SECTION I

2014

MINE RESCUE

RULES

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GENERAL INFORMATION FOR CONDUCTING
2014 MINE RESCUE CONTESTS

Mine Rescue Rules were designed as a training tool for mine rescue teams. The gas levels, limits, travel distances, water levels, etc. were developed for contest purposes only. Discretion should be used in actual mine emergency situations. If a mine rescue problem(s) is utilized to comply with Part 49 the problem(s) must be submitted and certified by the National Contest Director(s).

1. Mine rescue teams must be composed of persons who are bonafide employees of mining companies or persons who are designated or contracted by mining companies to fulfill the requirements of 30 CFR Part 49 mine rescue coverage.
2. All mine rescue teams must report to isolation at the designated time on each day of their participation. The number of persons in isolation will be limited to ten uniformed team members.
3. Teams are required to bring with them a sufficient supply of materials and apparatus accessories.

   Teams cannot expect recharging materials and facilities, apparatus parts, and accessories for the several types of apparatus to be made available at the contest site.
4. In mine rescue ties, B cards will be the first tie breaker; mine maps (the Team map and the Briefing Officer's map) will be the second tie breaker; written examinations will be the third tie breaker; time cards will be the fourth tie breaker; and actual time to work the problem(s) will be the fifth tie breaker.
5. Mine rescue teams shall be notified by posting when they may review their map and scorecards. Within one hour of posting, the team captain, team trainer, briefing officer and map man shall report to a designated location. Teams will have 20 minutes to review and prepare any written protests. All protests will be considered by the Final Appeals Committee. Under no circumstance will video tape recordings or photographs be introduced as supplementary material for consideration by the Final Appeals Committee.
6. For a combination team, the three working first aid team members will be chosen from the registered mine rescue team members.

   The final ranking of combination teams will be determined from a composite of both days mine rescue scores and the first aid team's score. In the event a team enters more than one first aid team, the first aid team's lowest score will be used to determine the final ranking. In the event of ties in the Combination Contest, the final Mine Rescue ranking will be the tie breaker.

7. All pillar blocks will be equal size.

   Each team will be provided two blank maps (1″ = 10′) for working of the problems.

RULES GOVERNING 2014 MINE RESCUE CONTESTS

1. Each team shall be composed of a minimum of seven persons (five working team members, a briefing officer, and a patient) and shall be limited to a maximum of ten persons. When teams elect to use a sound-powered telephone communication system (lifeline), teams may provide up to two persons to assist in managing the lifeline. If provided these two persons must be in lock-up and part of the ten member team. The two lifeline persons will not be selected for taking the written examination. Teams will be responsible for managing lifeline behind the contest lifeline judge.

   In the event of an emergency, the Contest Director may exempt a team from the seven person minimum, and allow only the replacement of a patient. Each member shall wear a different number, from one to ten, on the arm, at or near the shoulder, with No. l assigned to the captain. Any means of affixing legible numbers on the sleeve of the uniform will be acceptable. After the clock is started only the five working members and the briefing officer will be permitted to do work. In the event of an emergency or by problem design the alternate/patient may be substituted for any working team member or briefing officer. The team may decide which position the alternate will fill.

   Each team shall have a briefing officer. The briefing officer will accompany only one participating team and may assist that team with any of the functions normally performed on the surface or at the fresh-air base. Switching of team members including the briefing officer from one team to another is prohibited. The briefing officer will be stationed at the fresh-air base during the working of the problem and will be permitted to communicate with the team via telephone or radio and may mark the briefing officer's map from information received from the team while the team is inby the Fresh Air Base. The briefing officer's map will be identified by the Chief Judge and shall be used for scoring purposes. All maps shall be turned in at the completion of the problem.

   Once the team makes the first team stop inby the fresh air base that requires an apparatus check the team may not have communications with the briefing officer except through the communication system until the clock is stopped. The briefing officer will remain isolated from the team until the clock is stopped. The briefing officer map will remain at briefing officer station.

The briefing officer will remain at a designated location when the team is working inby the fresh-air base except when it is necessary to perform work outside that location in the fresh-air base. When required work is completed, the briefing officer must return to the designated location. Briefing officers meeting the physical requirements may substitute for any team member if so desired.

2. Each team shall provide its own breathing apparatus for each member of the team. A breathing apparatus approved for at least four hours shall be used in mine rescue contest problems. Other approved breathing apparatus may be used on patients. Each team member must wear safety boots, an MSHA approved protective hat and cap light, and members must be similarly dressed. During the working of the problem, the cap lights may or may not be turned on but must be operational. The wearing of self-rescuers is not required for Contest work. Each team member must have a metal identification tag attached to his/her belt. Each team must have at least one stretcher capable of transporting an unconscious person. Each team must have at least one portable fire extinguisher rated at 2A10BC with a minimum five-pound capacity.

3. Each team must have its own breathing apparatus approved under Part 84, Title 42, Code of Federal Regulations. Any team that anticipates using a breathing apparatus not listed in the rules must provide, at the time of registration, written instructions outlining the proper donning procedures for such apparatus.

4. Gas testing devices used by teams shall be approved by MSHA, and only instruments which give an accurate reading for percent by volume or parts per million shall be used. Any team that anticipates using an instrument not listed in the rules shall provide, at the time of registration, written instructions outlining the proper procedures for checking and testing with such instruments.

5. Teams must assure themselves that before they report to the mine entrance or fresh-air base all apparatus are fully assembled, airtight, and ready to wear. Cylinder pressures must be within specifications of approval. Spare apparatus are not required to be tested as part of the equipment check at the fresh-air base. Full practice canisters or other acceptable canisters must be in place in the apparatus. Each team will be responsible for the proper removal of all waste material from the competition site (i.e. canisters or chemicals).

6. Teams shall be equipped with and use a portable or a sound powered communication system approved by MSHA. The wires or cable shall be of sufficient tensile strength to be used as a manual communication system. Teams may use standard signals if the communication system fails. Wireless

communication systems may be used, provided they are designed and used in such a manner that the integrity of the Contest is not jeopardized, as determined by the Contest Director.

Upon registration the team shall properly identify their radios and provide the programmed channels and frequencies for their radios. The team must provide their fully charged radios immediately upon arrival to a guard in isolation/lock-up on the day of the contest. When selecting a channel for team competition, their radios will be set by a designated contest official on a channel that is different from other radios in use.

The mine superintendent or other designated person will check and monitor conversations on the channel selected. In the event of failure of the radio provided to the mine superintendent or other designated person, corrective actions will be immediately taken by the team.

Teams may take up to three radios inby the fresh air base and must provide at least two for the fresh air base to be used by the briefing officer and the mine superintendent or other designated official. Teams may leave additional radios in the fresh air base for use in case of malfunctions. A minimum of three radios shall remain operational during the working of the problem. This consists of: one radio each for the team underground, the briefing officer and the mine superintendent or other designated person. This complement of radios is necessary to be considered as using wireless communication.

Teams using wireless communication must have radios charged and properly programmed to the MSHA FCC licensed radio frequencies prior to turning them over to contest officials.

MSHA licensed radio frequencies and settings such as PL codes, low power, and narrow banding protect MSHA and teams from FCC violations and prevent crosstalk between competing teams.

All radios are to be MSHA approved and intrinsically safe.

VHF radios must support at least 3 channels.
UHF radios must support at least 16 channels.

National Mine Rescue Contest Radio Frequencies

UHF Frequencies

1	451.8125	9	464.5000
2	456.8000	10	464.5500
3	456.8125	11	464.5625
4	461.0375	12	466.0375
5	461.0875	13	466.0875
6	461.1375	14	466.1125
7	462.7625	15	466.1375
8	462.7875	16	469.5500

All Frequencies will have a PL code set for transmit and receive of 94.8 hz

All frequencies will be set to "Low Power" and "Narrow Band"

VHF Frequencies

1	151.5050	3	154.5275
2	151.6250		

A lifeline will still be required for working of the problem. This can be achieved through the use of a communication reel or rope, wire or cable which has sufficient tensile strength to be used as a manual communication system.

Anyone anticipating using wireless communication shall notify the Contest Director at official registration for the **2014** event. Wireless communication systems will be prohibited in the isolation area. This includes personal pagers, cellular phones, radios, laptop computers, etc.

7. Each team must be under guard, in a designated location, before the start of the Contest. Teams must remain continuously under guard until time to work the problem. Teams that have competed will not be permitted to return to the isolation area or communicate with any teams awaiting their turn to compete.

8. Any team or member receiving information concerning a Contest problem prior to arriving at the fresh-air base will be disqualified by the Chief Judge and Director.

   Any team or member receiving unauthorized information concerning a Contest problem after arriving at the fresh-air base may be disqualified by the Chief Judge and Director or discounted under Rule 38.

9. Teams will not be permitted to furnish or make placards indicating materials or equipment and then simulate their use.

10. During isolation, and after the written test has been drawn, contest officials will select one team member from the remaining 5 team members to bench their breathing apparatus.

    There will be no discounts for this exercise, unless the team refuses to participate. If the team refuses they will be discounted under rule 50.

    Teams may reference the National Bench Problem Designer test procedures.

    The team member will be allowed to take any material needed to assist them in the procedures for benching his apparatus.

    The contestant will supply the breathing apparatus and tester.

    There will be no planned bugs in the breathing apparatus, and the apparatus will not be disassembled for the test.

    A maximum of 10 minutes will be allowed for the team member to test their breathing apparatus.

    Local contest will determine if this exercise will be done in lock up or after the team works the field problem.

WRITTEN EXAMINATION

1. During isolation, contest officials will select one team member from the five working team members and the briefing officer to take the written examination. One number will be drawn which will apply to all teams. The written examination will be ten statements of fact taken verbatim from the contest rules. Each statement shall contain a blank space which shall represent a key word, with no more than two consecutive blanks per statement. Answers will be multiple choice with three choices. Answers will not be intentionally misspelled. "None of the above" shall not be used as one of the choices.

   A maximum of fifteen minutes will be allowed for the team member to take the test.

2. Team members taking the written examination will not be permitted to take any written material or information into the testing area.

3. There will be no discussion during the time that written examinations are being taken.

FRESH-AIR BASE PROCEDURES

1. A video presentation may be shown to the team or a prepared statement will be given to the team prior to arriving at the fresh air base. The prepared statement will include information relating to the mine or section of the mine to be explored. The person in charge of the fresh-air base will introduce himself/herself to the team captain and briefing officer immediately upon arrival of the team at the mine portal or fresh-air base. When the team arrives at the fresh air base, the team will have 4 minutes to position their equipment and lay out lifeline across the fresh-air base. The team will be confined to the fresh-air base during this time period. If the captain fails to start the clock at or before the 4 minutes has elapsed, the clock will be started for them. They will not receive the discount for the captain not starting the clock. The team will be discounted under Rule 50.
2. Each team will be given a written problem and maps. The blank maps and problem will be given to the team immediately after the captain or judge starts the timing device. Time required for studying the problems, checking equipment and getting under oxygen and/or air will be included in the total problem working time.

MISCELLANEOUS

1. To rescue people, teams may be required to change existing ventilation, energize power circuits, pump water, or support unsafe roof if it can be done safely. Other methods of recovery will not be accepted (i.e. roping, hooking, etc.).
2. Only judges, Contest officials, news media, and working team members will be permitted in the working areas. Unauthorized persons must stay out of the working area. Photographers who wish to take pictures of the working teams must receive permission from the Director of the Contest.
3. Solid lines on a map denote actual and accurately measured workings. A solid line means there will be no openings from above, below or on the same plane that are not shown on the map.

   Dotted lines, on a map, denote projections and may or may not be accurate.
4. Ventilation changes made by the team will reflect general ventilation principles, to direct airflow where it is needed, or block the airflow where it would create a violation of the rules.

Airflow will be considered to enter all openings where exhaust ventilation applies, and exit all openings where blowing-type ventilation applies.

All of the airflow from at least one opening will be required to ventilate a barricade or refuge alternative, or remove gases and/or smoke.

Any air movement will move irrespirable and/or explosive gases across an ignition source and/or unexplored area, if not blocked.

If no airflow is indicated in the Fresh Air Base (FAB) or other openings, then none exists, regardless of ventilation controls or fan operation.

If there are no openings/exits which allow air to enter/exit the mine workings inby the Fresh Air Base, air will not travel inby the FAB unless directed; once inby the FAB the above applies. Air may be short circuited across the FAB.

INTERPRETATIONS OF A CARDS

1. For each incorrect answer on written examination. ___1

2. Failure to examine gauges and apparatus at not more than 20 minute intervals. This must be done at a team stop. One point for each minute or fraction thereof. (Total discounts are not to exceed 5 points)___1

   The zero point for the timekeeping process for apparatus checks will begin with the completion of the last person checked during the first apparatus examination and this will be the procedure that will be used throughout the problem. This means that all team members must be checked before the next twenty minutes have elapsed.

3. Failure to complete the problem in the calculated time, for each five minutes overtime, or fraction thereof (not to exceed 10 points) __1

   The calculated time will be determined by averaging the working time of all teams participating in the Contest.

   Average working time will not be utilized in problems where time limits are set.

   The working time for a problem will start when the team captain or judge starts the timing device at the fresh-air base and will continue until the team captain stops the timing device. The team captain or judge must start the timing device immediately before the team receives the maps and problem and before any work is done. In the event the captain fails to start or stop the timing device or the team begins working before the clock is started or continues to work after clock is stopped, working time will be determined by

the timekeeper. When the captain stops the timing device, the maps must be submitted to the judges. (No work will be permitted on the map after the timing device has been stopped.)

For teams that do not complete the problem within the time limit:

1. Stop the team, allow no more work.
2. Discount team for everything not mapped, written instructions not followed and any rules related to patients or missing persons.
3. Discount team an additional;
    a. 15 points if problem was not completed, or
    b. 5 points if exploration was completed and team is traveling out of the mine, or;
    c. 30 points if the captain stops the clock and doesn't try to finish the problem because time is running out.

4. When submitted to the map examiners, conditions and/or objects marked on the team map in any area of the mine not explored by the team, each infraction___2

   Conditions and/or objects that are in advance of the point that the captain has traveled shall not be recorded on the map, except for the following conditions when they extend from rib to rib: unsafe roof, caved areas, and water over knee deep. This also includes inextinguishable fires. The captain will examine these areas as close as practical, and this will require them to be located on the mine map.

   Objects or conditions passed by the team in the same opening or intersection shall be marked on the map.

5. Failure to locate and record accurately (verbatim) on the team map objects/conditions that should have been found and were indicated to be in the mine, for each omission ___2

   A. Verbatim means that the card information only has to be in sequence not stacked or oriented like the card. It also means that symbols are not acceptable to replace wording written out on the placard (i.e., (") cannot be substituted for the word "inches" from a placard).

   B. The team is not responsible for locating and mapping objects/conditions that are initially found in the fresh-air base and the briefing officers' station. All objects/conditions located in the fresh air base will be shown on the Team Map and the Briefing Officer's Map.

   C. This discount shall be assessed for all objects/conditions that are not mapped in an area of the mine that the team should have explored if the

problem had been worked systematically and correctly or for mapping objects/conditions not found in the mine.

D. Objects/conditions located in areas of elongated unsafe roof, unsafe rib, and areas where unsafe roof extends diagonally from rib to rib must be mapped if passed by the team.

E. The legend developed by MSHA and furnished to the teams shall be used by all teams to mark their respective mine maps. Objects/conditions not covered by the legend will be written in by the team and the location of the object/condition indicated by the symbol "X". The team may place any additional information on the mine map concerning objects/conditions found in the mine if it does not adversely affect the legibility of the items/conditions required to be mapped.

F. The marked map as submitted by the team will be compared with the problem and key map by the map examiners. Objects/conditions located on the map must be within six feet of accuracy and the six foot allowance will be measured from the center point of the object/condition drawn in to the center point of the object/condition denoted on the key map. All objects/conditions mapped by the team must be shown in the entries, crosscuts and openings. If a team fails to explore the entire mine, the farthest point of advance shall be indicated on the map submitted to the map examiners except at locations where the following objects/conditions are encountered: faces, caved areas, water over knee deep, unsafe roof across an opening, seals, stoppings, barricades, and inextinguishable fires. Objects/conditions must be indicated on the team's map submitted to the map examiners. This does not include statements read by the patient or notes given to the team.

G. Information found on notes in lunch boxes, at barricades and any other location must be recorded on the mine map. The map shall reflect an X for each note found. (e.g. one X for the lunch box and one for the note.) These X's cannot be stacked one on top of the other.

H. Additional information placed on the map by the team cannot be existing symbols that are presently denoted in the legend, regardless of color coding used by the team in mapping.

I. The six foot tolerance will not apply to rib lines or pillar blocks drawn in projected areas, but discounts will be assessed for improperly located objects/conditions in these areas including faces denoted by placards.

J. A placard indicating <u>person</u> that is located by the team in an area of elongated unsafe roof, but cannot be reached due to a lack of roof support, shall be mapped as an X with the word <u>person</u> written out. If the team

subsequently reaches the person placard and the placard is changed to a body or live person, the proper symbol shall be used in conjunction with the original X.

K. The following changes need to be noted on the team map to indicate the conditions left in the mine and the fresh-air base: changes to ventilation structures (i.e. stoppings, doors, etc.); victims removed from the mine; electrical circuits energized or de-energized; fires extinguished; ignition sources relocated; water pumped; roof supports installed; and in the areas reentered by team, smoke cleared, gases removed, and permanent changes in direction of ventilation. Any terminology which describes these changes is acceptable.

L. A single placard which denotes the start and end of any condition requires only one symbol to be mapped.

M. Ventilation structures, found intact, such as stoppings, doors, etc. that are initially located and mapped, will remain on the map and any removal of such structure will be reflected by a notation such as removed. If rebuilt in the same location, a notation, such as rebuilt, will suffice.

N. All newly erected, intact and airtight structures built by the team, except for brattice cloth in lieu of frames erected for a line curtain, will be considered to be temporary stoppings. Regardless of their use or intention (i.e. ventilation, airlock, seals, , etc.) they shall be treated and mapped as a temporary stopping if left intact.

O. After the clock is stopped, the judge's final ventilation map shall be confirmed on the field with the team captain or his designee.

6. Failure to locate and record on the briefing officer's map all objects/conditions as described below, that should have been found and were indicated to be in the mine, for each omission _____2

The following objects/conditions as found in the mine must be located on the briefing officer's map: locations of persons/bodies; smoke; gases; caved areas; unsafe roof; water in depths that prevents travel; ignition sources; fans; fires; ventilation structures; brattice cloth; line curtain; seals; barricades; air direction and refuge alternatives.

The following changes need to be noted on the briefing officers map to indicate the conditions left in the mine and the fresh-air base: intact ventilation structures, changes to ventilation structures (i.e. stoppings, doors, etc.); victims removed from the mine; electrical circuits energized or de-energized; fires extinguished; ignition sources relocated; water pumped; roof supports installed; and in the areas reentered by team, smoke cleared, gases removed, and permanent changes in direction of ventilation. Any

terminology which describes these changes is acceptable. (and if the team fails to explore the entire mine, the team's farthest point of advance (FPA) as per rule 5F.)

The legend developed by MSHA and furnished to the teams shall be used to mark their respective mine maps. Objects/conditions not covered by the legend will be written in by the team and the location of the object/condition indicated by the symbol "X". The briefing officer may place any additional information on the mine map concerning objects/conditions found in the mine if it does not adversely affect the legibility of the items/conditions required to be mapped.

The marked map as submitted by the team shall be compared with the problem and key map by the map examiners. All objects/conditions mapped by the briefing officer must be shown in the correct entries, crosscuts, and openings. (Orientation, verbatim and the six foot tolerances do not apply to the briefing officer's map.)

Additional information placed on the map by the team cannot be existing symbols that are presently denoted in the legend, regardless of color coding used by the team in mapping.

7. Each team may have a Command Center Attendant who will accompany only one team and remain in lock up with that team. The Command Center Attendant will be a full time employee of the company and may or may not be one of the team members referred to in Rule 1 governing the 2014 Mine Rescue Contest. The attendant will use the computer located in the designated Command Center location away from the briefing officer to map conditions encountered and called out by the team. The Command Center Attendant will communicate through the use of headsets with the team and the Briefing Officer via the communication system located in the command center. The Command Center Attendant can relay information about the ventilation and mapping to the Briefing Officer and assist in ventilation and mine related decisions.

   The map of the Attendant will not be graded for scoring purposes but will be reviewed by the map examiners. If there is a discount on the Briefing Officer's map, the Attendant's map will be reviewed. If that discount is correct on the Attendant's map, no discount will be assessed on the Briefing Officer's map.

   Teams may opt out from the Command Center Attendant.

   Teams may bring their own computer provided it meets the specification stated on MSHA's website. Time to set up their computer is included in the 4 minutes referred to in Rule 1 of the Fresh-Air Base procedures.

INTERPRETATIONS OF B CARD

A. Apparatus

1. Apparatus improperly assembled, each apparatus___ 3

   Failure to fasten covers, snaps, etc.

   Full practice canisters or other acceptable canisters must be in place and used in the apparatus.

2. Apparatus improperly adjusted to the wearer, each person___1

   If required, patient must have apparatus on and properly adjusted, even if on stretcher.

   This ONLY applies to shoulder straps, chest straps, and head straps that are not properly fastened, are twisted or rolled (separate discount for each strap).

3. Failure to follow prescribed procedures for going under oxygen, each person, excluding patient___3

   This will depend on type of apparatus used.

4. Apparatus part or parts worn or deteriorated so as to be dangerous to the wearer, each person___8

   Holes that are in the breathing tubes and straps that break after the wearer goes inby the fresh-air base are discounts.

5. Oxygen supply of team members over specified limitations___2

   This will apply to oxygen supply prior to starting work and be determined by the type of apparatus worn.

   It does not mean minimum at end of problem.

6. Failure of captain to examine gauges, apparatus, and to have his/her gauges, apparatus examined before entering the mine, or going inby the fresh air base each apparatus___2

7. Failure to make proper apparatus examination during any required apparatus check, each infraction___1 (Maximum 5 Points)

   Each team captain will examine gauges and apparatus of team members and have his gauge and apparatus examined by a team member.

   A proper apparatus examination will include a visual examination of the gauge, facepiece, hoses, and determine by sight or feel, that the protective cover is secure. If the gauge has a protective holder, the gauge must be put back into the holder after viewing.

The team member making the check must obtain assurance from the person being checked that the person is all right. A verbal response from the person that he/she is all right will suffice.

8. Not wearing goggles in conjunction with an SCSR when smoke is encountered, each patient, each infraction___2

   Means any smoke.

9. Team members breathing external air inby the fresh-air base, each team member, each infraction (excluding patient)___10

10. Team not following proper procedure in case of apparatus failure, each infraction___6

    Proper procedure would depend on type of apparatus; however, team must proceed to fresh-air base or other such designated location immediately.

    Proper procedure for returning simulated malfunctioning apparatus to use would be to take apparatus off and set it on the ground at the fresh-air base or other such designated location, and then put it back on following the prescribed procedures for getting under oxygen.

11. Failure to properly protect patient, secure patient to stretcher, cover patient with blanket, or placing patient on stretcher in such a way as to foul proper operation of apparatus, each omission___2

    Failure to properly protect the patient shall be assessed when the team drops the patient.

    Patient should be secured to stretcher by at least two bandages or straps, one around trunk of body and one around legs, covered with blanket from the neck to and including the feet and placed so as not to crimp air hoses. The bandages or straps shall be fastened perpendicular to the patient's body.

    All unconscious patients must be brought to the fresh-air base on stretchers.

12. Failure to conduct a complete initial assessment of each patient. _____2

    An initial assessment must be conducted of all **live** persons who are encountered during the working of the problem. The assessment should commence once the captain has physically made contact with the person. Any of the five working team members may be utilized to conduct the assessment. However, the team member starting the assessment of a live person will continue and complete the assessment.

When assessing a conscious live person, a team member must physically contact the patient.

1. Ask if he/she is okay; asking person if he/she is "alright" will suffice.
2. If present, control life threatening bleeding according to critical skill sheet (rule 34).

When assessing an unconscious live person, a team member must physically contact patient.

1. Ask patient if he/she is okay; asking if he/she is "alright"
2. Look for absence of breathing or gasping, verbalize assessment.
3. Check for presence of a carotid pulse (5-10 seconds).
4. If present, control life threatening bleeding according to critical skill sheet (rule 34).

Injuries will be limited to one life threatening bleed to patient's extremities during the problem.

Injury must be identified by lettering on labels will be at least ¼-inch in height.

Example:

LIFE THREATENING BLEEDING

Required First Aid Supplies:

1. Gloves
2. 4"X4"gauze pads or equivalent
3. Roller bandage such as Kerlex or equivalent

B. <u>Auxiliary Equipment and Testing Devices</u>

13. Failure to take necessary equipment and gas-detecting devices to work the problem, each omission ___2

    Failure to take necessary equipment or testing devices underground; discount should be assessed even if team returns to fresh-air base to pickup necessary equipment.

14. The following equipment must be examined after the clock is started and before the entire team goes underground or inby the fresh-air base _____2

Communication system: communications between the team and briefing officer shall be tested before the team advances inby the fresh-air base.

All gas detecting instruments used or taken inby the fresh-air base must be examined in the presence of a judge. (After examining, gas detecting instruments may be turned off during the working of the problem.)

15. Equipment failing to function properly, if not corrected before entering the mine, each infraction ___4

    Faulty equipment must be left at the fresh-air base.

16. Failure to secure extra approved breathing apparatus or device to stretcher___2

    Extra apparatus must be secured to stretcher to prevent it from falling off.

C. Communication and Signaling

17. Failure to arrange standard lifeline pull signals___3

    A team must arrange standard lifeline pull signals with the judge handling the lifeline after the clock is started and before the entire team goes underground or inby the fresh-air base.

    A team using wireless communication is not required to arrange standard lifeline signals prior to the entire team going underground. However, standard lifeline signals must be arranged prior to the entire team going underground if the team has retreated to the fresh air base due to communication failure and a sound-powered communication system with lifeline will be used for the completion of the problem.

18. Failure to give proper notification to the briefing officer with lifeline or communication system of team's intentions, (total discounts not to exceed 6 during working of problem) each infraction___1

    The following verbal or standard lifeline pull signals shall be used between the No. 5 team member and the briefing officer or lifeline judge:

Signal	Meaning
1 pull or "Stop"	Stop if traveling or "All Right" if team is at rest.
2 pulls or "Advance"	Team will advance and take lifeline from fresh-air base.
3 pulls or "Retreat"	Team will retreat and give lifeline to fresh-air base. If this signal is made from the fresh-air

	base to team, then team should return to fresh-air base at once.
	When using wireless communication/link line, if the captain is leading, the team is “advancing”; if the tail captain is leading, the team is “retreating”
4 pulls or "Help"	Team is in distress.

A team using a telephone or wireless communication system must report its intentions to the briefing officer. Constant communication shall be maintained with the briefing officer unless a malfunction occurs.

A team will not be discounted if the communication system fails if they have back-up radios, secondary telephone communications, or, if they change to using the standard lifeline pull signals. If the lifeline breaks, the team must immediately repair the lifeline or return to the fresh-air base.

If team’s communication system fails, the team may do work necessary to repair the system. The team and briefing officer maps must be turned over or covered so no comparison can be made. The only verbal communication between the team and the briefing officer must relate to repairing the communication system. Teams will be discounted under Rule 38 for any other communication. When repairing the communication system, working team members may enter the isolation area.

Teams may only use standard lifeline signals if their communication system fails. If the team is using standard lifeline signals, verbal communications between the working team members and the briefing officer is allowed. No comparison of the maps can be made.

Failure to notify the briefing officer by voice communication or lifeline of team's intentions would include advancing or retreating team inby the fresh air base prior to notifying the briefing officer and receiving a reply. If the team is stopped and gives a signal to retreat or advance, the No. 5 team member must await return signal from the briefing officer prior to moving. When traveling and the No. 5 team member gives signal to stop, the No. 5 team member may not move more than two steps after receiving return signal from the briefing officer.

Signals need not be initiated by the Captain.

Improper signals would apply only to signals transmitted between the No. 5 team member and the briefing officer. If an improper signal is corrected prior to team moving, the team shall not be discounted. To correct an improper signal, the No. 5 team member gives a "Stop" signal

prior to moving, then gives corrected signal and receives the reply from the briefing officer.

All team members must hold or be attached to the team link line while traveling. The team link line shall be not more than 28 feet in length and a non-extendable tagline not more than 36 inches in length may be used from a team member to the team link line.

19. The team must notify the briefing officer and obtain his or her permission before ventilation changes are made or power circuit's energized___2

    Ventilation changes will be considered as starting, stopping, or redirection of the air current or changes of the constituents. Dropping a line curtain, extinguishing a fire, or opening a valve, is not considered to be a ventilation change. Boreholes cannot be used for ventilation purposes. The removal of any contaminant by the use of a line curtain and ventilating air current will require the inby end of the line curtain to be within five feet of the extent of the contaminant. If the extent of the contaminant is less than five feet inby the rib line, then the line curtain must break the imaginary rib line. If water is being pumped, teams must wait until placards have been changed by the Contest officials before assuming the water has been lowered.

20. Failure to take lifeline/link line or other communication system into the mine___10

    This would apply only if all team members were inby the fresh-air base.

    Teams must carry sufficient rope, wire or cable to be used as a lifeline when smoke is encountered. The lifeline must be attached on the outby end of the smoke and left in place until the team travels back through the smoke.

    Teams using radios may carry a small reel containing rope, wire or cable, which has sufficient tensile strength to be used as a manual communication system, to be used in the event smoke is encountered.

21. In air clear of smoke, none of working team members having hold of lifeline/link line or having it firmly attached to his/her person. ___2

    Lifeline/link line dropped by all members. Teams using radios may achieve this by having hold of their link line.

    Does not apply on the surface or at the fresh-air base unless otherwise required by the Rules.

22. In smoke, each team member not having hold of lifeline/link line, or not being firmly attached to his/her person, each infraction___2

Applies to any smoke. All team members must be in air clear of smoke before any team member drops lifeline/link line. Would include checking entrances or portals inby the imaginary line of the openings. Any part of a team member (hand, etc.) in smoke, entire team is in smoke.

Teams using radios shall secure their lifeline in a location that is clear of smoke and continue with that lifeline traveling into or through the smoke to air clear of smoke, and retreat through the smoke using the reverse procedure.

Where:

A. No. 5 man does not travel into smoke. Captain and other team members may travel into smoke. All members must hold or be firmly attached to lifeline and/or link line. Captain's travel limited by rules covering exploration (e.g. 25' limit.)

B. Team intends to ventilate smoke over the team; all members must hold or be firmly attached to lifeline and/or link line.

D. <u>Gas and Roof Testing</u>

23. Failure of captain to test the roof, faces, and/or ribs by the sound and vibration method, each infraction (maximum - 6 points at any one location except fires) ___2

Roof and rib tests need to be made only once where the roof is designated as unsafe, caved areas, prior to building a temporary stopping, installing brattice cloth in lieu of frames erected for a line curtain, rebuilding a stopping that is completely destroyed and at faces.

No team member may perform work or move into any area during a team stop until the captain makes the appropriate roof examination for that area. This would include either a sound and vibration method or a visual examination by the captain's physical presence. In an intersection, placards on imaginary rib lines will be considered as being discovered when the captain enters the intersection. In these cases, the sound and vibration method must be made by the captain prior to the team leaving the area. Team members may be in the intersection prior to the test being made.

Team member can follow directly behind the captain and make appropriate gas test as the captain makes roof test. (Roof test does not have to be completed for whole area.)

If it can be done safely, all roof tests shall be made from rib to rib, and the face, roof, and each rib at faces of places. Where conditions permit, the full extent of the condition requiring roof and/or rib tests shall be tested. All roof and rib tests shall be made using the sound and vibration method. No sound and vibration method roof and rib tests are required at the areas of overhanging brows or unsafe ribs.

The proper way to make roof tests along an extended area of unsafe roof would be to make roof tests from rib to rib at the outby end of the unsafe roof, zigzag between the edge of the unsafe roof and the adjacent rib, and make tests from rib to rib at the inby end. See Figure 1(a) and 1(b). If an example is not shown in the rules then a zigzag test will be sufficient.

Prior to extinguishing a fire, roof and rib tests shall be made from rib to rib. When a fire is in an intersection, the tests must be made from imaginary rib line to imaginary rib line, perpendicular to the direction of team travel in the area the team member(s) work to extinguish a fire. The initial roof test, prior to extinguishing a fire, will suffice until the team advances (meaning that the No. 5 person passes the fire) or the team retreats and returns to the fire area; at which time a roof test will be required. Thereafter, roof and rib tests perpendicular to the route of travel must also be made prior to each time a team member(s) travels through the area where the fire was located. The entire team traveling through the area as a unit would only require one test. (This test must be made by the captain before any team member travels past the location of the fire.) One test will suffice at each team stop after the fire is extinguished.

Roof test of fire at intersection must be perpendicular and from imaginary line to imaginary line. However, a zigzag roof test will be acceptable as an alternative test on subsequent trips through the fire area if a diagonal ventilation structure has been installed. (Diagonal structure will not have to be removed and the test will be comparable to the roof test illustrated for diagonal unsafe roof).

The roof and rib test must be made at all fires, including inextinguishable fires.

24. Failure to make necessary gas tests where required, each location___5

    A. If conditions permit, tests for methane, carbon monoxide, and oxygen deficiency shall be made at each team stop that is required by the problem or rules during initial exploration in unexplored areas and at the following <u>normal</u>/required areas to be tested: all mine entrances; entrances to sections of the mine to be explored; faces; walls of overcasts or undercasts, stoppings, ventilation doors, barricades, and

seals, (if intact and airtight); all fires; sample pipes or tubes in airtight seals (valves must be opened before testing if closed); open boreholes; and exhaust fans.

Gas tests made during apparatus checks are not normal areas to be tested.

B. Methane, carbon monoxide and oxygen deficiency tests shall be made in each opening to an intersection before the team advances or retreats from that intersection. Gas tests need not be made from rib to rib. Tests may be made at any location in the opening within 25 feet from the original stopping point of the captain or No. 5 team member if conditions permit. In order to properly check an opening, mine entrance, or section entrance, the gas detecting instruments used shall be extended inby the imaginary line of the rib lines of the openings or entrances. However, openings or entrances containing unsafe roof, caved areas, water over knee deep from rib to rib at or outby the imaginary line to the opening shall be tested immediately outby the condition.

   Teams passing an opening without first checking that opening and making necessary gas tests shall be discounted. Teams advancing inby an opening to a point that the No. 5 team member is at or inby the rib will be considered to have passed that opening.

C. Teams must check all entrances to the area to be explored prior to the entire team going underground or inby the fresh-air base. Entrances may be checked in air clear of smoke without the use of a lifeline so long as the entire team does not go underground or inby the fresh-air base. The captain shall not advance more than 25 feet inby the imaginary line of the opening prior to the entire team advancing underground or inby the fresh-air base.

D. The constituents of the air enclosed by separations intended or indicated to be airtight will be considered unknown and must be determined by the Captain before other team members enter such area. Actual constituents may be indicated by the use of placards. If a stopping has a hole in it, a gas test is not required prior to entry.

E. When smoke is encountered, it will be considered to extend to a placard stating the "end of smoke" or a separation intended or indicated to be airtight.

   If methane, carbon monoxide, or oxygen deficiency is found in an opening containing a separation intended or indicated to be airtight, the gas will be considered to extend to the airtight separation or to a

gas placard indicating a change in the gas constituents. If methane carbon monoxide, or oxygen deficiency is encountered in other locations, it will be considered to extend to a gas placard indicating a change in the gas constituents or the next normal/required area to be tested for that gas, depending on direction of team travel, at which time the continuance or discontinuance of the gas will be determined by gas placard or by results of the tests. See Figure 4. Methane, carbon monoxide and oxygen quantities will be shown on all gas placards. The order of the gases shown on the placards will be methane first, carbon monoxide second, and oxygen third (example see below). Air clear placards will not be used.

_____ % CH4

_____ PPM CO

_____ % O2

F. Areas in which gas tests have been performed need not be retested when a team re-enters the area unless ventilation has been changed. Upon re-entry into any area where the ventilation has been changed, including subsequent ventilation changes, teams shall make examinations for methane carbon monoxide, and oxygen deficiency at the location of all placards where any of these gases were encountered on the initial exploration into the area. These tests shall be made prior to the entire team passing the initial location of the placard. Tests are not required at other locations upon re-entry. Areas that are affected by ventilation changes but not re-entered by a team need not be retested.

25. Improper procedure when testing with gas detectors, testers, and indicators, total discounts not to exceed 6 points per team member during working of problem___2

A proper test for methane, carbon monoxide and oxygen shall require the following actions by the team:

METHANE - Detector shall be held at eye level or higher

CARBON MONOXIDE - Detector shall be held at chest (between neck and waist) level

OXYGEN DEFICIENCY - Detector shall be held below the waist level

The team member shall verbally identify each test.

E. Miscellaneous

26. Failure of team captain to legibly mark date, initials, and team number on the check board at mine portal or fresh-air base after the timing device is started, each omission___2

    Captain must legibly mark date, initials, and team number on check board after clock is started but before the entire team travels inby the fresh-airbase.

    Team number means the team's working position number drawn during registration at the Contest.

27. Failure of the captain to mark legibly, with chalk, the date and his/her initials at the following locations: barricades, stoppings, ventilation doors, seals, walls of overcasts and undercasts, the location of all faces, bodies, live persons, doors of refuge alternatives and points where objects/conditions prohibit further travel in that direction, not to exceed 12 points___2

    These dates and initials must be marked at each required location, during the initial exploration, before the team advances or retreats from that area.

    Dates and initials are not required if the live person or body cannot be reached due to the conditions of the mine.

    The captain must mark the date and his/her initials at team built stoppings, at each location where they are constructed, after the building process has begun but before the clock is stopped or the stopping is moved.

    Such places only need to be marked once. Date and initials are not required at ventilation controls completely destroyed.

    Date means correct month, day, and year.

28. Failure of teams to stop within 50 feet of the fresh-air base to check team members and apparatus___4

    The first examination must be made when the team is stopped within the first 50 feet, and with all team members underground or inby the fresh-air base to check apparatus.

    This examination must be made at the first stop when entire team is inby fresh-air base or portal even though the 50 foot limit has not been reached. This examination is also required on the affected apparatus upon initial re-entry inby the fresh-air base after such apparatus has been repaired or changed.

The team captain shall not exceed 50 feet; however, all team members must be underground, inby the fresh-air base or bottom of air shaft. When the team enters the mine through an air shaft, this examination must be made within 50 feet of the bottom of the air shaft.

29. Any team member traveling more than 25 feet from the captain or No. 5 team member's original stopping point, each infraction___2

    During initial exploration, when a team advances into an intersection and makes a team stop, exploration into the openings will be limited to 25 feet from the captain or No. 5 team member's original stopping point or to the imaginary line of the next intersection, whichever is the lesser distance. (The Captain's stopping point cannot be inby the imaginary line of the next intersection.) See Figure 5.

    At any team stop, travel will be limited to 25 feet from the captain or No. 5 team member's original stopping point.

    The 25 foot limit shall also apply when the team is attached to the lifeline.

30. Captain or other team member who acts to endanger self or patient, 5 points each team member or patient, each infraction maximum 15 points each occurrence___5 (except Part F)

    Each team member that endangers self will be assessed points for each endangerment (when less than three members are involved as described below):

    A. Travel under unsafe roof, unsafe rib, or overhanging brow. See Figures 2 and 2 (a).

       Teams supporting unsafe roof:

       1. If both ends of the unsafe roof have been previously tested by sound and vibration method, timbers must be set in sequence as follows:

          a. set first timber outby unsafe roof

          b. set additional timbers in unsafe roof at no more than five foot intervals

          c. set last timber inby unsafe roof before any other work is done or team members pass through the area

       2. If neither end of the unsafe roof has been examined by the sound and vibration method, roof testing and timbers must be set in sequence as follows:

          a. test roof on outby end of unsafe roof (Rule 23)

          b. set first timber outby unsafe roof

d. set additional timbers in unsafe roof at no more than five foot intervals

e. set last timber inby unsafe roof

f. test roof on inby end of unsafe roof before any other work is done or team members pass through the area (Rule 23)

Outby/inby verbiage is interchangeable depending on the direction the unsafe roof is approached.

B. Travel into or through water over knee deep. When water is encountered, the extent of the water will be denoted by placards.

C. Passing a fire in the same opening or intersection the team is traveling without first extinguishing the fire.

D. Not immediately retreating to the fresh-air base when the manufacturer's warning device of the apparatus is activated. If visual contact has been made with a patient, the patient may be removed simultaneously with the team. (No additional work such as setting/retrieving timbers or the completion of building any structure can be done to rescue the patient.) The team may perform gas test, roof and rib test and D&I's at such location, but may not advance inby the captain's location at the time of the activation or simulation.

a. The activation of the warning whistle will require the team to return to the fresh-air base and change out the apparatus or bottle. If the activation of the warning whistle is a simulated event, the team may simulate replacement (may verbally state changing bottle). Upon re-entry, the 50-foot apparatus check must be made.

E. Removing any roof support that is set, whether found or installed by the team.

F. Ventilating an unexplored area with irrespirable air when the location of a potentially live person is unknown. Any unaccounted for person is considered to be a potentially live person. If a team explores all sides of overcasts or undercasts, all ends of ventilation tubes and the bottom of shafts, the in-between areas are considered explored. This discount will be assessed for each irrespirable mixture passed over each unexplored area (# of mixtures x # of areas x 5 point discount x # of unaccounted for persons (maximum 3 persons).

When a body is located in an area of elongated unsafe roof and the team finds and maps the body, the location of the body will be considered known. This will apply even if there are conditions that prevent the captain from physically examining the body.

31. Any act by a team which may result in an explosion of an explosive air/gas mixture___30 This discount will be assessed for each explosive mixture passed over each unexplored area or ignition source (# of mixtures x # of areas x 30 point discount).

    A. Changing conditions of the mine ventilation system in such a manner that an explosive mixture is moved over an ignition source.

    B. Continuing exploration after conditions are found to indicate an imminent explosion is possible by the presence of an explosive mixture and evidence of fire (visual acknowledgment of a fire, smoke or carbon monoxide above 10 ppm), or continuing exploration when energized electrical equipment, energized circuits (including all batteries except cap light batteries) or energized cables are found in an explosive mixture.

    When a withdraw situation exists at an intersection, the team can go to any location they have already explored at that stop, prior to exiting the mine. The key phrase in this paragraph is "at that stop." This would also apply to withdraw situations encountered not in an intersection.

    A team must continue to explore if it knows there is a continuous non-explosive separation between the explosive mixture and the evidence of fire or energized cables.

    C. Changing conditions of the mine ventilation in such a manner that an explosive mixture is moved over an unexplored area. If a team explores all sides of overcasts or undercasts, all ends of ventilation tubes and the bottom of shafts, the in-between areas are considered explored.

    D. Changing conditions of the mine ventilation in such a manner that an explosive mixture is moved over energized electrical equipment, energized electrical circuits (including all batteries except cap light batteries) or energized cables. Energizing electrical equipment, electrical circuits, or cables in an explosive mixture, or moving any of the above ignition sources into an explosive mixture.

    An explosive mixture will be present when the methane is between five and fifteen percent inclusively and the oxygen is 12.1 percent or

greater. Carbon monoxide, methane and oxygen concentrations will be shown on all gas placards.

32. Failure to locate missing persons, each omission___10

The team must stop and the captain examine, by touching with his or her hand, all missing persons (live persons or body) prior to any team member passing the location of the missing person. This will not be considered a team stop by the rules for the purpose of gas testing.

If the Captain cannot physically examine a missing person located under elongated unsafe roof due to a lack of roof support, a team stop will not be required.

If roof support is provided, bodies located under unsafe roof must be examined before the clock is stopped and after all missing persons have been accounted for. See Figure 3.

33. Failure to bring live person to the fresh-air base, each omission___20

Self-explanatory

34. Failure to properly protect a live or potentially live person(s), each omission___10 (Part A: 10 points; Part B: 2 points each critical skill maximum of 10 points)

A. Proper protection must be used on persons exposed to or found in irrespirable atmospheres. Atmospheres containing less than 19.5 percent oxygen, concentrations of carbon monoxide in excess of 50 PPM or smoke are irrespirable atmospheres. In an irrespirable atmosphere, unconscious patients must be protected by an approved breathing apparatus or device with full face piece. On a conscious person, if conditions permit, an approved self-rescuer may be used. Training models may be used if sterilized and properly assembled. Simulation of proper donning of approved respiratory apparatus shall not be permitted.

B. Critical skill treatment for life threatening bleeding.

1. Direct pressure and elevation	A. Apply direct pressure with a gloved hand B. Apply a dressing to wound (cover entire wound) and continue to apply direct pressure C. Elevate the extremity except when spinal injury exists D. Bleeding has been controlled E. If controlled, bandage dressing in place

Patient may be loaded if needed onto the stretcher and taken to the FAB once bleeding is controlled and bandage dressing is in place.

35. Failure to remove irrespirable atmosphere___30

    If an irrespirable atmosphere is encountered immediately outby an airtight barricade the team must remove the irrespirable atmosphere before breaching the barricade.

    If an irrespirable atmosphere is encountered immediately outby an airtight ventilation structure and verbal contact is made with patient, the team must remove the irrespirable atmosphere before breaching the structure.

36. Refuge Alternative; Teams will be discounted under rule 24 for gas tests and rule 34 for failure to properly protect patient(s).

    When a team finds a refuge alternative, it may be entered by one of the following methods.

    If the atmosphere is respirable, the team (2 members the Captain and another team member) may enter into the airlock after the door is open. The Captain will take a gas test at the inner door, if the air inside the airlock is respirable the team may open the inner door, take another gas test before making contact with the patient(s).

    If the atmosphere outside the refuge alternative is irrespirable the team (2 members the Captain and another team member) will enter and close the outer door and make a gas test to determine that the atmosphere is respirable or irrespirable. If irrespirable, use the purge valve (placard) for 5 seconds to clear the airlock. The captain will take a gas test to determine if the irrespirable atmosphere is cleared. If the atmosphere is respirable, the team will then open the inner door take another gas test before making contact with the patient. Patient must be protected with (apparatus, SCSR or CareVent) before being removed from the refuge alternative.

    Team members entering the airlock may drop their life line at the refuge alternative door (even in smoke) so an airtight airlock is maintained and allow them to move around in the airlock area.

    Objects other than the person or bodies inside the refuge alternative will not need be mapped. Orientation of person or bodies will not need to be mapped as they are found because of limited space of the enclosed refuge alternative. If the live person is unconscious they may be moved outside the refuge alternative before being placed on a stretcher.

37. The atmosphere for the briefing officer shall remain respirable. This cannot be achieved by the use of an apparatus.___10

    The briefing officer cannot be relocated at the fresh-air base to allow irrespirable air to flow across his designated location.

If the briefing officer's designated location is airtight, irrespirable atmospheres can flow over the location when the briefing officer is at the designated location. However, if the briefing officer is outside of the designated location, irrespirable atmospheres cannot flow across the designated location.

Teams will be informed by placard if the designated location is airtight and if there is a door in the designated location that the briefing officer can use to do work in the fresh air base.

The briefing officer's designated location cannot be used for ventilation purposes.

38. Team member talking to or receiving information from an unauthorized person without permission of the judges, each infraction___5

    Unauthorized information given to the team by the patient would be prohibited.

    A person behind a barricade, stopping, etc. may relay information by reading aloud a statement furnished by the judges. No other information on conditions behind the barricade is permitted to be relayed to the team.

39. Failure to follow proper procedure when putting apparatus on patient, each infraction___2

    Mask tightness test is not required for an unconscious patient.

40. Assistance lent by supposedly unconscious patient, each infraction___2

    Would cover patient sitting up unassisted or moving arms so as to help in putting on apparatus, or unconscious patient communicating with team.

41. Teams leaving patient unattended, each infraction___6

    A team member must be within 10 feet of the patient to be considered attended.

42. Failure to remove patient(s) promptly to the fresh-air base, each infraction___6

    a. When a team finds a patient(s), either by visual or verbal contact, every effort must be made to remove them safely and promptly to the fresh-air base. Visual contact will require the captain's presence in the area. Verbal contact is any voice communication from the patient(s) that can reasonably be expected to be heard by the team. Maximum of one (1) live person may be found in each refuge alternative.

    b. When a team reaches a patient(s) (visual contact), every effort must be made to remove them safely and promptly to the fresh-air base. Exploring ahead of the location will be limited to 25 feet in any

direction. The 25 foot limit will be determined from the stopping point at or outby the patient(s).

Once a team reaches a patient(s), (visual contact), the team may perform any function during this team stop; however teams will not be allowed to build ventilation controls, timber unsafe roof or pump water unless necessary to recover the patient(s). The team may not continue to explore while exiting with the patient, unless required by the problem design. Once the team starts to exit the mine with a patient(s) the team must continue directly to the fresh air base or surface before retrieving other patient(s).

c. If the team is in verbal or visual contact with a patient, and the team is unable to immediately reach the patient due to the conditions of the mine, the team may continue to explore if necessary for its own or the patient's safety. During this exploration process, the team may perform any function during team stops. Every patient shall be safely and promptly removed from the mine as soon as means and/or materials are available.

   1. If a team finds a patient(s) under or inby an area of unsafe roof and has the necessary roof support available to recover the patient(s), the team must stop and recover the patient. If a team subsequently finds necessary roof support to recover the patient(s), the team must stop (prior to the No. 5 team member passing the roof support), retrieve the roof support and recover the patient(s). The team may perform any function during this team stop; however, teams will not be allowed to build ventilation controls, timber unsafe roof or pump water unless necessary to recover the patient(s).

   2. If a team finds a patient(s) inby an area of water over knee deep and has a pump available to pump the water, the team must stop and recover the patient. If a team subsequently finds a pump, the team must stop (prior to the No. 5 team member passing the pump), retrieve the pump, pump the water and recover the patient(s). The team may perform any function during this team stop; however, teams will not be allowed to build ventilation controls, timber unsafe roof, or pump water unless necessary to recover the patient(s). Exploration may continue, if necessary, to ventilate an explosive mixture prior to energizing the pump.

43. Failure to erect temporary stopping (airlock) when necessary, each infraction___6

Before breaching airtight separations such as: stoppings, doors, seals, barricades, or removing water roofed, an airlock must be formed if conditions on the other side are unknown. When retreating out of a barricade or coming back through a stopping where an airlock has been erected, it will not be necessary to airlock on the way out if this will not change any existing ventilation.

If a person behind the barricade, stopping, etc. verbally relays to the team that the area is "airtight", an airlock is not required.

A refuge alternative is considered to be airtight and is equipped with an airlock therefore no airlock is required to breach the refuge alternative.

An airlock is formed by erecting a temporary stopping at a location(s) that will provide the equivalent airtight separation as the airtight structure or condition breached by the team. An equivalent airtight separation would require an airlock built for each airtight structure removed within one crosscut. An equivalent airtight separation must also be maintained when pumping water roofed. If the water roofed is in an entry or crosscut one build is required; a 3-way intersection two builds are required; a 4-way intersection three builds are required. If there are two sides blocked, one airlock is needed. If there are three sides blocked, two airlocks are needed. If four sides are blocked, three airlocks are needed. This is the minimum requirements for a solid line map and may not prevent air movement on a dotted line map.

44. Failure to erect temporary stopping, reasonably airtight, each infraction___2

    Materials used to erect temporary stoppings shall be installed and or constructed as intended by problem design.

    If a structure is moved from one location to another, it must be completely dismantled prior to moving.

45. Failure of team to explore or examine workings systematically and thoroughly, each omission___4

    Definitions:

    Inaccessible: All areas of the mine where team travel is blocked by one or more of the following conditions: seals; unsafe roof rib to rib; inextinguishable fires; water over knee deep and caved areas.

    Opening: Any entry or mining that was performed off an entry, room, or crosscut that may or may not connect to another entry, room, or crosscut.

Crosscut: An opening that connects two entries.

Contaminant: Any one or more of the following: smoke; carbon monoxide above 10 PPM; methane above one percent; or less than 19.5 percent oxygen. An entry or crosscut will be considered contaminated until the team finds the end of the contaminant.

A. This should be assessed for not exploring all areas of mine that can be explored without endangering team if problem requires entire mine to be explored or leaving accessible areas unexplored outby where team is working and for passing accessible openings.

B. Unless blocked, teams must advance in the contaminated entry or in entries adjacent to the contaminated entry. When a contaminated entry and adjacent entries are blocked, teams may explore/advance in other nearest accessible entries. However, the team will be discounted if it fails to return to the contaminated or adjacent entry at the first open crosscut, and if not blocked, make all further explorations in the contaminated or adjacent entries before advancing into other areas of the mine.

   If the team encounters contaminants in multiple entries, the team has the option of which entry to examine first. As the team advances into a contaminated entry and subsequently encounters a placard(s) indicating that all contaminants are cleared prior to reaching an intersection, the team must stop (prior to the captain passing the placard(s)) and make further advances in the other contaminated or adjacent entry.

C. When advancing in an entry and an intersection is encountered with open crosscuts on both sides, the team would be required to tie across into the contaminated crosscut first unless the team is required to return to a contaminated entry.

   If the team encounters a contaminant in both crosscuts, the team has the option of which crosscut to examine first. As the team advances into a contaminated crosscut and subsequently encounters a placard(s) indicating that all contaminants are cleared, the team must stop (prior to captain passing the placard(s)) and make further advances in the other contaminated crosscut.

D. Passing or failing to explore an open crosscut.

   Team would be required to travel into this opening and tie across into the next intersection. Teams cannot advance from this intersection before tying outby unless the outby entry is blocked.

Teams advancing inby an opening to a point that the No. 5 team member is at or inby the inby rib line will be considered to have passed that opening. If a contaminant is found in an open crosscut, teams would be required to tie across in this crosscut after accessible outby areas have been explored.

E. Where crosscuts are blocked, the No. 5 team member may not advance beyond the inby corner of the second crosscut before the team ties across and/or behind into all accessible areas outby that crosscut. After the accessible areas outby are completely explored to the side where the two crosscuts were determined, the team will be permitted to explore the original entry until it encounters the second crosscut to the other side. This may require building an airlock or ventilation controls such as a stopping, door, etc., or returning to the fresh-air base, and exploring into other entries at the discretion of the team and according to the conditions of the mine.

A refuge alternative is not an "area"; it is a refuge component.

This rule requires team to make all accessible areas outby the second crosscut limit (this would include all sides of areas that are inaccessible such as caved, etc.).

F. Inaccessible areas need not be explored unless the team has explored all accessible areas and there are unaccounted for persons or an explosive mixture to be moved through the inaccessible (unexplored) areas.

Teams will be required to pump water or support the roof to explore the inaccessible areas in these cases, if the necessary materials are provided in the problem.

G. Teams cannot explore behind seals, unless required by the problem and then only after all accessible areas of the mine are explored.

46. Only the ventilation material provided will be permitted to be used during the working of the problem. Erected walls of overcasts/undercasts cannot be removed or altered by the team. An overcast cannot be rebuilt as an overcast if completely destroyed, but if the materials from the completely destroyed overcast are on the field they can be used to build temporary stoppings. Other structures located on the course shall be completely disassembled when moved to other locations.___10

47. Less than five team members completing problem, each person___8

Self-explanatory.

48. Failure to examine lunch pails, each infraction___2

    Lunch pails may contain important information and therefore shall be examined. Any team member may examine the lunch pail provided he/she does not exceed the 25 foot limit of the captain or No. 5 team member at a team stop. Lunch pails under unsafe roof need not be examined unless teams enter the area.

49. Any act by a team member that violates the intent of the problem design layout, each location___10

    A. This would include traveling into or passing materials through areas indicated to be impassible by placards or intended to be impassible by the physical condition indicated. Examples of such areas would include, but not be limited to, caved areas, ribs, faces, water roofed, etc.

    B. Isolating equipment, or other energized electrical components with structures other than those depicted in the legend will not be acceptable.

    C. Mobile equipment cannot be moved unless indicated as operable on placards.

    D. Ventilation structures built by the team may only be placed perpendicular across an entry, crosscut, or opening, or diagonally from corner to corner at intersections. (Exception: Brattice cloth in lieu of frames may be used to erect a line curtain which can only extend from a face, barricade or airtight separation to the outby intersection.)

    E. Team members holding up brattice cloth in an attempt to clear a contaminant shall be discounted under this rule and the contaminant shall not be cleared. Line Curtain is the designated curtain provided for teams to hold up in order to remove contaminants. (If brattice cloth is to be used it must be used in lieu of frames when extending a line curtain)

    F. Visually comparing briefing officer's map with any team maps.

50. Failure to comply with other written adopted National Rules not covered in Discount Sheets, each infraction___2

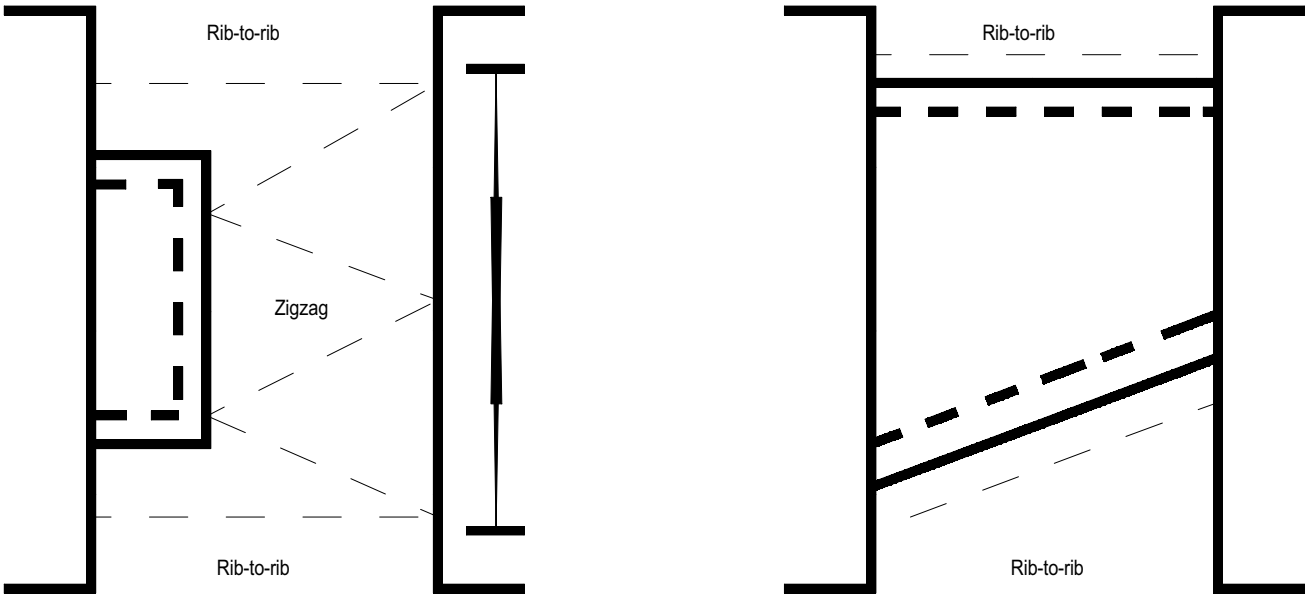
51. Failure of team to follow written instructions provided to the team for working of the Contest problem, maximum per item___15

    Written problems/instructions should deal with exploration, rescue, recovery and ventilation. If covered under another rule, don't include in written problem/instructions (e.g., spelling, mapping, etc.)

Written instructions will be defined as anything given to team after the clock is started. Any information in the written statement given to the team before the clock is started is to inform the team of the conditions leading up to the event and known conditions after the event and will not be discounted under this Rule.

Figure 1(a)

PROPER METHOD OF ROOF TESTING



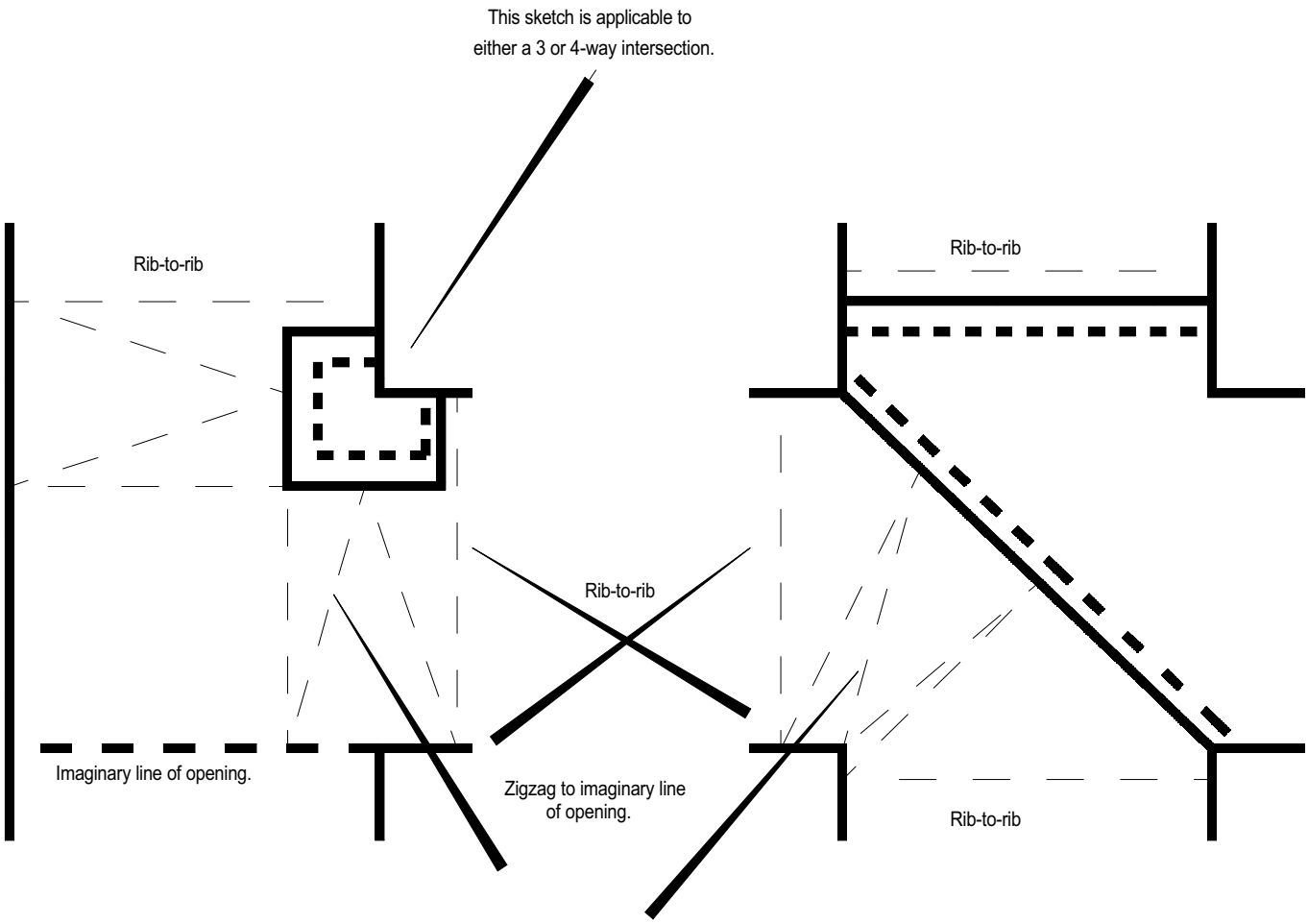
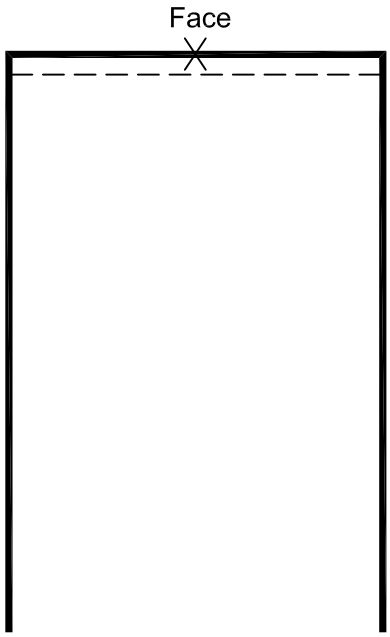
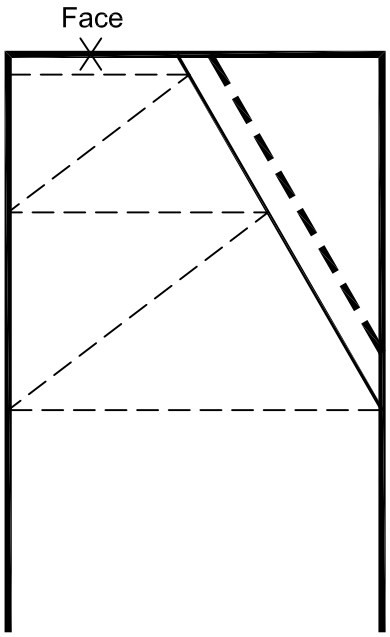


Figure 1 (b)

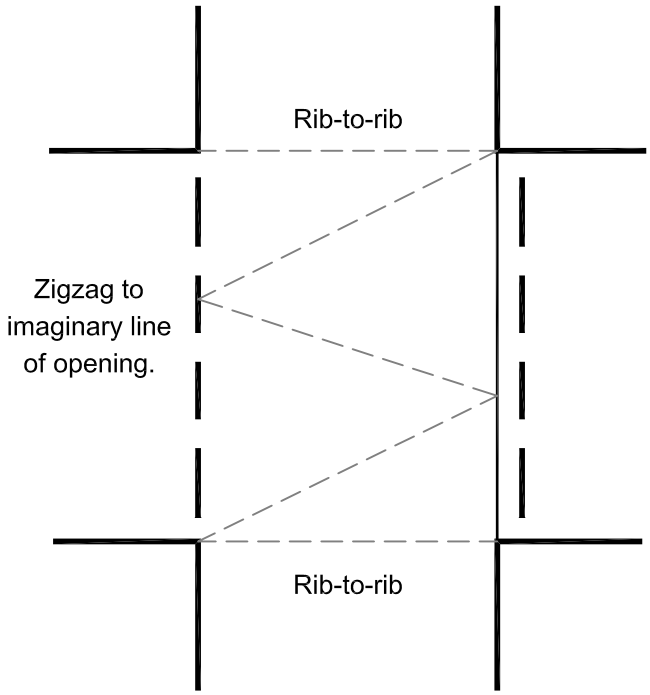
PROPER METHOD OF ROOF TESTING (cont.)



Face, Roof, and Ribs Tested.



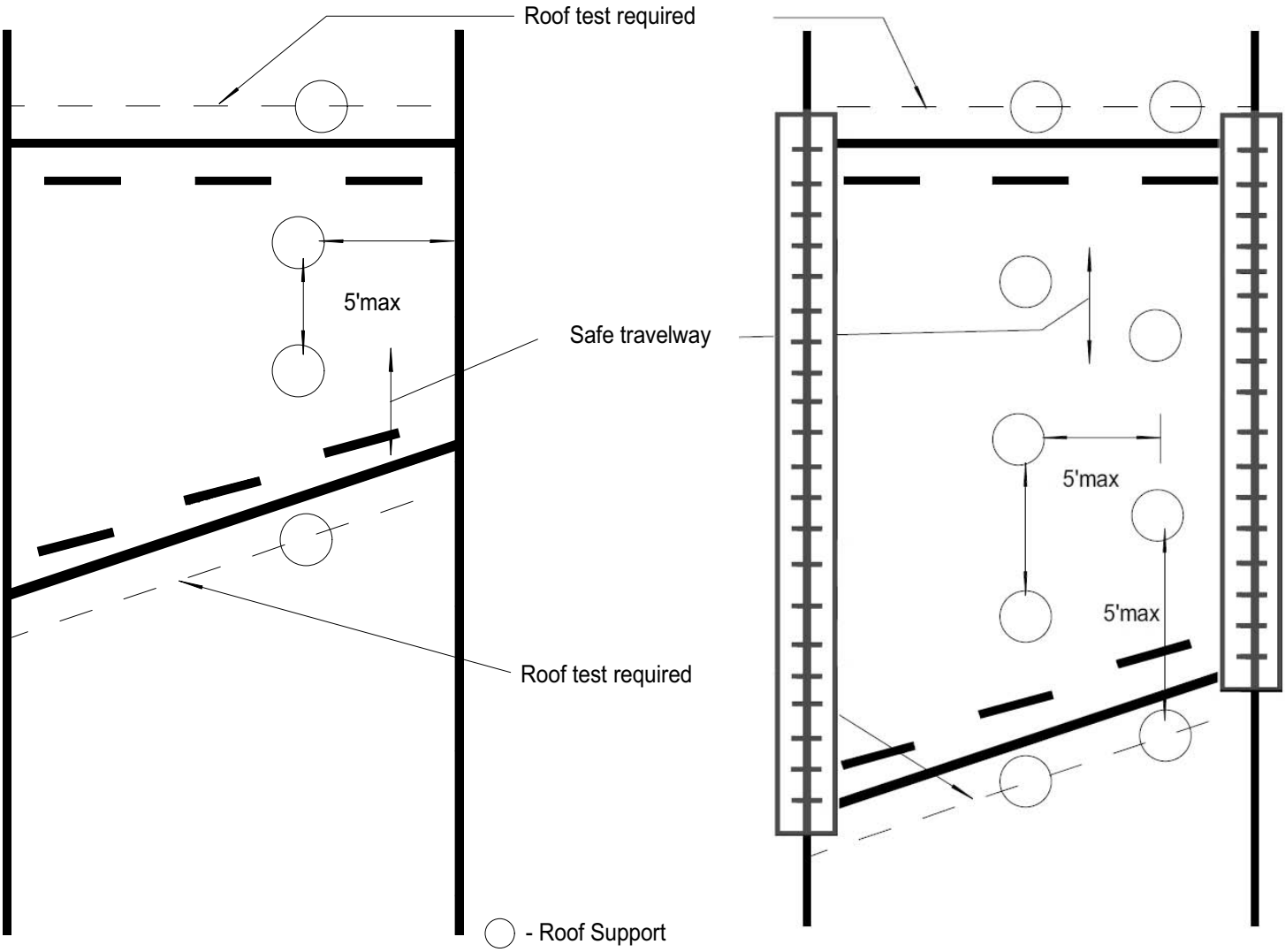
Face, Roof, and Rib at Face.



This sketch is applicable to either 3-way or 4-way intersection.

Figure 2

EXAMPLES OF PROPER METHODS OF SETTING ROOF SUPPORTS



5' maximum width travel way may be established between one row of supports and a safe rib or between two rows of supports.

No roof test required IN area of unsafe roof.

Simulate setting support by standing in proper location and then placing on floor.

If the unsafe roof is less than 5 feet in length, a minimum of three supports must be set; one on each end and one under the unsafe roof.

Figure 2(a)

EXAMPLE OF PROPER METHOD OF SETTING ROOF SUPPORT THROUGH UNSAFE ROOF INTERSECTION

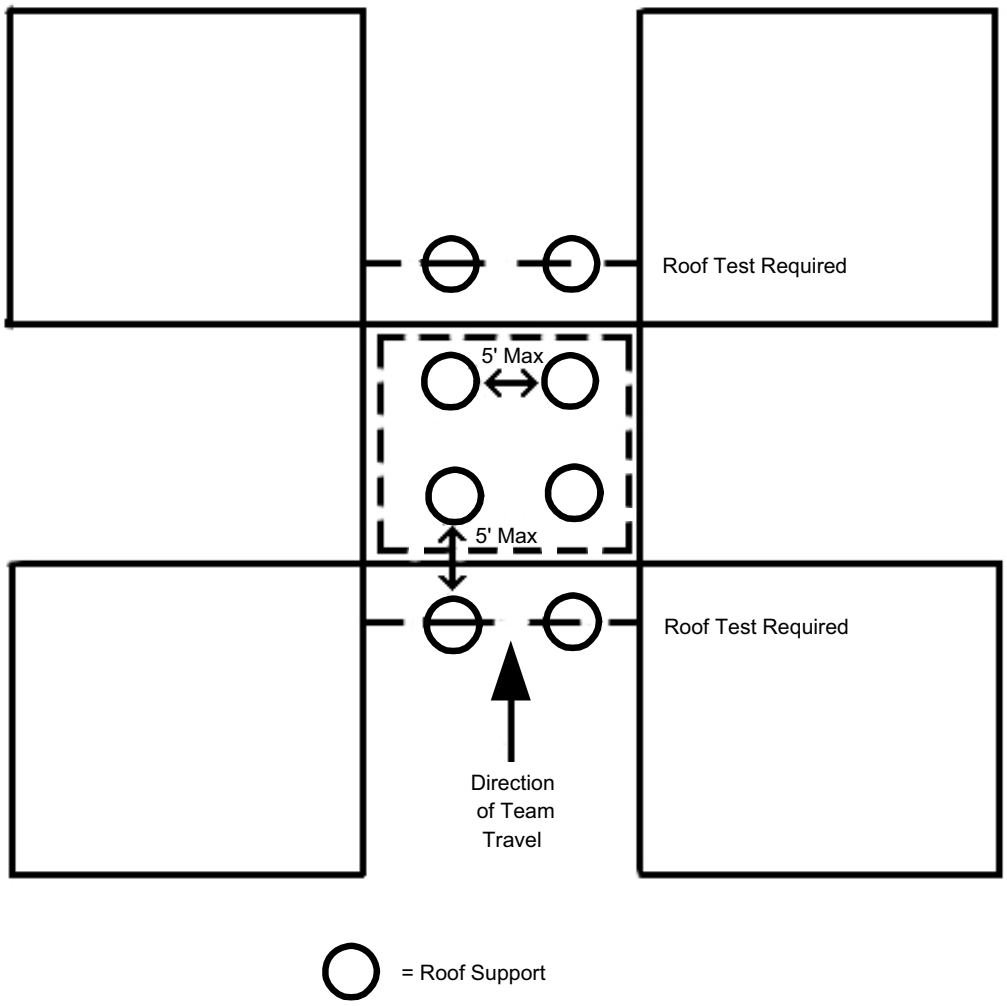


Figure 3

PROPER INSTALLATION OF ROOF SUPPORT TO RECOVER A PATIENT LOCATED UNDER AN AREA OF ELONGATED UNSAFE ROOF

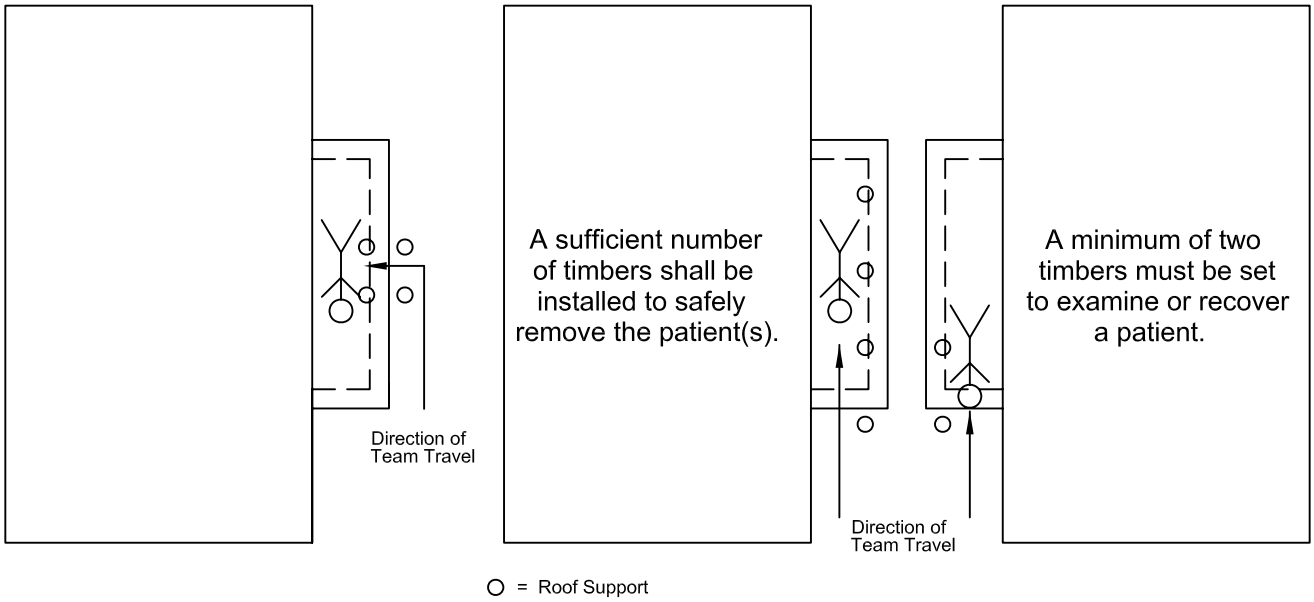


FIGURE 4
EXTENT OF GAS SKETCH

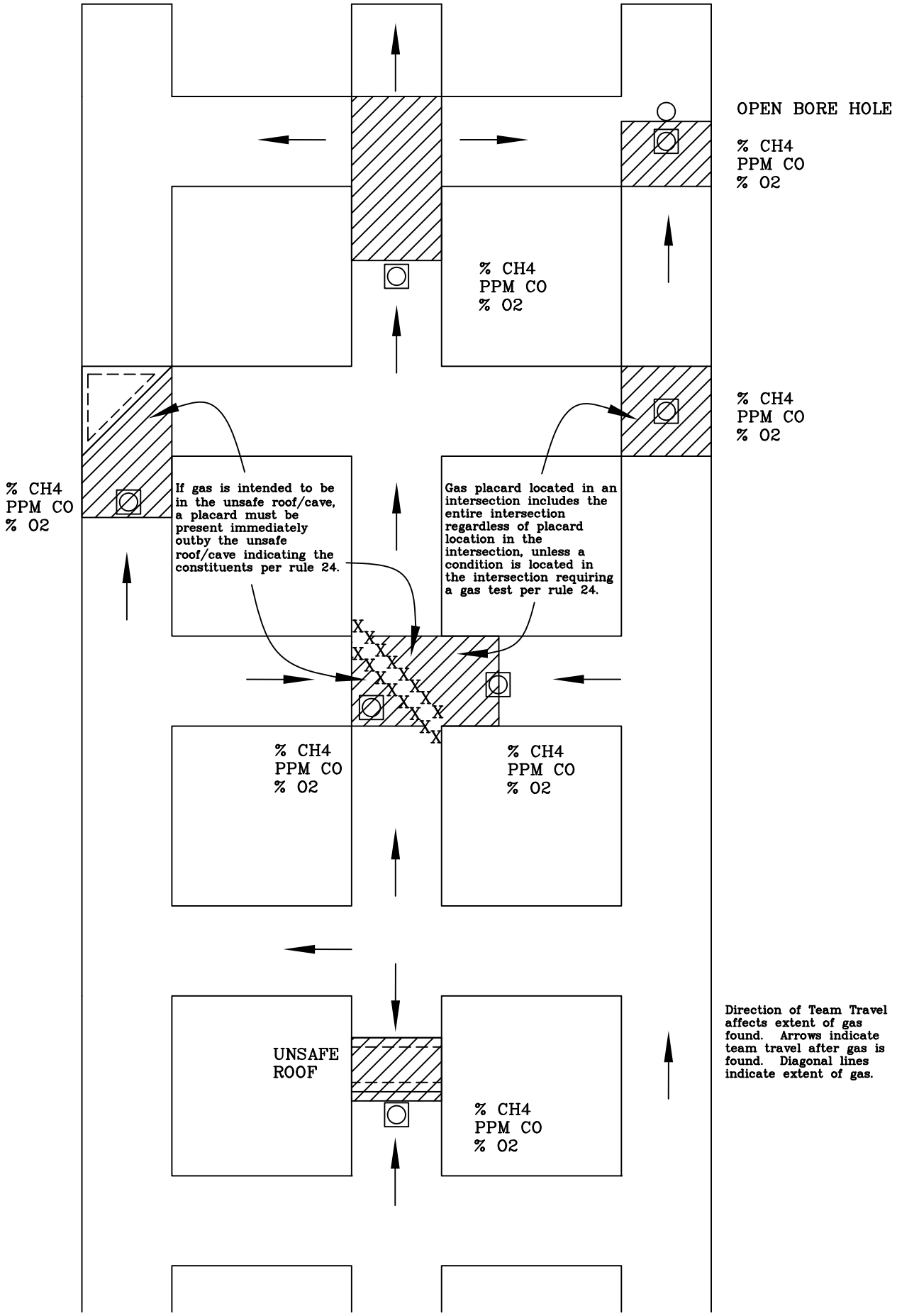
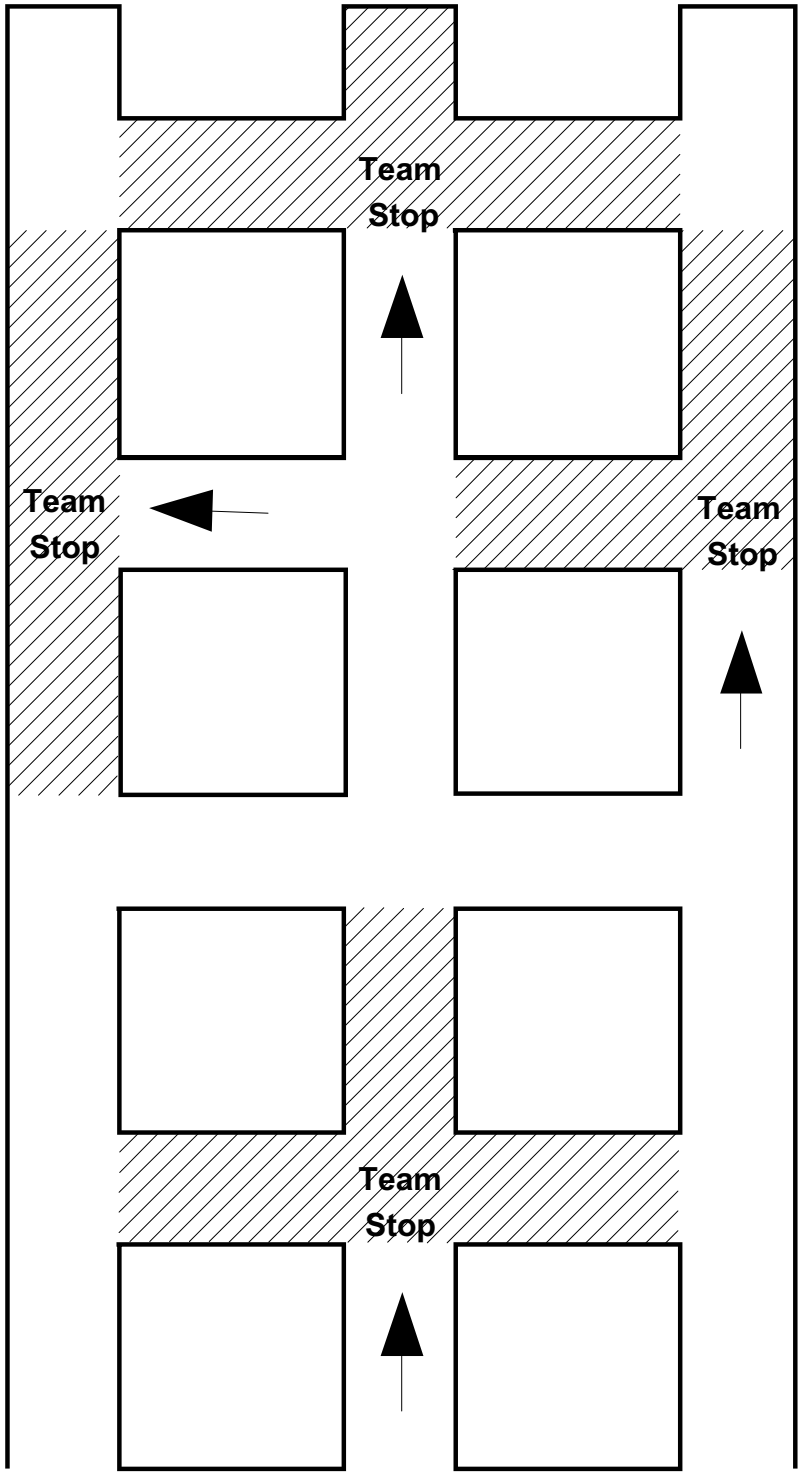


Figure 5

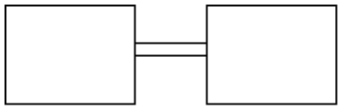
Example of Initial Exploration Under Rule 29



Direction of Team Travel

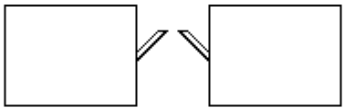
Maximum Extent of Exploration **(25')**

MINE MAP LEGEND



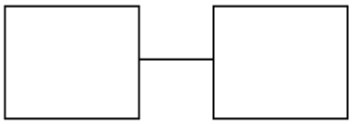
PERMANENT STOPPING

Stopping intact, airtight (No indication of opening(s) or leakage).



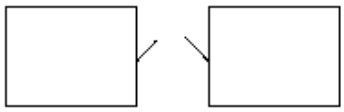
PERMANENT STOPPING NOT INTACT, NOT AIRTIGHT

Condition noted on placard must be shown on map.



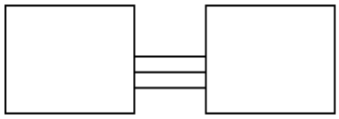
TEMPORARY STOPPING

Stopping intact and airtight, this symbol must be used for all newly erected, intact and airtight, structures built by the team.



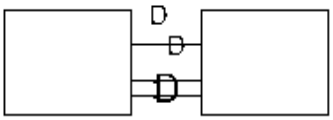
TEMPORARY STOPPING NOT INTACT, NOT AIRTIGHT

Condition noted on placard must be shown on the map.



SEAL

If the seal is equipped with devices such as sampling tubes or water traps, or is damaged, leaking, or destroyed, that particular device or condition must be noted beside the symbol.

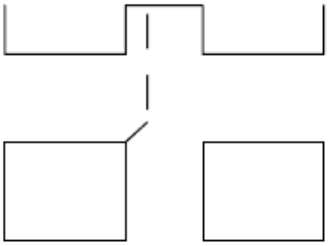


DOOR

Can be shown by itself or in ventilation controls. However, the type and size (if indicated by placard) and “open” or “closed” must be written out. Letters to indicate doors or barricades can be parallel or perpendicular to or on the stopping, or adjacent to the structure as shown.

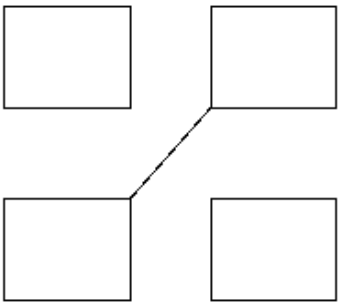
LINE CURTAIN

Designated curtain provided for removing contaminated or explosive gases. Hand held by the team.



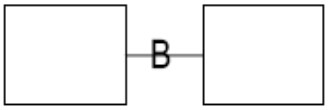
LINE CURTAIN INSTALLED

The full extent of the line curtain shall be shown. If the line curtain is partially or completely down, it must be noted beside the symbol. It cannot be folded or rolled up.



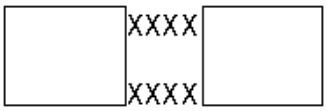
DIAGONAL

Temporary stoppings used to form a diagonal in an intersection, shall extend from corner to corner.



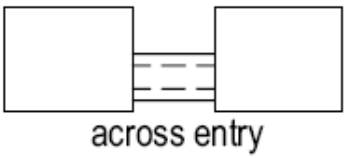
BARRICADE

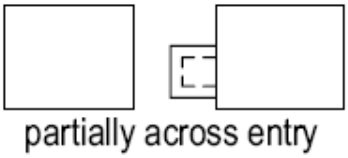
If the placard indicates that the barricade is damaged, leaking, or destroyed, that particular condition must be noted beside the symbol.



CAVED

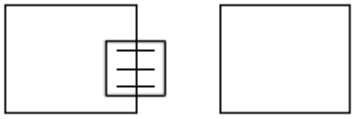
Caved areas are not considered airtight unless the placard states “airtight” and it will have to be written out on the map (“airtight”) beside the symbol.





UNSAFE ROOF

Placard must state “unsafe roof”. Any other condition designated must be noted beside the symbol.. Outline size if indicated by placard or markings.

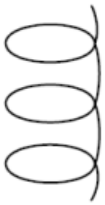


UNSAFE RIB OR OVERHANGING BROW

Project over ribline and area on map.

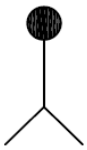
WATER

Symbol indicates start and end of water or changes in depth of water. Write out depth(s) as shown on placard.



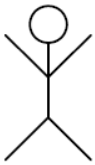
SMOKE

Write out “light” or “dense” if indicated on placard; draw in entire extent of smoke.



BODY

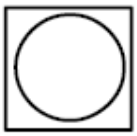
Indicate position of head and feet as body is found. If the word “body” is on the placard, show symbol for body and denote the additional information that is shown on the placard.



LIVE PERSON

Write out condition indicated on the placard, such as conscious, unconscious, walking, etc., indicate position if lying down.

BRATTICE CLOTH



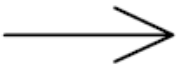
PLACARD INDICATING GAS MIXTURE

Write out as indicated on placard.

_____ % CH4

_____ PPM CO

_____ % O2

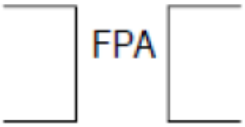


AIR MOVEMENT

Write out quantity if shown on placard.

FIRE

Write out "smoldering", "raging", etc., if shown on placard. The fire symbol must be placed over the object on fire.

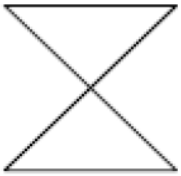


FARTHEST POINT OF ADVANCE IN ENTRY, ROOM, OR CROSSCUT

This symbol should only be used where areas inby the farthest point of advance will not be explored.

FAN

Write out conditions of fan as indicated by placard.



OVERCAST OR UNDERCAST

This symbol is to be used for placards indicating “overcast/undercast” or “overcast wall”. If the overcast or undercast is damaged, leaking, or destroyed, that particular condition must be noted beside the symbol.

LOCATION OF ANY OTHER OBJECTS, CONDITIONS, OR EQUIPMENT

Write the name of the object, condition, or equipment by the symbol. This also includes faces if indicated by a placard.

ANY ROOF SUPPORT INSTALLED BY THE TEAM

REFUGE ALTERNATIVE

A refuge alternative is considered to be an undamaged and airtight unit equipped with an airlock. For contest work a refuge alternative will be the prefabricated type and will not block ventilation through an entry where the component is located or prohibit exploration around the component.

The symbol “RA” may be located outside of the RA, the symbol is to remain upright with door oriented as found.

NOTE: Two maps will be provided to each team. The scale on the maps will be 1 inch is equal to 10 feet.

SELF-CONTAINED BREATHING APPARATUS

Biomarine, BioPak 240-S Donning Procedures

A. Don Facepiece

1. Tighten lower straps simultaneously
2. Tighten temple straps simultaneously
3. Tighten forehead strap (if face piece has this strap)

B. Simulate the inhalation valve check by verbally stating:

"I am using my hand to block the inhalation port of the face piece and inhaling. There are no leaks present. I am removing the hose cap and reconnecting the inhalation hose to the face piece". (This can be stated by the captain.) OR with neoprene hoses, grasp inhalation hose and inhale.

C. Perform exhalation valve test

1. Grasp exhalation hose and exhale

D. Open oxygen bottle valve full counter clockwise and then turn back 1/4 turn

Biomarine, BioPak 240 Revolution Donning Procedures

A. Don Facepiece
   1. Tighten lower straps simultaneously
   2. Tighten temple straps simultaneously
   3. Tighten forehead strap (if face piece has this strap)

B. Open oxygen cylinder valve by turning counter clockwise until the valve stops

C. Perform exhalation valve test
   1. Grasp inhalation hose and inhale

D. Perform inhalation valve test
   1. Grasp exhalation hose and exhale

E. Depress the emergency bypass valve to verify proper operation

Draeger BG-4 Self Contained Breathing Apparatus

A. Procedures for getting under oxygen:
   1. Put on facepiece properly and tighten straps. Open cylinder valve fully, then close one-half turn.
   2. Observe the Monitron or Sentinel Pressure Gauge and Warning Module:
      (a) Green indicator light - Apparatus O.K.
      (b) Red Indicator light - Apparatus faulty
      (c) PSI Reading
   3. Tightly squeeze both breathing hoses and breathe in until a vacuum is produced. Hold your breath for an instant; the vacuum must be maintained, otherwise the straps on the mask must be tightened.
   4. Check gauge and operation, straps, etc., prior to leaving fresh-air base.

CAREvent® DRA

Automatic Rescue Ventilator

A. Procedures for getting under oxygen:

1. Bring mask close to face, check cylinder pressure and open cylinder valve. Face mask straps may be placed over the head and the mask allowed to hang loosely prior to opening cylinder valve. This will suffice for bringing the mask close to the face.
2. Put on facepiece properly and tighten straps; observe gauge.
3. Check gauge and operation, straps, etc.
4. Check cylinder pressure every five (5) minutes.

Note: CAREvent® DRA cylinder and regulator must be transported and used in a protective case to prevent damage.

DETECTING INSTRUMENTS

CMX 270 Continuous Carbon Monoxide, Methane, and Oxygen Monitor

A. Checking instrument:

1. Turn unit on by backing off knurled knob and inverting calibration cover. Tighten knurled knob. (Do this prior to starting the clock for the working of the Contest problem.) Visually inspect the digital display.
2. In the battery failure mode, the liquid crystal display (LCD) becomes blank except for the numeral "1" and the word "LOBAT", and the audible alarm sounds a continuous tone. Approximately one-half hour before this condition, the audible alarm begins to beep periodically.
3. If the instrument's methane sensor should malfunction, the monitor will go into a failure mode similar to the low battery failure mode. The word "FAULT" will appear in the lower left corner of this display, and the audible alarm will sound a continuous tone.

B. Tests for carbon monoxide/methane/oxygen:

1. When activated, the CMX 270 detects and measures concentrations of carbon monoxide, methane, and oxygen in ambient air continuously and simultaneously. Also, when activated, the instrument will automatically reveal the oxygen content on the digital LCD. Since the Contest rules require the oxygen deficiency tests to be made last, the instrument should be put into a different readout mode before tests at the gas box are made.
2. All gas measurements are revealed in the digital LCD. The type of readout desired is selected by activating one of three touch type switches on the front of the case.
3. Carbon monoxide is measured and displayed in parts per million (ppm), methane is percent by volume, and oxygen is percent by volume.

MSA Passport Personal Alarm

A. Checking instrument:

1. Turn the instrument on by pressing the On/Off button on the control face panel. (Battery pack should be secured to instrument prior to starting the clock for working of the contest problem.) Visually inspect the digital display after it stabilizes.
2. Check the battery condition by pressing the page button. Battery condition and voltage will be displayed. BATT appears in the exposure display, alarm lights flash, and alarm sounds. After initial LOW warning, (instrument will function for only approximately 30 minutes more). The alarm sounds every five minutes until power is turned off or the battery condition is at VERY LOW level. Very low battery is no longer able to operate the instrument and unit shuts down automatically.
3. Visually check instrument for damage.

B. Testing for carbon monoxide/methane/oxygen:

1. When activated, MSA Passport detects and measures concentration of carbon monoxide, methane and oxygen in the ambient air continuously and simultaneously.
2. All gas measurements are revealed in the digital liquid crystal display (LCD) and all are displayed simultaneously.
3. Carbon monoxide is measured and displayed in parts per million (ppm), methane and oxygen are displayed in percent by volume.

LTX 310 Multi-Gas Monitor

A. Checking instrument:

1. Turn the instrument on by pressing the On/Off button on the control face panel. The HOLD screen appears and the instrument sounds a beep approximately once a second. Continue holding the On/Off key until the RELEASE screen appears.
2. The following start-up screens will be displayed.

   DISPLAY TEST - All segments of the display are activated to verify proper operation.

   BATTERY TEST - The battery charge condition is displayed as either

   NORMAL (at least eight hours of operation) or LOW (there may not be sufficient charge to operate the instrument for eight hours).

   SENSOR CONFIGURATION - Displays the types of installed sensors.
3. Visually check instrument for damage. Visually inspect the digital display after it stabilizes.

B. Testing for carbon monoxide/methane/oxygen:

1. When activated, LTX 310 detects and measures concentrations of carbon monoxide, methane and oxygen in the ambient air continuously and simultaneously.
2. All gas measurements are revealed in the digital liquid crystal display (LCD) and all are displayed simultaneously.
3. Carbon monoxide is measured and displayed in parts per million (ppm), methane and oxygen are displayed in percent by volume.

TMX 410 Multi-Gas Monitor

A. Checking instrument:

1. Turn the instrument on by loosening the finger nut at the base and rotate the calibration cover. Rock On/Off switch to the left. The four LED's will flash once and the instrument will emit a short beep.
2. The following start-up screens will be displayed.

   DISPLAY TEST - All segments of the display are activated to verify proper operation.

   BATTERY TEST - If the battery is not fully charged, the voltage reading will blink. When there is insufficient charge for the instrument to function properly, the display will read BATTERY FAIL (Instrument cannot be used).

   SENSOR CONFIGURATION - Displays the types of installed sensors.

   CODE - Normal startup continues without any operator response.
3. Visually check instrument for damage. Visually inspect the digital display after it stabilizes.

B. Testing for carbon monoxide/methane/oxygen:

1. When activated, TMX 410 detects and measures concentrations of carbon monoxide, methane and oxygen in the ambient air continuously and simultaneously.
2. All gas measurements are revealed in the digital LCD and all are displayed simultaneously.
3. Carbon monoxide is measured and displayed in parts per million (ppm), methane and oxygen are displayed in percent by volume.

TMX 412 and ATX 620 Multi-Gas Monitors

A. Checking instrument:

1. Turn the instrument on by pressing and holding the mode button on the bottom of the instrument for 5 beeps.
2. The following start-up screens will be displayed.

   DISPLAY TEST - All segments of the display are activated to verify proper operation.

   BATTERY TEST - If the battery is not fully charged, the voltage reading will blink. When there is insufficient charge for the instrument to function properly, the display will read BATTERY FAIL (Instrument cannot be used).

   SENSOR CONFIGURATION - Displays the types of installed sensors.

   CODE - Normal startup continues without any operator response.
3. Visually check instrument for damage. Visually inspect the digital display after it stabilizes.

B. Testing for carbon monoxide/methane/oxygen:

1. When activated, TMX 412 and ATX 620 detect and measure concentrations of carbon monoxide, methane and oxygen in the ambient air continuously and simultaneously.
2. All gas measurements are revealed in the digital LCD and all are displayed simultaneously.
3. Carbon monoxide is measured and displayed in parts per million (ppm), methane and oxygen are displayed in percent by volume.

CSE Explorer 4 Multi-Gas Monitor

A. Checking instrument:

1. Turn the instrument on by pressing either key on the side of the instrument. The main menu will appear on the display.
2. Press the right key to select the main operate display. All installed gas sensors will be displayed.
3. Press the left key to display the battery charge condition.
4. Visually check the instrument for damage. Visually inspect the digital display after it stabilizes.

B. Testing for carbon monoxide/methane/oxygen:

1. When activated, Explorer 4 detects and measures concentrations of carbon monoxide, methane and oxygen in the ambient air continuously and simultaneously.
2. All gas measurements are revealed on the digital display and all are displayed simultaneously.
3. Carbon monoxide is measured and displayed in parts per million (ppm), methane and oxygen are measured and displayed in percent by volume.

ITX Multi-Gas Monitor

A. Checking instrument:

1. Turn the instrument on by pressing the ON/OFF button on the control face panel for one beep. "Warm up" appears on the LCD.
2. Zero – Press (on/off mode) until "zero sensors" appears. Press "E" to start zeroing.
3. Peaks – Press (on/off mode) to view peaks. Press (E) to reset peaks.

Following start-up screen will display:

Sensor configuration – Displays the types of installed sensors.

Display test – All segments of the display are activated to verify proper operation.

Battery test - A battery status indicator is shown in the center of the display. As the instrument battery life is reduced, the shaded area of the battery indicator will clear until the instrument reaches the low battery condition. (24 hr. usage with full charge)

Visually check instrument for damage.

B. Testing for carbon monoxide/methane/oxygen:

1. When activated, ITX detects and measures concentrations of carbon monoxide, methane and oxygen in the ambient air continuously and simultaneously.
2. All gas measurements are revealed in the digital liquid crystal display (LCD) and all are displayed simultaneously.
3. Carbon monoxide is measured and displayed in parts per million (ppm), methane and oxygen are measured and displayed in percent by volume.

MSA Solaris

A. Checking Instrument:

1. Turn the instrument on by pressing on/off button on the side of the instrument.
2. The following start-up screens will be displayed.

   SELF TEST – All segments display, audible alarm sounds, alarm lights illuminate, vibrator activates, software version displays, along with internal diagnostics

   ALARM SETPOINTS – Low, High, STEL(if activated), and TWA(if activated)

   CALIBRATION GAS – Expected calibration gas values

   TIME AND DATE - If data logging option installed

   LAST CAL DATE - If data logging option installed

   CAL DUE DATE - If data logging option installed

   INSTRUMENT WARM-UP PERIOD

   FRESH AIR SETUP OPTION
3. Visually check instrument for damage. Visually inspect the digital display after it stabilizes.

B. Testing for carbon monoxide/methane/oxygen:

1. When activated, MSA Solaris detects and measures concentrations of carbon monoxide, methane, and oxygen in the ambient air continuously and simultaneously.
2. All gas measurements are revealed in the digital liquid crystal display (LCD) and all are displayed simultaneously.
3. Carbon monoxide is measured and displayed in parts per million (ppm), methane and oxygen are displayed in percent by volume.

M40M Multi-Gas Monitor

A. Checking instrument:

1. Turn the instrument on by pressing the power button on the control face panel for one beep. This is the second button from the left and is the international symbol for power with a circle with a slash at the 12 o'clock position.
2. Zero – Press the up arrow (^) button once and "0" appears. Press the "Enter" button to start the zero process. This enter button is the third button from the left and is the international symbol for enter that is composed of a left descending arrow.
3. Peaks – Press the up arrow button (^) twice to view peaks. While viewing the peak readings press "Enter" to clear.

Following start-up screen, all the segments of the display illuminate to verify proper operation. This is followed by the software revision number. This in turn is followed by a 20 second count down timer. All installed sensors will then display.

A battery status indicator is shown in the lower left corner of the display. As the instrument battery life is reduced, the shaded area of the battery indicator will clear until the instrument reaches the low battery condition. (18 hr. usage with full charge)

Visually check instrument for damage.

B. Testing for carbon monoxide/methane/oxygen:

1. When activated the M40M detects and measures concentrations of carbon monoxide, methane and oxygen in the ambient air continuously and simultaneously.
2. All gas measurements are revealed in the digital liquid crystal display (LCD) and all are displayed simultaneously.
3. Carbon monoxide is measured and displayed in parts per million (ppm), methane and oxygen are measured and displayed in percent by volume.

MX4 and MX6 iBrid Multi-Gas Monitors

A. Checking instrument:

1. Turn the instrument on by pressing and holding the center [Enter] navigation button on the lower front of the instrument for at least 3 seconds.
2. After power up, a series of startup screens are displayed on the LCD.

   STARTUP SELF TEST – Depending on configuration, startup screens may be displayed.

   NORMAL OPERATION MODE – The types and readings of all installed sensors are displayed.

   BATTERY STATUS – Under the main menu [VIEW] option, select [BATTERY] to view the battery status.
3. Visually check instrument for damage. Visually inspect the LCD display after it stabilizes.

B. Testing for carbon monoxide/methane/oxygen:

1. When activated, instrument detects and measures concentration of carbon monoxide, methane and oxygen in the ambient air continuously and simultaneously.
2. All gas measurements are revealed on the LCD and all are displayed simultaneously.

Carbon monoxide is measured and displayed in parts per million (ppm), methane and oxygen are displayed in percent by volume.

Drager X-am 2000 and Drager X-am 5000 Multi Gas Detectors

A. Checking instrument:

Switching on the device:

•Press and hold the [OK] key for approximately 3 seconds until the countdown shown on the display has expired.

- All the display segments, including the visual, audible and vibration alarms, are activated for a short time.

- The device performs a self-test.

- The remaining operating time is displayed. Note: (battery status)

- All alarm set points are displayed in succession.

Check that the gas inlet opening on the device is not covered.

Visually check instrument for damage. Visually inspect the digital display after it stabilizes.

B. Testing for carbon monoxide/methane/oxygen:

1. When activated, Drager X-am 2000 and Drager X-am 5000 detects and measures concentrations of carbon monoxide, methane and oxygen in the ambient air continuously and simultaneously.
2. All gas measurements are revealed in the digital LCD and all are displayed simultaneously.

STATEMENTS OF FACT
MINE RESCUE

1. Under no circumstances will the team ever alter ventilation without orders to do so from the Command Center. (MSHA 3028, pp. 3-3)

2. High temperatures (or heat) cause gases to expand, so they diffuse more quickly. (MSHA 3028, pp. 2-6)

3. The Command Center considers several factors before it orders a change in ventilation, most importantly; it has to consider how the alterations will affect ventilation into an unexplored area. (MSHA 3028 pp. 3-16)

4. A dangerous and sometimes fatal mistake that responders make is entering an unsafe or hazardous scene. (Brady First Responder, p. 165)

5. With the airway open place your ear over the patient's nose and mouth, and watch for chest movement. (Brady First Responder, p. 172)

6. If the patient is not breathing, check for a carotid pulse at the neck to determine if blood is circulating. (Brady First Responder, p. 174)

7. One of the first critical steps when fighting fire in a mine is to spray water (preferably as fog) downstream (inby the fire) into the path of (as close as possible to) the oncoming flames. (Donald W. Mitchell Mine Fires, p. 5)

8. Stopping smoke rollback is a must because if you cannot control the rollback you probably can't get close enough to fight the fire effectively. (Donald W. Mitchell Mine Fires, p. 19)

9. Gas layering is like smoke rollback with Methane and Hydrogen the likely gases to form layers during a fire. (Donald W. Mitchell Mine Fires, p. 23)

10. The IDLH of Carbon Dioxide is 40,000 ppm.
(NIOSH Chemical Hazards, p. 52)

11. A smoke tube is used to show the direction and velocity of slow moving air.
(MSHA 3028, pp. 3-18)

12. When taking a reading with an anemometer, a commonly used method is to traverse the airway. (MSHA 3028, pp. 3-17)

13. An airlock consists of two doors or two stoppings with flaps or doors in them which are in close proximity to each other in the same passageway. (MSHA 3028, pp. 3-22)

14. The purpose of an airlock is to separate two different atmospheres while still permitting miners to enter and exit without mixing the atmospheres. (MSHA 3028, pp. 3-22)

15. Temporary stoppings built in a crosscut should be placed at least four to six feet into the crosscut in order that sufficient space is available to construct a permanent stopping. (MSHA 3028, pp. 3-21)

16. "Pogo sticks" are devices which may be used to erect temporary stoppings. (MSHA 3028, pp. 3-21)

17. Oxygen is a supporter of combustion. (MSHA 3028, pp. 2-13)

18. Temporary seals should include provisions for collecting air samples from within the sealed area. (MSHA 3028, pp. 5-24)

19. Progressive ventilation is the re-ventilation of a sealed area in successive blocks by means of airlocks. (MSHA 3028, p. 7.6)

20. Direct ventilation is the re-ventilation of an entire sealed area at once. (MSHA 3028, pp. 7-8)

21. Sufficient time should be allowed for a fire area to cool before it is unsealed. (MSHA 3028, pp. 7-5)

22. Normal air has a specific gravity of one. (MSHA 3028, p. 2.6)

23. Besides helping you determine where to test for a gas, specific gravity also indicates how quickly the gas will diffuse and how easily it can be dispersed by ventilation. (MSHA 3028, pp. 2-7)

24. Methane is lighter than air. (MSHA 3028, pp. 2-6)

25. Carbon monoxide is explosive. (MSHA 3028, pp. 2-16)

26. The range of concentrations within which a gas will explode is known as its "explosive range." (MSHA 3028, pp. 2-7)

27. Nitrogen dioxide has a reddish-brown color in high concentrations. (MSHA 3028, pp. 2-18)

28. Color, odor, and taste are physical properties that can help you identify a gas, especially during barefaced exploration. (MSHA 3028 pp. 2-8)

29. Clean, dry air at sea level is made up of 78 percent nitrogen and 21 percent oxygen. (MSHA 3028, pp. 2-11)

30. Oxygen has no odor. (MSHA 2102, pp. 27 & 67)

31. Hydrogen sulfide has an odor similar to rotten eggs. (MSHA 3028, pp. 2-20)

32. The explosive range of methane in air is 5 to 15 volume percent. (MSHA 3028, pp. 2-15)

33. When present in high concentrations (2 percent or higher), carbon dioxide causes you to breathe deeper and faster. (MSHA 3028, pp. 2-14)

34. Carbon monoxide can be detected by means of carbon monoxide detectors, multi-gas detectors, or by chemical analysis. (MSHA 3028, pp. 2-17)

35. The lower explosive limit of hydrogen is 4.0 percent. (MSHA 3028, pp. 2-19)

36. Hydrogen sulfide is flammable and explosive in concentrations from 4.3 to 45.5 percent in normal air. (MSHA 3028, pp. 2-20)

37. Carbon dioxide is non-explosive. (MSHA 3028, pp. 2-14)

38. Air containing 4 to 74.2 percent hydrogen will explode even when there is as little as 5 percent oxygen present. (MSHA 3028, pp. 2-17)

39. A mixture containing as little as 1 ½ to 2 percent methane, together with coal dust, may be explosive. (MSHA 3028, pp. 2-21)

40. Nitrogen is an asphyxiant in above normal concentrations. (MSHA 3028, pp. 2-17)

41. The IDLH of Hydrogen sulfide and Sulfur Dioxide is 100 ppm. (NIOSH Chemical Hazards, pp. 170 & 288)

42. The IDLH of Nitrogen Dioxide is 20 ppm. (NIOSH Chemical Hazards, p. 228)

43. The affinity of carbon monoxide for hemoglobin is 200 to 300 times that of oxygen. (MSHA 3028, pp. 2-16)

44. Carbon Dioxide is the product of oxidation including the decay of timbers. (MSHA 3028, pp. 2-14)

45. About 21 percent of normal air is oxygen. (MSHA 3028, pp. 2-11)

46. Afterdamp is a mixture of carbon monoxide, carbon dioxide, methane, oxygen, nitrogen and hydrogen. (MSHA 3028, pp. 2-27)

47. Afterdamp is usually found after a mine fire or explosion. (MSHA 3028, pp. 2-27)

48. Hydrogen can be detected with a multi-gas detector or by chemical analysis. (MSHA 3028, pp. 2-20)

49. In some mines, carbon dioxide is liberated from the rock strata. (MSHA 3028, pp. 7-6)

50. To detect oxygen deficient atmospheres teams will use an oxygen indicator. (MSHA 3028 pp. 2-14)

51. To test for methane, use a methane detector or chemical analysis. (MSHA 2102, p. 33)

52. Because fire consumes such large quantities of oxygen, there is a hazard of oxygen-deficient air in the mine. (MSHA 3028, pp. 5-18)

53. Nitrogen dioxide is produced by burning and by the detonation of explosives. (MSHA 2102, p. 37)

54. A mixture of coal dust in air reduces the explosive limit of methane. (MSHA 2102, p. 32)

55. If the mine has had an explosion, the team may encounter a great deal of debris, damage to stoppings, and hazardous roof and rib conditions. (MSHA 3028, pp. 3-22

56. Mines below the water table tend to have more methane than those above the water table. (MSHA 2102, p. 33)

57. After a fire or explosion in a mine, rescue teams are usually needed to go into the mine to assess and re-establish ventilation. (MSHA 2103, p. 5)

58. When the fresh air base is set up underground, an air lock must be built to isolate the fresh air base from the unexplored area beyond it. (MSHA 3028, pp. 4-7)

59. Any flammable gas can explode under certain conditions. (MSHA 2102, p. 15)

60. Indirect firefighting methods allow firefighters to remain a safe distance from the fire. (MSHA 2105m p. 35)

61. Temporary seals are built before permanent seals are erected in order to seal off a fire area as quickly as possible. (MSHA 2105, p. 36)

62. In mines where head coal (roof coal) is left, a fire will spread more rapidly. (MSHA 2105, p. 37)

63. One hazard of heat during a fire is that it tends to weaken the roof, especially where head coal is left. (MSHA 2105, p. 32)

64. Fires can be attacked by the use of a foam generator from a distance of 500-1,500 feet. (MSHA 2105, p. 17)

65. It is generally recommended that teams not travel through foam filled areas. (MSHA 2105, p. 17)

66. One method of indirect firefighting is flooding the sealed fire area with water. (MSHA 2105, p. 50)

67. Once an explosion has occurred, there is always the possibility of further explosions. (MSHA 2105, p. 52)

68. Mine rescue teams may find it necessary to use line brattice to sweep noxious or explosive gases from a face area. (MSHA 2103, p. 39)

69. Once ventilation has been re-established and fresh air advanced non-apparatus crews can take over the rehabilitation and cleanup effort. (MSHA 2107, p. 3)

70. Rescue teams are responsible for assessing damage to the ventilation system. (MSHA 2107, p. 4)

71. Information the team relays to the fresh-air base as it proceeds is known as the "progress report". (MSHA 2104, p. 46)

72. It is the responsibility of rescue team members to have all the information needed to do the work. (MSHA 2104, p. 23)

73. When a team locates a body, its location and position should be marked on a mine map and on the roof or rib close to the body. (MSHA 2106, p. 12)

74. The rescue team captain should regulate the team's pace according to conditions encountered. (MSHA 2104, p. 39)

75. When a body is first located, every effort should be made not to disturb any possible evidence in the area. (MSHA 2106, p. 13)

76. In situations too hazardous for teams to explore and reventilate safely, teams may be instructed to seal the area. (MSHA 2105, p. 56)

77. New mine rescue team members must have at least 20 hours of instruction on the breathing apparatus used by the team. (MSHA 2002, p. 23)

78. Before the team leaves the fresh-air base to travel inby, the captain should take note of the time of departure. (MSHA 2104 p. 23)

79. It is recommended that team checks be conducted every 15 to 20 minutes. (MSHA 2104, p. 31)

80. It is recommended that the first stop for a team check be just inby the fresh-air base. (MSHA 2104, p. 32)

81. For teams using a compressed oxygen breathing apparatus, the captain usually notes each team member's gauge reading at each rest stop and reports the lowest reading to the fresh-air base. (MSHA 2104, p. 32)

82. "Tying in" is the process by which you systematically explore all crosscuts and adjacent areas as you advance. (MSHA 2104, p. 38)

83. As the team advances underground, the captain takes the lead. (MSHA 2104, p. 38)

84. It is important that the team pace its work so that it can return to the fresh air base on time. (MSHA 2104, p. 51)

85. As the team advances, the map man records what the team encounters by marking the information on a mine map. (MSHA 2104, p. 48)

86. The team is responsible for choosing the exact sites within headings for building seals. (MSHA 2105, p. 38)

87. Smoke causes a lack of orientation which may cause a team member to lose his/her sense of balance. (MSHA 2106, p. 32)

88. Class B fires involve flammable or combustible liquids. (MSHA 2105, p. 8)

89. Class D fires involve combustible metals. (MSHA 2105, p. 8)

90. Before using a hand held extinguisher it must be checked for the type of fire you are fighting. (MSHA 2105, p. 10)

91. Solubility is the ability of a gas to be dissolved in water. (MSHA 2102, p. 67)

92. Pools of water can release water soluble gases into the air when they are stirred up. (MSHA 2102, p. 16)

93. High expansion foam is light and resilient and can travel long distances to a fire without breaking down. (MSHA 3028, pp. 5-11)

94. Low expansion foam is very wet and heavy and can only be used when you're close enough to a fire to force the foam directly onto the fire. (MSHA 3028, p. 5-10)

95. Take the carotid pulse for 5 to 10 seconds. (Brady First Responder, p. 174)

96. Blood that is bright red and spurting may be coming from an artery. (Brady First Responder, p. 174)

97. Most cases of external bleeding can be controlled by applying direct pressure to the site of the wound. (Brady First Responder, p. 311)

98. Two types of fire cannot be fought directly, fuel rich and spon com (spontaneous combustion), these will be extinguished only by remote controls. (Donald W. Mitchell Mine Fires, p. 27)

99. Team safety must not be compromised. Although "Time is never your friend" do not be in too great a hurry and do not permit others to hurry. (Donald W. Mitchell Mine Fires, p. 45)

100. Monitoring pressures and gases helps determine what is the danger of explosion, how soon firefighters have to move to safety, how effective are the techniques being used and is the fire under control. (Donald W. Mitchell Mine Fires, p. 45)