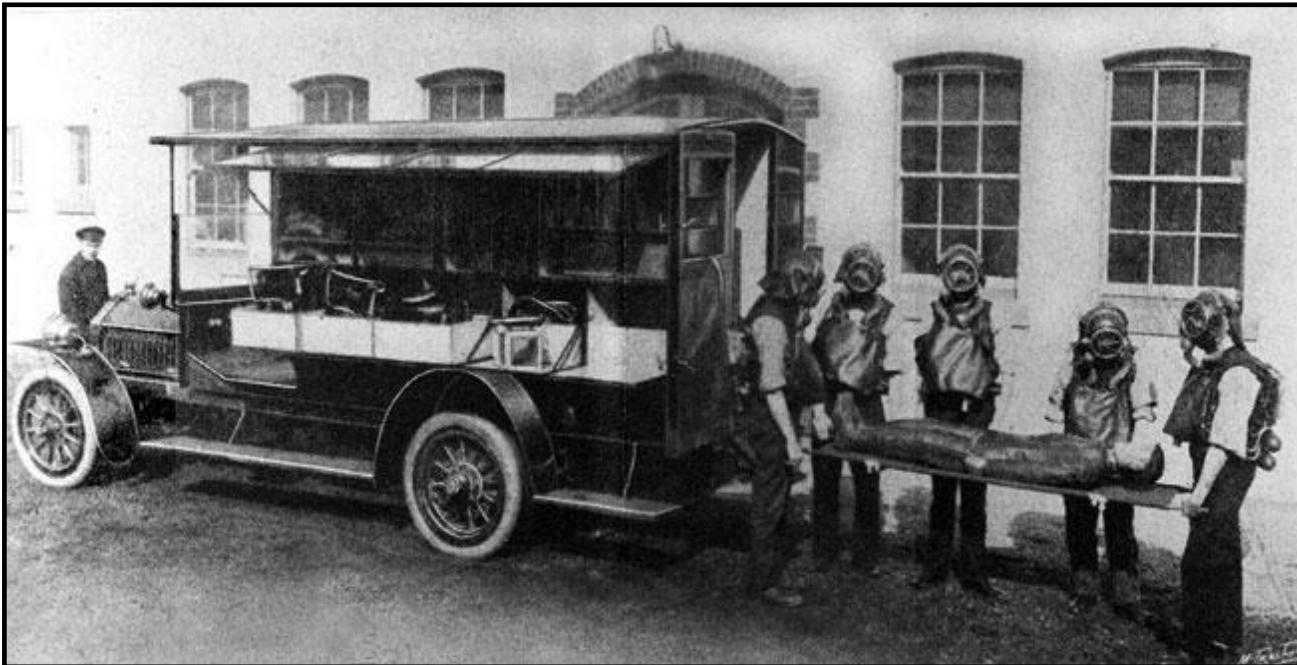


2012 North Central Regional
Metal and Nonmetal
Mine Rescue Contest

MINE RESCUE FIELD EVENT

FIELD PROBLEM SOLUTION



April 3-5, 2012
Wilmington, IL

FIELD PROBLEM SOLUTION

Note: There are likely many possible solutions to this mine rescue contest field problem. The following step-by-step explanation is therefore not the only, nor is it necessarily the best or most efficient solution. It is simply presented as a solution to the problem that achieves the desired objectives while complying with the rules established for the 2010 MNM National Mine Rescue Contest.

Note: This solution does not address the gas testing proficiency element of the MNM mine rescue contest field problem. The gas testing proficiency element is a “stand alone” requirement, and the results obtained from the gas testing (i.e. the gas concentrations) do not play a role in the field problem per se, or its solution.

Note: Repetitive pro forma procedures such as gas testing at the entrance to each opening, 20-min equipment checks, captain’s date and initials (D&I) at points of farthest advance, etc. are omitted from this problem solution, but teams need to comply with these requirements nonetheless.

Upon arriving at the fresh air base, the team will meet the #1 Judge (who is also the Mine Manager), the #2 judge, and mine attendants. The #1 Judge/Mine Manager will then read the Team Briefing Statement and review the Mine Information Sheet. Questions will be answered only as required by the rules or to explain the meaning of a term. The #1 Judge/Mine Manager then reads the Team and Fresh Air Base Instructions. When the team verifies that they understand the instructions, the captain immediately starts the official clock. He writes the month, day, year, and the team name or number on the sign-in board. The #1 Judge/Mine Manager will then 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.

SURFACE PROCEDURES:

After receiving the information from the Mine Manager, the team may discuss the conditions presented by the problem and the map. Since there are no methane or explosive gas mixtures in the mine, the team does not need to use non-sparking tools to work the problem. However, if they choose to use them as a precaution, the captain may ask the official in charge to provide them. No docks will be assessed for not using or requesting non-sparking tools. The team then checks all the equipment to be used to work the problem and goes under oxygen.

****Note: Breathing apparatus approved for at least four hours shall be used in the Mine Rescue Contest problems. Each team member must have his/her own approved breathing apparatus. Teams cannot expect recharging materials, apparatus parts, and accessories for all types of apparatus at the contest site.***

****Note: Team members must wear an approved protective hat, identification tag, safety shoes, permissible cap lamps, self-rescuer, and be clean shaven to the extent that a good face-to-facepiece seal is achieved.***

****Note: Each team must have approved gas instruments or testers for rescue and recovery work.***

****Note: the lifeline signals must be presented to the lifeline judge.***

When ready, the team must examine the mine opening.

UNDERGROUND PROCEDURES:

NOTE: Numbered items on the following list refer to the numbered team stops shown on the maps.

There are many possible routes the team may follow as it explores the mine, all of which are acceptable, as long as they obey contest rules, particularly the requirement for systematic exploration and the “2 plus 3” rule.

The team counts off before entering the mine (first time they go underground). The team performs a gas check indicating CLEAR AIR in the entrance. The team performs a team check.

**Note: if the team does not make a personnel and apparatus check, then they must do it within 50 feet of this location.*

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

**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.*

**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 furthest points of advance (FPA); 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.*

**Note: team captain must also mark the date and his/her initials at the furthest points of advance (FPA) 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.*

**Note: at all times the team must travel at normal walking speed.*

**Note: the team must not pass a placard indicating a condition before acknowledging the information on the card.*

0. Team checks east mine entrance
1. Team enters mine through west mine entrance door (which was open)

2. Team advances north in Highway 1. They immediately encounter heavy smoke, 12% O₂, 2200 ppm CO, 20 ppm NO₂, and 0% CH₄. While advancing they find a scissors lift partially blocking the highway, and a little further on, they find 1 set of brattice materials. Next, they find a haulage truck along the right rib, and they also note a change in conditions to very heavy smoke, 10% O₂, 2500 ppm CO, 20 ppm NO₂, and 0% CH₄. At the entrance to the intersection with Crosscut 3, they encounter a fire out of control. They use the brattice materials to build a temporary stopping, leaving a corner open to act as a regulator (regulator does not change ventilation). The team is now required by rule, to find and seal or regulate all other approaches to the fire without undue delay, while at the same time, adhering to rules regarding systematic exploration. The team can advance no further in Highway 1, so they retreat and enter the mine through the east entrance.
3. Upon entering the mine, the team immediately encounters moderate smoke, 14% O₂, 1600 ppm CO, 20 ppm NO₂, and 0% CH₄. A little further in the middle of the Crosscut 1 intersection, they encounter water knee deep. The team stretches west in Crosscut 1 and finds the crosscut blocked by an impassible cave. The team returns to Highway 3 and continues to advance north.
4. At the Crosscut 2 intersection, the team finds water over knee deep in Crosscut 2 west of the intersection. They can not travel in water over knee deep (team endangerment), so the team continues to advance north in Crosscut 3. On the west rib, they find the controls for the pump in Crosscut 2. The team considers whether they should use the pump controls to operate the pump in Crosscut 2. If the water was pumped out of Crosscut 2 (or at least pumped down to knee deep or less), the team could travel through Crosscut 2 to continue their exploration in that direction. However, the water pumped out of Crosscut 2 would go to the sump, which is an area they haven't explored yet. If any of the missing miners were located in the sump, they could be endangered by this action (the briefing statement said an electrician and mechanic were thought to be working on a pump, so its plausible that they could be working on a pump in the sump). Therefore, the team decides that they will not pump the water in Crosscut 2 at this time. A little further, they find a pickup truck parked along the west rib. A little further, they find 2 sets of brattice materials on the west rib. A little further, they find a haulage truck parked along the east rib.
5. At the entrance to the Crosscut 4 intersection, the team encounters a change in conditions; heavy smoke, 12% O₂, 2200 ppm CO, 20 ppm NO₂, and 0% CH₄. The team turns west and advances in Crosscut 4, still trying to find and seal or regulate all approaches to the fire. They find a scaler parked along the south rib about half way between Highways 2 and 3.
6. At the Highway 2 intersection, the team finds Crosscut 4 blocked to the west due to loose, unscalable roof that extends from the intersection at least 15 feet toward the west in Crosscut 4. The team turns south in Highway 2 and finds a loader parked along the west rib. The cab door is open and the loader is idling.
7. After a few more steps, the team discovers that Highway 2 is caved tight rib-to-rib at that point, blocking further advance to the south. The team turns around and travels north through the Crosscut 4 intersection.
8. The team reaches a face at the northern-most extent of Highway 2, and also finds a bolter parked along the west rib. To complete its exploration of the parts of the mine

that are accessible, the team retreats east in Crosscut 4 toward Highway 3, and advances north in Highway 3.

9. The team finds a face drill parked along the east rib, and reaches a face at the northern-most extent of Highway 3. The team also finds roof support posts sufficient to support 8 feet of mine entry. The team has now explored all areas of the mine that are accessible, and has regulated a fire at one location. Based on the mine map, the team believes there are other potential approaches to the fire that they have not been able to access, and they have not yet located any of the missing miners. The team determines that they can not travel further north in Highway 1 (blocked by fire out of control), they can not travel further south in Highway 2 (blocked by caved tight), they can not travel further east in Crosscut 3 (blocked by loose roof unscalable), and they can not travel east in Crosscut 2 (blocked by water over knee deep). They found roof support posts that could be used to travel through the loose roof in Crosscut 4, but they only have enough posts for 8 feet of entry, and they know the loose roof in Crosscut 4 extends for at least 15 feet.
10. The only remaining option is to travel east in Crosscut 1, which has caved and is impassible. Per contest rules, falls can be moved, so the team decides they need to move the fall and post through the area with the roof support posts they found in Highway 3. They travel back to Highway 2 and use the loader they found south of the Highway 2 – Crosscut 4 intersection to muck out the caved material, and then post through the caved area. The team advances west in Crosscut 1 and turns north in Highway 2. They encounter water knee deep, and then reach the Crosscut 2 intersection.
11. At the Crosscut 2 intersection, the team advances through the open door to the west into the office to tie across the rest of Crosscut 2. By rule, the team is required to find and seal or regulate all approaches to the fire without undue delay, but this does not preclude systematic exploration. Thus, before advancing further north (toward what could be an approach to the fire), the team needs to tie across Crosscut 2.
12. In the mine office, they find the end of the water knee deep, and they find that conditions have changed to light smoke, 17% oxygen, 1200 ppm CO, 15 ppm NO₂, and 0% CH₄. They also find a telephone, and the door to the warehouse is closed.
13. Since conditions in the mine office are such that the door to the warehouse could be opened without endangering anyone who might be inside (i.e. this area does not need to be ventilated before opening the door), they close the door to the office (necessary, because the warehouse is a “ventilation unknown”) and enter the warehouse.
14. In the warehouse, the team finds a miner who is conscious with no apparent injuries. The miner is Alek Buschufferickski, Employee Number 15. The team also finds the controls for the sump pump, and roof support posts sufficient for 20 feet of mine entry. Mr. Buschufferickski is given a primary assessment and he dons an extra breathing apparatus (simulated only; the breathing apparatus is required because he will be taken out of the mine through a hazardous atmosphere)
15. The survivor is walked out of the mine to the fresh air base. The team returns to Highway 2 outside the mine office and resumes its exploration northward. On the northern side of the Crosscut 2 intersection, they find conditions have changed to heavy smoke, 12% O₂, 2200 ppm CO, 20 ppm NO₂, and 0% CH₄. A little further along they find the end of the water over knee deep.

16. At the entrance to the Crosscut 3 intersection, they encounter fire out of control. There is a sliding door regulator at this location which is completely open. They close the regulator, leaving just a small opening to regulate (not seal) the fire. The team then travels to the Highway 2 – Crosscut 4 intersection with the roof support posts they found in the warehouse.
17. The team travels through the loose roof area to the west of the intersection, scaling and setting roof support posts as they go. When they reach the end of the loose roof, they discover conditions have changed to very heavy smoke, 10% O₂, 2500 ppm CO, 20 ppm NO₂ and 0% CH₄.
18. When the team enters the Highway 1 intersection, they find the gas box (for gas testing proficiency), and a barricade to the north at the entrance to the sump. They shout to anyone who might be inside the barricade, but there is no answer. The team turns south to tie in and to reach what they believe will be another approach to the fire.
19. At the entrance to the Crosscut 3 intersection, the team encounters fire out of control. They use brattice materials to build a regulator at this location. The team now needs to enter the barricaded area to find out if any of the missing miners might have sought refuge there. However, the atmosphere outside the barricade is irrespirable, so opening the barricade without first ventilating in front of it would endanger anyone inside.
20. To bring fresh air across the barricade, the team travels to the regulator in Highway 2 and closes it.
21. The team then travels to the west mine entrance door and closes it.
22. The team then travels back to the barricade in highway 1, erects a wing curtain to direct ventilation air across the entire surface of the barricade, and asks the mine manager to turn on the fan.
23. Since the area inside the barricade is a “ventilation unknown,” the team needs to build an airlock before opening the barricade. Once the air has been cleared in front of the barricade, the team asks for the fan to be shut down, they shift the location of the wing curtain so that it now serves as a temporary stopping on the east side of the intersection, and they close the regulator on the north side of the Crosscut 3 – Highway 1 intersection. The fan needs to be shut down because the temporary stopping on the east side of the intersection will close the only path for ventilation air to flow.
24. The team then enters the barricade and finds two miners; Cole Pollischevznikki, Employee Number 50, who is conscious with no apparent injuries, and Steve Youssourinvsink, Employee Number 16, who is unconscious with no apparent injuries. The team examines each miner, places Mr. Youssourinvsink on a stretcher, and brings both miners to the fresh air base (stretcher carry is simulated only).

NOTE: If the team pumped water from Crosscut 2 earlier in the problem, when they enter this barricade they would find water over knee deep and the two miners would be dead.

25. The team brings the survivors to the fresh air base, and returns to the pump controls in Highway 3.
26. The team actuates the pump in Crosscut 2, which removes all water from Highway 2,

Crosscut 2, and Highway 3.

27. The team enters Crosscut 2 and finds that the air in the Crosscut has not cleared. It is still moderate smoke, 14% O₂, 1600 ppm CO, 20 ppm NO₂, and 0% CH₄. The team finds a loader against the north rib near the Highway 3 intersection. There is a miner inside the loader cab who does not respond when the team shouts to him. They can not open the door of the loader until they clear the atmosphere in Crosscut 2.
28. The team travels to the regulator in Highway 2 and opens the regulator, then asks the mine manager to turn the fan back on.
29. The team then travels back to the loader and, once the air clears, opens the door (no need for air lock; this is not a ventilation unknown). The miner is Dave Wanaukerkshuff, Employee Number 27. He is conscious with no apparent injuries. The team examines Mr. Wanaukerkshuff and confirms no injuries.
30. The team brings Mr. Wanaukerkshuff to the fresh air base.
31. Last remaining task is to seal all fires.

NOTE: Briefing statement asked team to extinguish or seal all fires. Fire out of control can not be extinguished by the team, so the fire must be sealed at all approaches.

Team asks for the fan to be shut down and returns to the regulator in Highway 2 and seals it.

32. Team then travels to the regulator in Highway 1 south of Crosscut 3 and seals it.
33. Team returns to the surface. Problem has been successfully completed.