fire extinguisher must be directed:
A. 12 inches ahead of the flame
B. directly at the flame
C. 6 inches behind the flame edge
D. none of the above
24. Blasting produces:
A. carbon monoxide
B. hydrogen sulfide
C. nitrogen dioxide
D. all of the above
25. Foam is useful **only** in fighting _____ fires.
A. Class A
B. Class B
C. Class A, Class B, and Class C
D. Class A and Class B

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