2009 NATIONAL RULES

MINE RESCUE, FIRST AID, BENCH AND PRESHIFT

SECTION I

2009

MINE RESCUE

RULES

2009 MINE RESCUE CONTEST RULES
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GENERAL INFORMATION FOR CONDUCTING
2009 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.

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 6:30 a.m. 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 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. The entire mine rescue problem including outby ventilation changes shall be contained in an area 6 entries wide by 12 crosscuts deep.

   All pillar blocks will be equal size.

   A team will not be discounted for mapping or ventilation outside of this area.

   Each team will be provided at least two each of the following maps for working of the problems.

   A. Blank maps (1″ = 10′)
   B. Maps of entire area (1″ = 15′)

RULES GOVERNING 2009 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. 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.

   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 and may mark the briefing officer's map from information received from the team. 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.

   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 lamp, and members must be similarly dressed. During the working of the problem, the cap lamps may or may not be turned on. 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.

3. Each team must have its own breathing apparatus approved under either 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 mine rescue communications system approved by MSHA or a sound powered communication system. 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. Anyone anticipating using wireless communication shall notify the Contest Director at official registration for the 2009 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 performed will not be permitted to return to the isolation area or communicate with any teams awaiting their turn to perform.

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 37.

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

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.

   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. The person in charge of the fresh-air base will introduce himself/herself to the team captain and briefing officer upon arrival of the team at the mine portal or fresh-air base. Teams will be allowed to position (this means unloading stretcher) their equipment and lay out lifeline across the fresh-air base prior to the introduction. The person in charge of the fresh-air base will read and present a prepared statement to the team but will not answer questions regarding the problem or conditions in the mine. The prepared statement will include information relating to the mine or section of the mine to be explored.

A maximum of five minutes will be allowed for discussion and preparation after the team receives the written statement. The team will be confined to the fresh-air base during this time period. A video presentation may be used in lieu of reading a prepared statement.

2. Each team will be given a written problem and maps. The timing clock will be started by the team captain immediately after the team receives the blank map and problem. 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. All existing ventilation or ventilation changes made by the team shall be defined by "parallel airflow." Parallel airflow: the shortest or equivalent path that air can flow through the mine from each source. A source is defined as each location where air enters the mine grid. Air flow will take the shortest path from each source through the mine to exit and will not be affected by other independent air flow paths. Line curtain used for ventilation will add one-half pillar block to the parallel air flow path.

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.

   The working time for a problem will start when the team captain starts the recording timing device at the fresh-air base and will continue until the team captain stops the timing device. The team captain must start the timing device immediately after receiving the maps and problem and before any work is done. In the event the captain fails to start or stop the timing device, working time will be determined by the timekeeper and the team will be discounted under Rule 25 (B Card). 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.)

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___1

   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

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).

The team is not responsible for locating and mapping objects/conditions that are initially found in the fresh-air base.

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.

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.

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.

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, closed regulators, 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.

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.

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.

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

A placard indicating person 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 person 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.

The following changes need to be noted on the mine map to indicate the conditions left in the mine and the fresh-air base: changes to ventilation structures (i.e. stoppings, doors, regulators, 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.

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

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. If a check curtain is converted to a temporary stopping, a notation indicating such will suffice.

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

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

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, 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 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, 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.

B. Auxiliary Equipment and Testing Devices

12. 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.

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

    Stretchers: stretchers must be completely unloaded and unfolded to be tested. Then, with a team member wearing an apparatus lying in a prone position with arms extended both ends of the stretcher must be lifted simultaneously. The stretchers cannot be lifted until the clock is started.

    Team member can lie on stretcher prior to starting the clock for stretcher test but stretcher cannot be lifted prior to starting the clock.

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

    Fire extinguishers: extinguishers need not be activated, but a visual examination is necessary. Fire extinguishers shall be 2A10BC Rating and a minimum 5 pound capacity.

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

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

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

15. 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

16. 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.

17. 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.
4 pulls or "Help"	Team is in distress.

    A team using a telephone or a mine rescue 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 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.

Failure to notify the briefing officer with phone 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 lifeline while traveling. The team lifeline shall be not more than 28 feet in length and a nonextendable tagline not more than 36 inches in length may be used from a team member to the team lifeline.

18. The team must notify the briefing officer and obtain his or her permission before ventilation changes are made or power circuits 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 an existing check curtain is used to direct ventilation, the check curtain must first be converted into a temporary stopping. If water is

being pumped, teams must wait until placards have been changed by the Contest officials before assuming the water has been lowered.

When the team requires a ventilation change to be made by the back-up team(s), each change will require a minimum of two minutes. During this time no additional work or team moves will be allowed. Making apparatus check or reviewing the map will not be considered work. Once the change has been submitted, the team cannot stop or change the request. Each change will require an additional two minutes. All changes must be initialed by a member of the team.

19. Failure to take lifeline or other communication system into the mine___10

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

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

    Lifeline dropped by all members.

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

21. In smoke, any team member not having hold of lifeline, telephone line, or having either 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. Would include checking entrances or portals inby the imaginary line of the openings. Any part of a team member (hand, etc.) in smoke, team member is in smoke.

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

22. Failure of captain to test the roof, face, 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, building frames for a line curtain, rebuilding a stopping that is completely

destroyed, converting an existing check curtain to a temporary stopping, 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. The one exception would be for designated areas of unsafe roof which are located in or on the imaginary line of an intersection. In these cases, the sound and vibration method must be made as soon as the captain discovers the placard indicating the unsafe roof. 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 zig zag 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.

23. Failure to make necessary gas tests where required, each omission___2

    A. If conditions permit, tests for carbon monoxide, methane, 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 normal 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. Carbon monoxide, methane, and oxygen deficiency tests shall be made in each opening to an intersection before the team advances 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.

   Teams will be assessed two points for each required gas test that is not taken, thus if team fails to test for all gases in an opening this will be a six point discount.

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 carbon monoxide, methane, 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 placard indicating a change in the gas constituents. If carbon monoxide, methane or oxygen deficiency is encountered in other locations, it will be considered to extend to a placard indicating a change in the gas constituents or the next normal 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 placards or by results of the tests. See Figure 4.

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 carbon monoxide, methane 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 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.

24. 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

25. Failure of team captain to legibly mark date, initials, and team number on the check board at mine portal or fresh-air base or to start timing device promptly after receiving the problem and map, 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.

26. Failure of the captain to mark legibly, with chalk, the date and his/her initials on barricades, stoppings, ventilation doors, seals, regulators, walls of overcasts and undercasts, and check curtains converted to stoppings, and at the location of all faces, bodies, live persons 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 or on 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 on 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.

27. 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.

28. 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 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.

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

29. Captain or other team member who acts to endanger self or patient, 5 points each team member or patient, each infraction (three or more persons involved will be considered as entire team endangered) maximum 15 points each occurrence___5

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

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

d. set last timber inby unsafe roof

e. 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.

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.

30. 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." The intent of this is once teams start exiting the mine, the team continues to follow their lifeline until they have retreated in the fresh air base. This would not allow teams to go to other areas in which they had already explored or go back to the intersection in which the withdraw situation existed. 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 nonexplosive 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 lamp 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. Both methane and oxygen concentrations must be shown on each placard~~s~~.

31. 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.

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

Self-explanatory.

33. Failure to properly protect a live or potentially live person(s), each omission___10

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.

34. 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.

35. 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.

36. All five team members running while advancing or retreating, total___4

37. 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.

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

Mask tightness test is not required for an unconscious patient.

39. 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.

40. Teams leaving patient unattended, each infraction___6

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

41. 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.

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).

The team may perform any function during this team stop. The team may not continue to explore while retreating with the patient, unless required by the problem design.

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.

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. Exploration may continue, if necessary, to ventilate an explosive mixture prior to energizing the pump.

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

    Before breaching airtight separations such as: stoppings, doors, seals, barricades, closed regulators, or removing water roofed, an airlock must be formed if conditions on the other side are unknown. This does not apply to existing check or drop curtains used to direct the air current. 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.

    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.

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

    Curtains used to erect temporary stoppings shall be fastened at the top and sides, and at the bottom when a bottom board is provided. Top and bottom boards shall not be nailed to the uprights by the teams when stoppings are erected.

If a structure is moved from one location to another, it must be completely dismantled prior to moving (includes curtains installed on frames).

If temporary stoppings are built using curtains with velcro straps, they will be considered reasonably airtight for ventilation purposes. If a strap is not fastened properly, this discount shall apply.

44. 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 (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.

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. Exploration behind seals is not necessary, unless required by the problem and then only after all accessible areas of the mine are explored.

45. 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

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

Self-explanatory.

47. 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.

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

    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.

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

    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 frames and brattice cloth may be used to erect a line curtain which can only extend from a face, barricade or airtight separation to the outby intersection.)

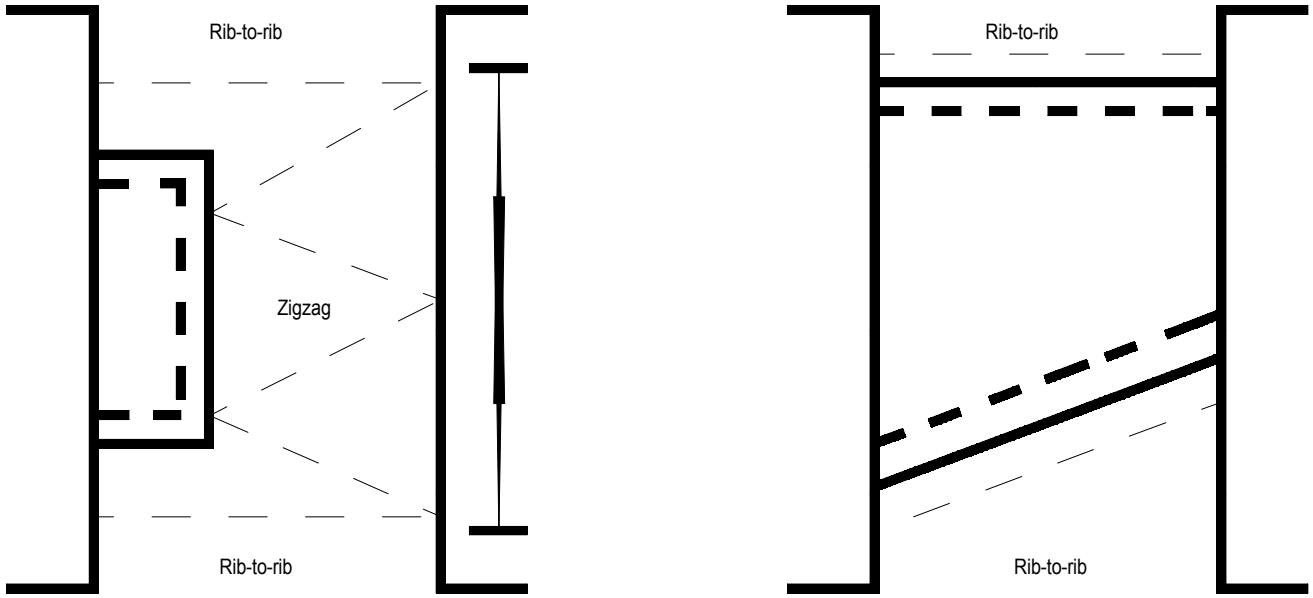
    Team members holding up brattice cloth in an attempt to clear a contaminant shall be discounted under this rule and the contaminant shall not be cleared. Line Curtain is the designated curtain provided for teams to hold up in order to remove contaminants. If brattice cloth is to be used it must be used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

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

50. Failure of team to follow written instructions provided to the team for working of the Contest problem___15

Figure 1(a)

PROPER METHOD OF ROOF TESTING



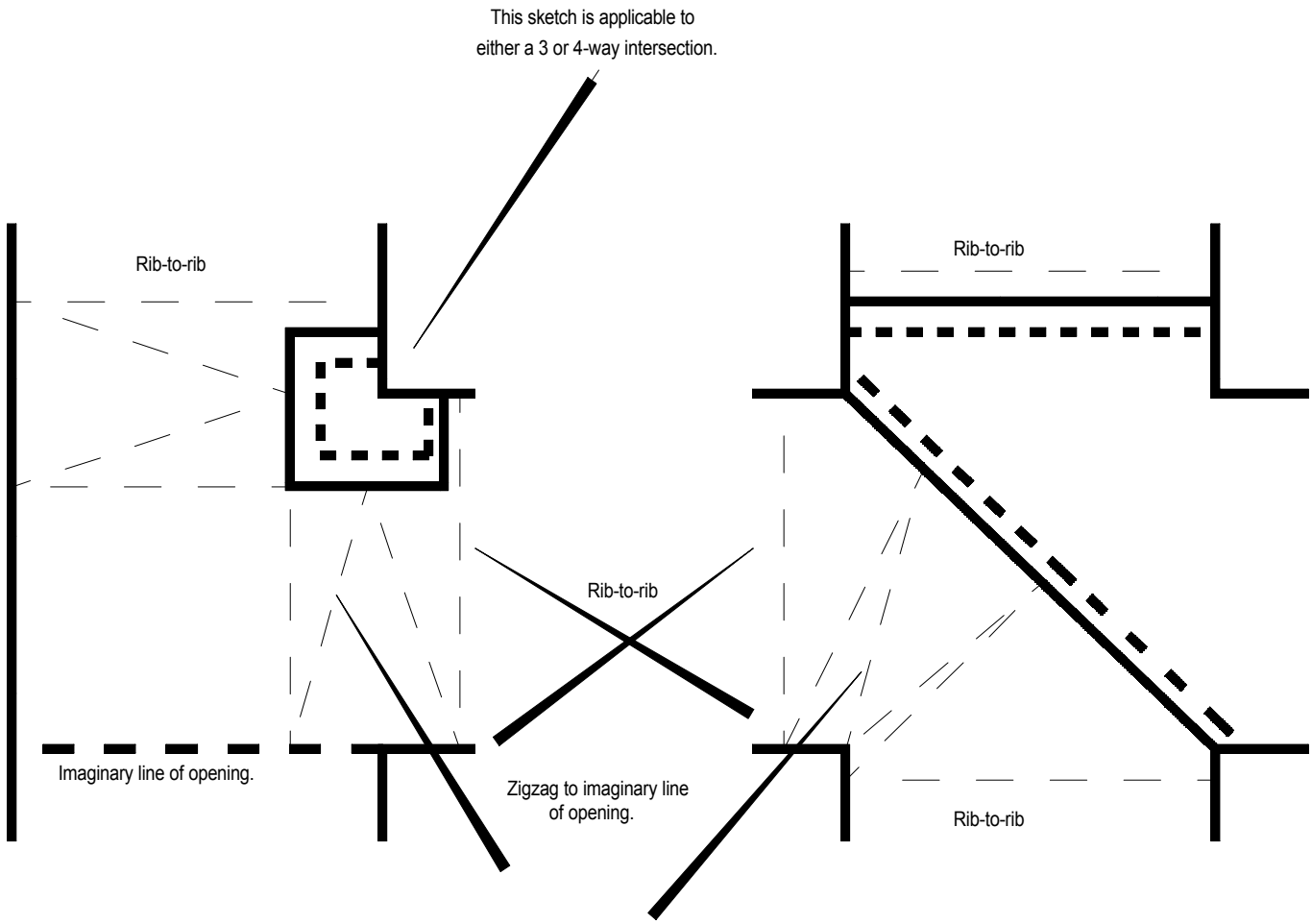
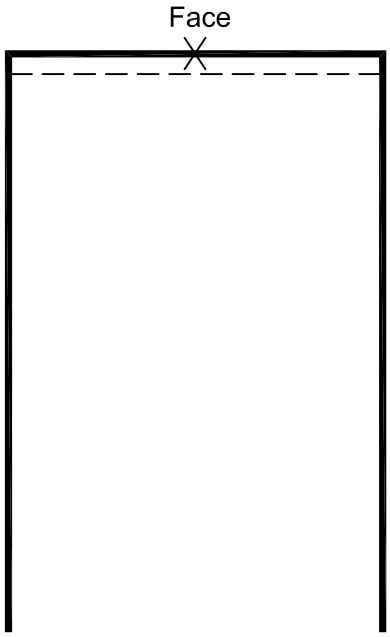
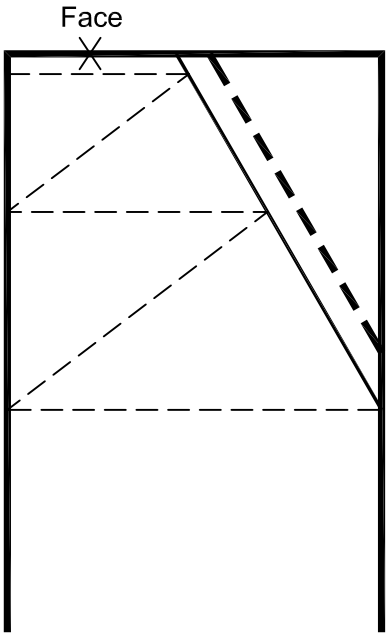


Figure 1 (b)

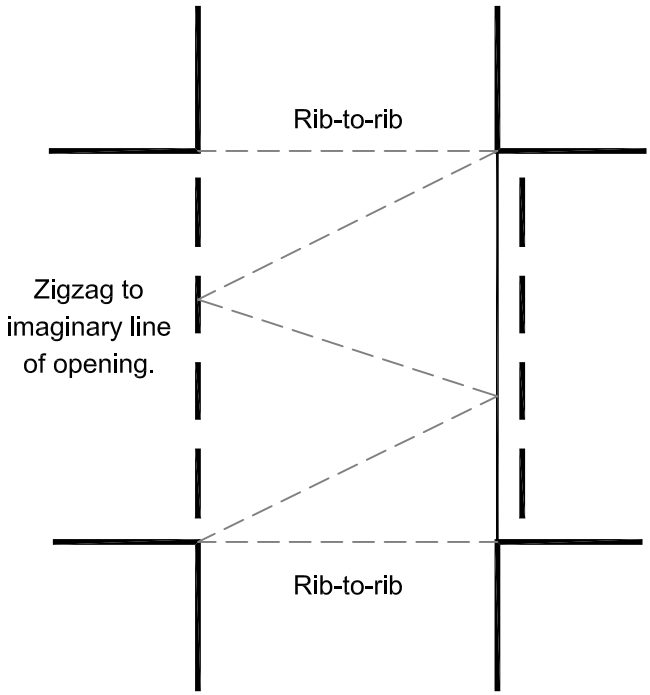
PROPER METHOD OF ROOF TESTING (cont.)



Face, Roof, and Ribs Tested.



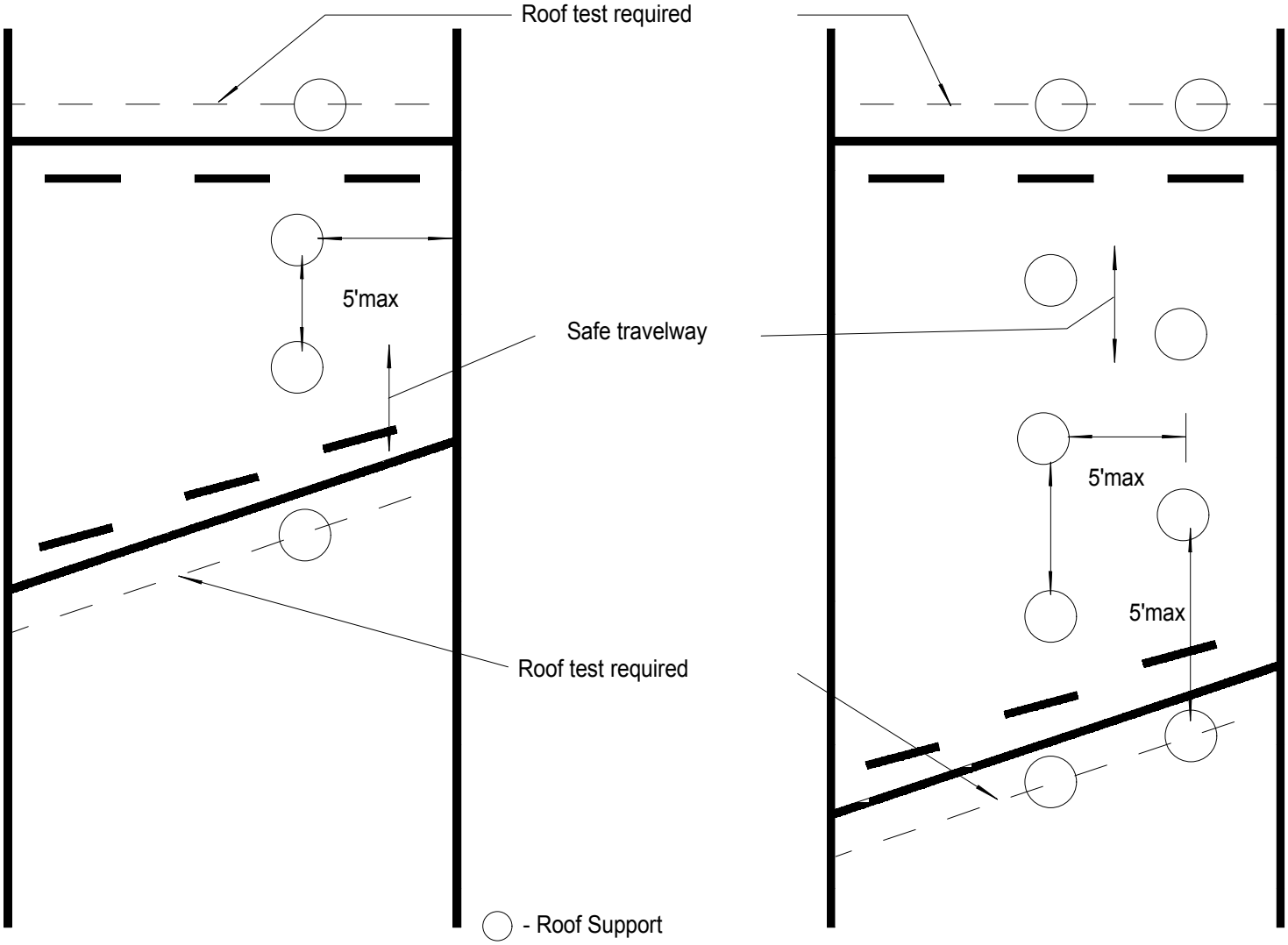
Face, Roof, and Rib at Face.



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 2a

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

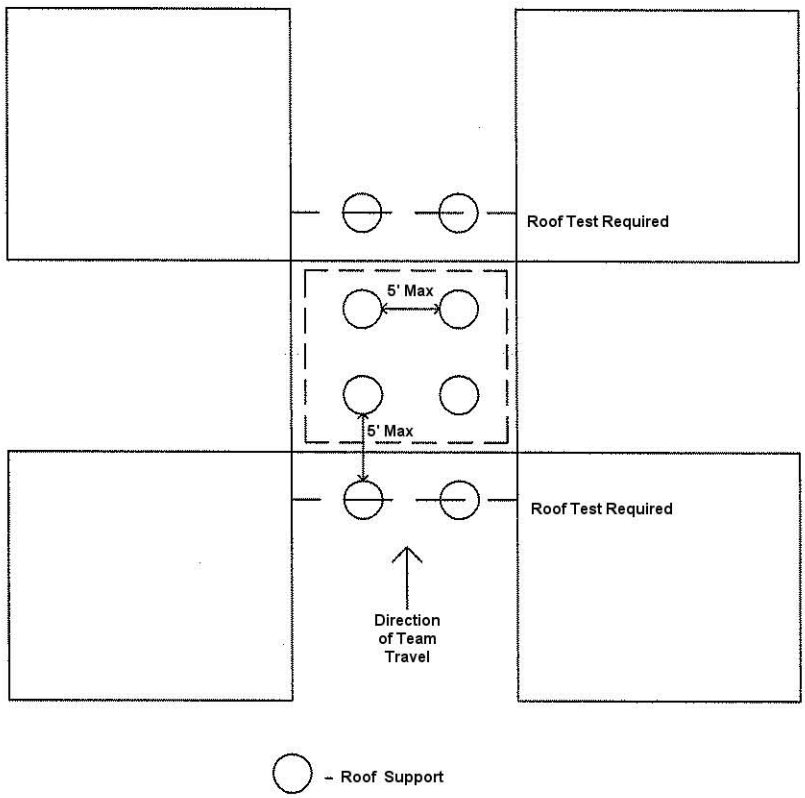


Figure 3

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

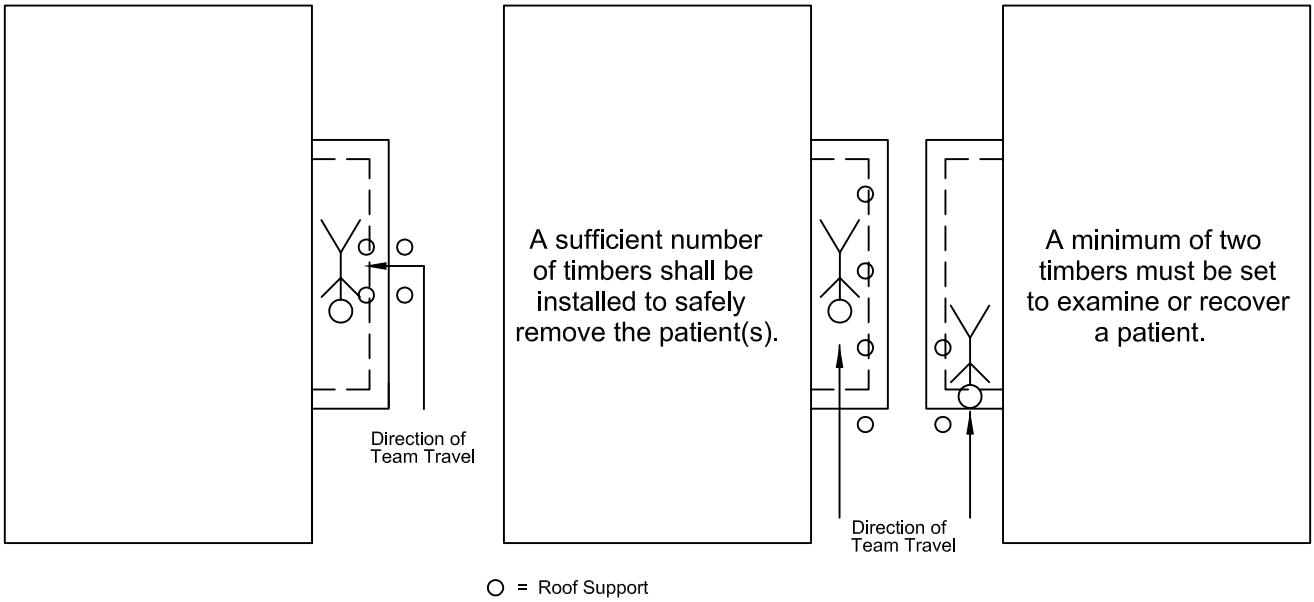
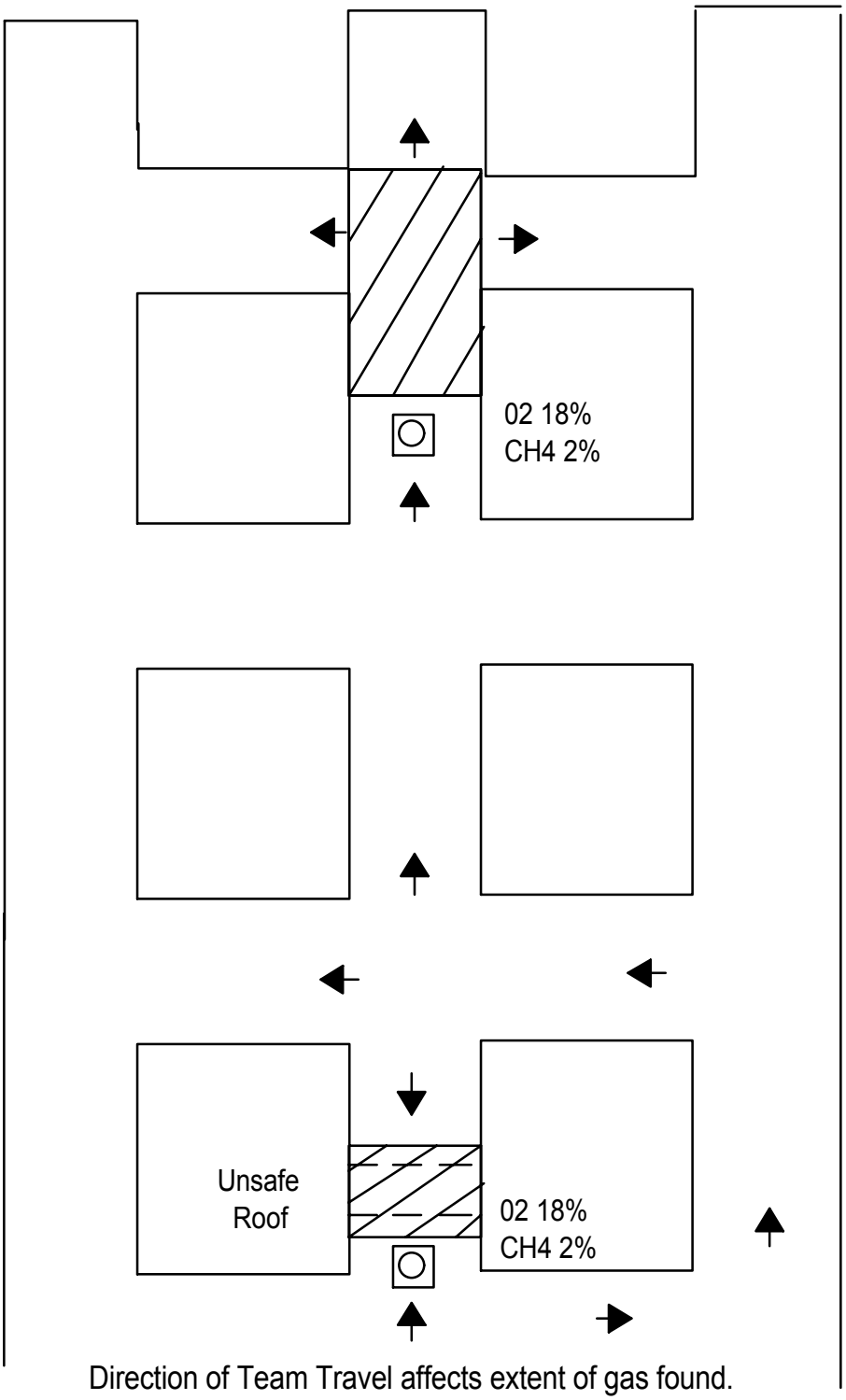


Figure 4

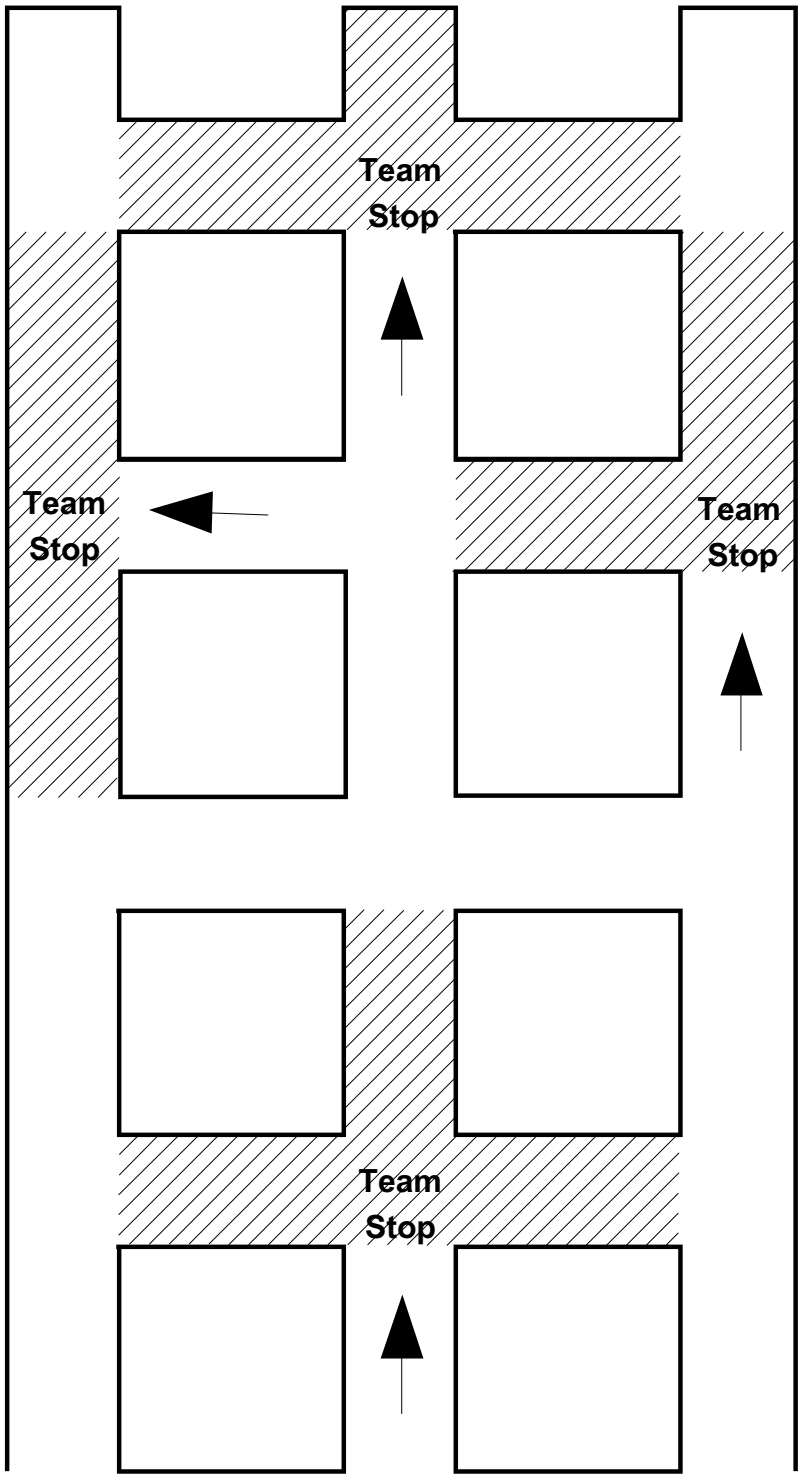
EXTENT OF GAS SKETCH



Direction of Team Travel affects extent of gas found.
Arrows indicate team travel after gas is found.
Diagonal lines indicate extent of gas.

Figure 5

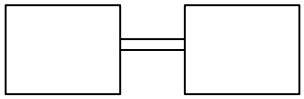
Example of Initial Exploration Under Rule 28



Direction of Team Travel

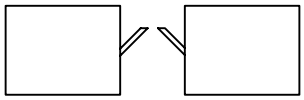
Maximum Extent of Exploration (25')

MINE MAP LEGEND



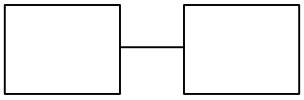
PERMANENT STOPPING

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



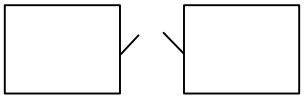
PERMANENT STOPPING NOT INTACT, NOT AIRTIGHT

Condition noted on placard must be shown on the map.



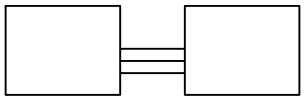
TEMPORARY STOPPING

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



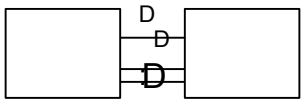
TEMPORARY STOPPING NOT INTACT, NOT AIRTIGHT

Condition noted on placard must be shown on the map.



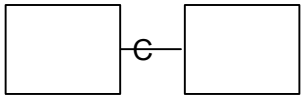
SEAL

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.

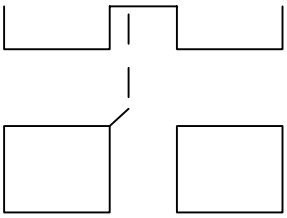


CHECK CURTAIN

Condition noted on placard must be shown on the mine map.

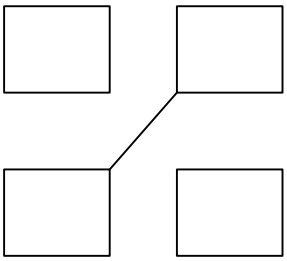
LINE CURTAIN

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



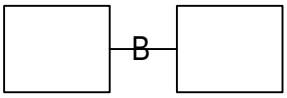
LINE CURTAIN INSTALLED

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. Can not be folded or rolled up.



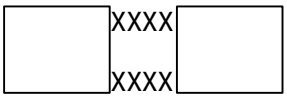
DIAGONAL

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



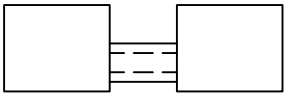
BARRICADE

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



CAVED

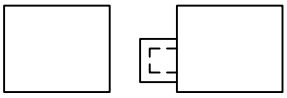
Caved areas are not considered airtight unless the placard states "airtight" and it will have to be written out on the map ("airtight") beside the symbol.



across entry

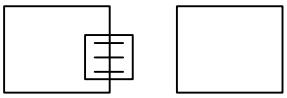
UNSAFE ROOF

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



partially across entry

.

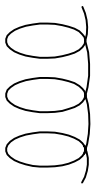


UNSAFE RIB OR OVERHANGING BROW

Project over ribline and area on map.

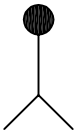
WATER

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



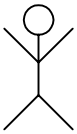
SMOKE

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



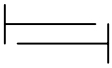
BODY

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.

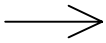


BRATTICE FRAMES

BRATTICE CLOTH

PLACARD INDICATING GAS MIXTURE

Write out gas name or symbol and state percent or PPM if shown on placard.

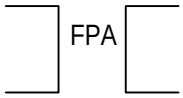


AIR MOVEMENT

Write out quantity if shown on placard.

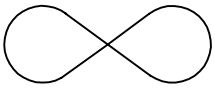
FIRE

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



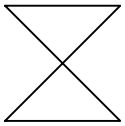
FARTHEST POINT OF ADVANCE IN ENTRY, ROOM, OR CROSSCUT

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



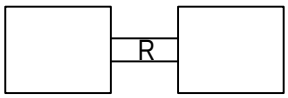
FAN

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.



REGULATOR

The particular condition must be noted beside the symbol.

The letter "R" can overlap the parallel lines.

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

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

(for Contest work only)

SELF-CONTAINED BREATHING APPARATUS

Draeger 174, BG174, or 174A, Two, Three, or Four-Hour Self-Contained Breathing Apparatus

A. Procedures for getting under oxygen:

1. Bring mask close to face and open cylinder valve fully; then close one-half turn. 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. Block off both breathing tubes. It should be impossible to draw in any air when inhaling and hard to expel air to the outside when exhaling.

4. Check gauge and operation, straps, etc., prior to leaving fresh-air base.

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 exhalation hose and exhale

D. Perform inhalation valve test

1. Grasp inhalation hose and inhale

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 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.

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

(for Contest work only)

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.

4. All gas measurements are revealed in the digital liquid crystal display (LCD) and all are displayed simultaneously.

MX6 iBrid Multi-Gas Monitor

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 stratup 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, MX6 iBrid 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.

STATEMENTS OF FACT
MINE RESCUE

1. Three elements must be present for an explosion to occur: fuel, oxygen, and heat (ignition). (Directorate MSHA 2105, p. 51)

2. Permanent seals should be well hitched in the roof, floor, and ribs to make them as airtight as possible. (MSHA 2105, p. 46)

3. Electrical fires are best extinguished by nonconducting agents such as carbon dioxide and certain dry chemicals. (MSHA 2105, pp. 8 & 21)

4. Under no circumstances should ventilation be altered without orders to do so from the command center. (MSHA 2103, p. 5)

5. "Class A" fires are best extinguished by cooling with water or by blanketing with certain dry chemicals. (MSHA 2105, p. 21)

6. The first priority of rescue and recovery operations is team safety. (MSHA 2104, p. 18)

7. The second priority of rescue and recovery operations is the rescue of survivors. (MSHA 2104, p. 18)

8. The third priority of rescue and recovery operations is the recovery of the mine. (MSHA 2104, p. 18)

9. A fresh-air base is established at the point where conditions no longer permit barefaced exploration. (MSHA 2104, p. 7)

10. Hydrogen can be liberated when water or steam comes in contact with hot carbon materials. (MSHA 2105, p. 31)

11. All conductive objects such as cables, track, trolley wire, water lines, belt structures, etc., extending into the explosion area should be severed or removed at or outby the fresh-air base before explorations are started. (MSHA 2104, p.10 and MSHA 2105, pp. 45 & 47)

12. Explosions in coal mines are most often caused by ignitions of methane, coal dust, or a combination of the two. (MSHA 2105, p. 52)

13. An indication of an explosion may be a jump in the pressure recording chart for the main fan. (MSHA 2104, p. 54)

14. Gas readings must be taken in the returns near the fire area to determine if the mine atmosphere is potentially explosive. (MSHA 2105, p. 25)

15. Seals in high volatile coalbeds are often placed 1,000 feet or more from the fire area. (MSHA 2105, p. 37)

16. When sealing a mine fire, you should be careful to ensure that there are no abrupt changes in the ventilation over the fire area. (MSHA 2105, p. 42)

17. Copper tubes or pipes are inserted in temporary and permanent seals for the purpose of collecting air samples from the sealed area. (MSHA 2105, pp. 42 & 47)

18. Before going underground to explore for a fire or to fight a fire, the team should know about any possible ignition sources that may exist in the affected area. (MSHA 2105, p. 23)

19. The team should make sure the main fan is running, a guard is monitoring the operation of the fan, and that tests are being made at the main return for any gases that may be present in the mine, before they go underground. (MSHA 2105, p. 22)

20. Before a fresh-air base is advanced, gas tests should be made in all dead ends and high places between the old and new fresh-air base. (MSHA 2104, p. 15)

21. Your captain may order the team to return immediately to the fresh-air base if a team member's apparatus malfunctions. (MSHA 2104, p. 52)

22. In potentially explosive atmospheres, nonsparking tools, nails, and spads should be used. (MSHA 2104, p. 22)

23. When you have located a barricade, you should try to determine whether the miners inside are still alive and conscious. (MSHA 2106, p. 5)

24. Carbon monoxide is a product of incomplete combustion of any carbon material. (MSHA 2102, p. 35)

25. Opening of seals prematurely can cause a re-ignition of a fire or an explosion. (MSHA 2107, p. 5)
26. Specific gravity is the weight of a gas compared to an equal volume of normal air under the same temperature and pressure. (MSHA 2102, p. 13)

27. The explosive range of methane in air is 5 to 15 volume percent. (MSHA 2102, p. 31)

28. The lower explosive limit of hydrogen is 4.0 percent. (MSHA 2102, p. 67)

29. Acetylene is formed when methane is burned or heated in air having a low oxygen content. (MSHA 2102, p. 45)

30. Continual exposure to hydrogen sulfide may dull the sense of smell. (MSHA 2102, p. 41)

31. The specific gravity of methane is 0.5545. (MSHA 2102, p. 31)

32. The specific gravity of carbon dioxide is 1.5291. (MSHA 2102, p. 29)

33. The specific gravity of carbon monoxide is 0.9672. (MSHA 2102, p. 34)

34. Blackdamp is a mixture of carbon dioxide, nitrogen and air which is oxygen deficient. (MSHA 2102, p. 47)

35. Smoke usually contains carbon monoxide and other toxic or asphyxiating gases produced by fires. (MSHA 2102, p. 48)

36. Breathing air containing 10 percent carbon dioxide causes violent panting and can lead to death. (MSHA 2102, p. 29)

37. The first symptom of carbon monoxide poisoning is a slight tightening across the forehead and possibly a headache. (MSHA 2102, p. 35)

38. High temperatures (or heat) cause gases to expand so they diffuse more quickly. (MSHA 2102, p. 12)

39. It is much easier to remove a concentration of a light gas like methane by ventilation than it is to remove the same concentration of a heavier gas like carbon dioxide. (MSHA 2102, p. 14)

40. Small hydrogen explosions, known as hydrogen "pops" are fairly common in firefighting. (MSHA 2105, p. 31)

41. Explosions, fires, and other disasters frequently result in weakened roof and rib conditions. (MSHA 2107, p. 23)

42. Before a rescue team goes underground, it will attend a briefing session. (MSHA 2104, p. 23)

43. The range of each gas sensor should be determined prior to taking a gas detector underground for mine rescue use.

44. Regulators are used in mine ventilation to regulate airflow to meet the individual needs of each air split. (MSHA 2103, p. 20)

45. Overcasts are used to permit two air currents to cross without the intake air short circuiting to the return. (MSHA 2103, p. 18)

46. When reporting anything to the fresh-air base, be sure you are clearly and correctly identifying locations. (MSHA 2104, p. 48)

47. The lower explosive limit of carbon monoxide is 12.5 percent. (MSHA 2102, p.67)

48. The basic principle of mine ventilation is that air always moves from high to low pressure regions. (MSHA 2103, p. 7)

49. The most positive indicator of the origin of an explosion is the direction in which blocks have moved in or from stoppings across entries near intersections. (MSHA 2103, p. 26)

50. Coking or coke streamers, if encountered, should be reported in location and size. (MSHA 2104, p. 47)