2017 Northern Regional Mine Rescue Contest

JUDGES' PACKET
Field Competition
Day 2

June 7, 2017
Clymer, New York

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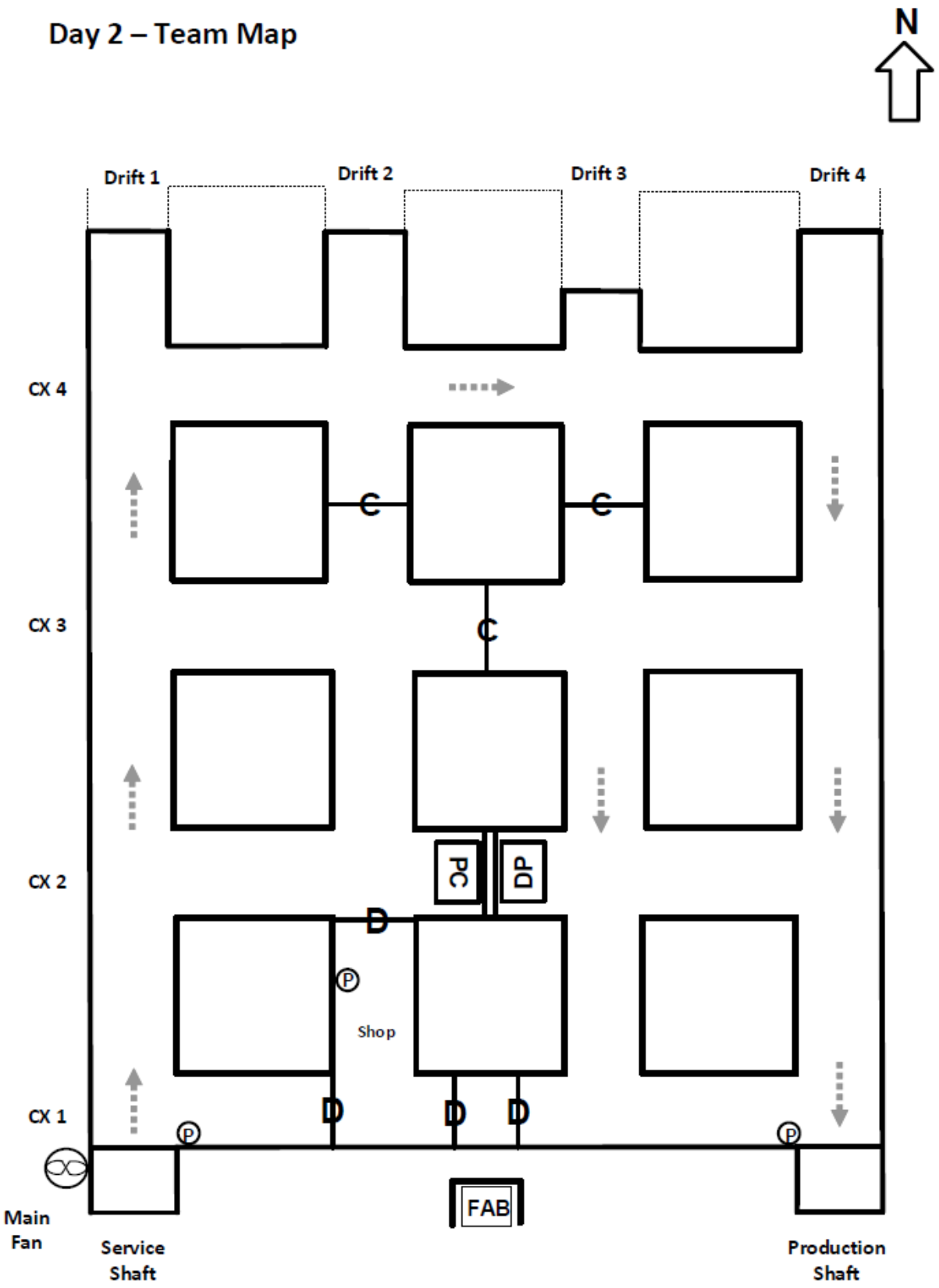
Day 2 – Team Map



Mine Information Sheet
PNP Mining Co. – Zipline Mine No. 2

Mining & Equipment:
The single-level, shaft mine uses a conventional room and pillar method to extract ore. Load-haul-dump (LHD) units are used to muck the faces and transport the broken ore to the shaft dump pocket located in CX 2 between Drift 2 and Drift 3. The ore is then hoisted to the surface via skips in the Production Shaft. The development entries are driven 8-feet high and 10-feet wide. Typical pillar dimensions are 15-feet by 15-feet (W x L). Most of the underground mobile equipment (including LHD's and transport vehicles) is diesel-powered. The face drill and roof bolting machine are electrically powered.

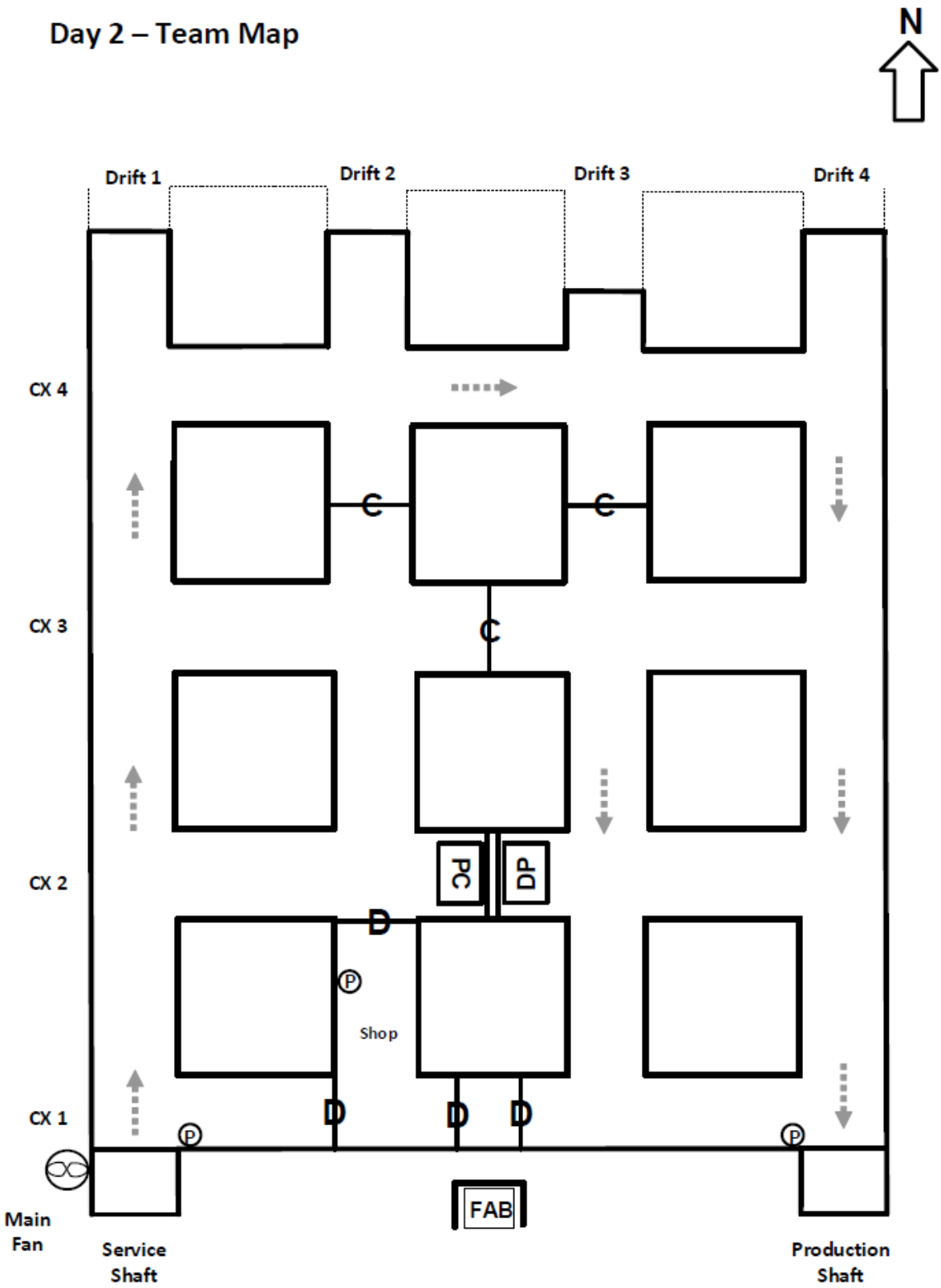
Mine Classification:
In accordance with Title 30 CFR § 57.22003, the mine was classified as a Category VI mine. That is, the presence of methane has not been established in this mine and there is no history of methane gas in any other mine in the area. Historical hygiene data from the mine, both MSHA and Company's samples, have indicated only trace amounts of methane.

Mine Openings:
The mine is opened by two 18-foot diameter shafts approximately 1,750 feet deep. The Service Shaft is equipped with a hoist used to transport people and to convey supplies. The shaft also serves as the primary escapeway from the mine. The Production Shaft is equipped with two ore skips and a separate compartment containing an escape hoist which can be used to bring a maximum of seven persons to the surface.

Ventilation:
A 6-ft. diameter blowing Main Fan is located on the surface near the Service Shaft. The Main Fan is <u>not</u> reversible. The fan produces approximately 100,000 cfm and operates in the stable portion of its performance curve. Airlock doors have been installed in CX 1 to allow passage between the intake and the return drifts without disrupting the established airflow to the faces. The electrical power to the fan is on and the fan is operating. The air enters the mine through the Service Shaft and exhausts from the Production Shaft. Air is directed to the faces using permanent (concrete block) and temporary (brattice cloth) ventilation controls. The typical airflow direction is marked on the Team and Fresh Air Base Maps.

Water and Pumps:
The mine has no history of water problems in the active workings. Each shaft is equipped with a ten-foot deep sump. The main water pumps, located on the surface, can easily handle the volume of water produced in the mine and the shafts. The main water pumps have been activated along with the power to the shafts.

Day 2 – Team Map



Mine Information Sheet (continued)
PNP Mining Co. – Zipline Mine No. 2

Ground/Rib and Roof Control:
The immediate roof, or back, is supported by six-foot rock bolts. The back is fairly competent, but problem areas are supported by wooden posts or stacked crib blocks.

Explosives:
Explosives are available and stored on the surface. They are used during the mining cycle and blasting is conducted at the end of each shift while all persons are out of the mine. Only enough explosives for a day's use are stored in day boxes on the blaster's truck.

Electric Power:
An electrical installation on the surface provides power to the shafts, the surface pumping station, and the Main Fan. The surface power circuit is energized. In the underground workings, a power center is located in CX 2 between Drift 2 and Drift 3. It delivers electricity to operate the face drill and roof bolting machine, as well as the overhead lighting and machinery in the Shop and at the shaft stations. The underground power circuit has been de-energized, locked out, and guarded.

Mine Map:
The onsite Engineering Department updated the mine map on June 5, 2017.

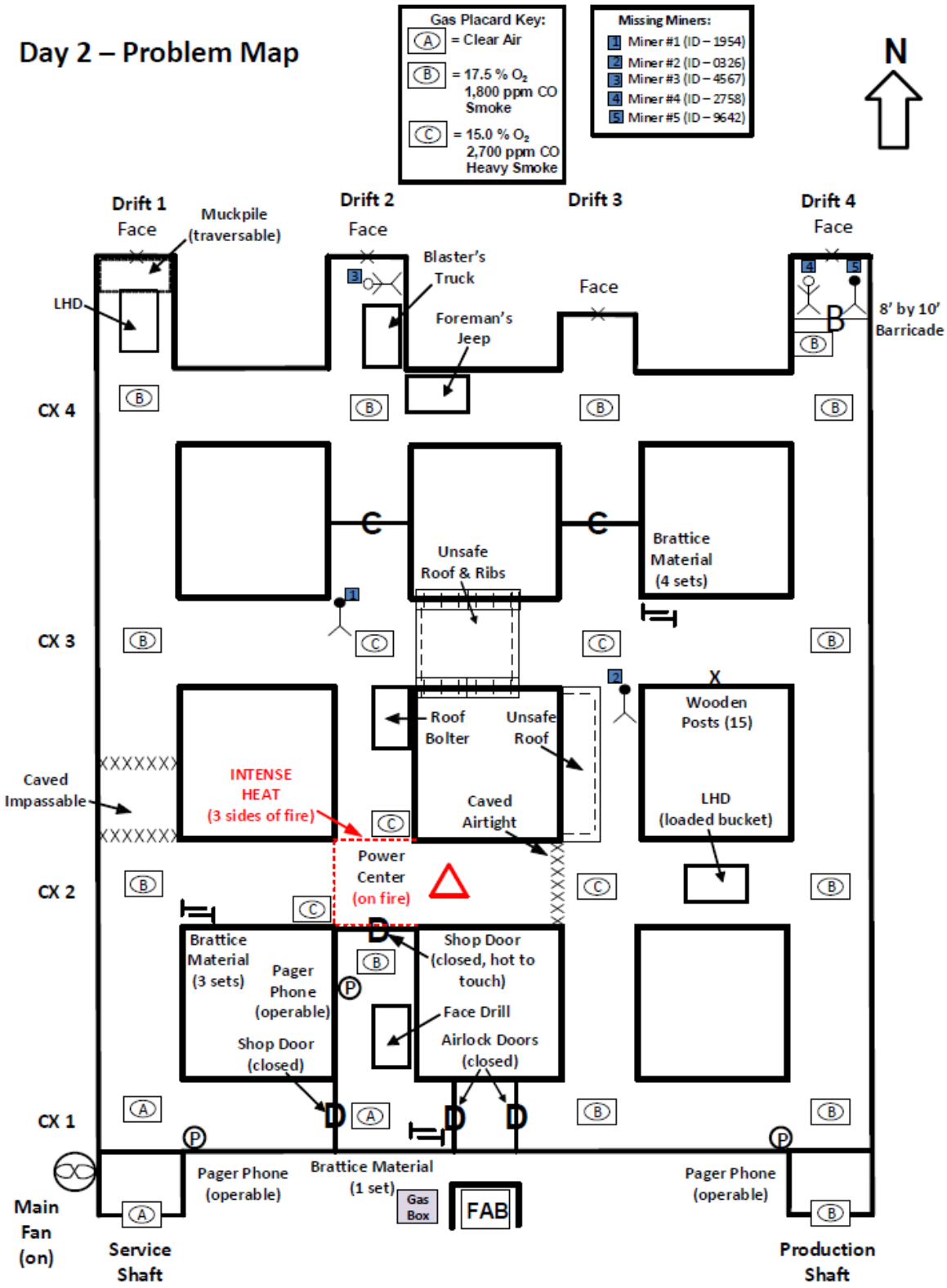
Other Mines:
There are several known mines, active and abandoned, in Clymer, New York. At this time, the Zipline Mine No. 2 is not connected to any of these mines.

Materials:
Most available equipment and materials to work the problem are located in the mine and are identified with placards. The materials are stored in several areas underground and can be readily located if needed. If there is something else deemed necessary by the team, upon request, it can be delivered in a reasonable amount of time.

> **Note: The brattice material available for use by the team is relatively lightweight and compact (10-foot strips of brattice cloth with a clip on each end). For the sake of realism, the team will only be allowed to carry two sets of material at any one given time.**

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

Day 2 – Problem Map



Note: Main Fan Not Reversible

Team Briefing Statement

You are located at the surface of the PNP Mining Company's Zipline Mine No. 2. The single-level, shaft mine uses a conventional room and pillar method to extract ore. The mine is opened by two shafts approximately 1,750 feet deep. Air enters the mine through the Service Shaft which is equipped with a hoist used to transport people and to convey supplies. This shaft serves as the primary escapeway from the mine. Air exhausts from the Production Shaft which is equipped with skips, as well as an escape compartment which can be used to hoist a maximum of seven persons to the surface. This shaft serves as the secondary escapeway from the mine. The mine is ventilated by a surface-mounted Main Fan located near the Service Shaft. The blowing Main Fan pushes approximately 100,000 cfm into the mine and cannot be reversed.

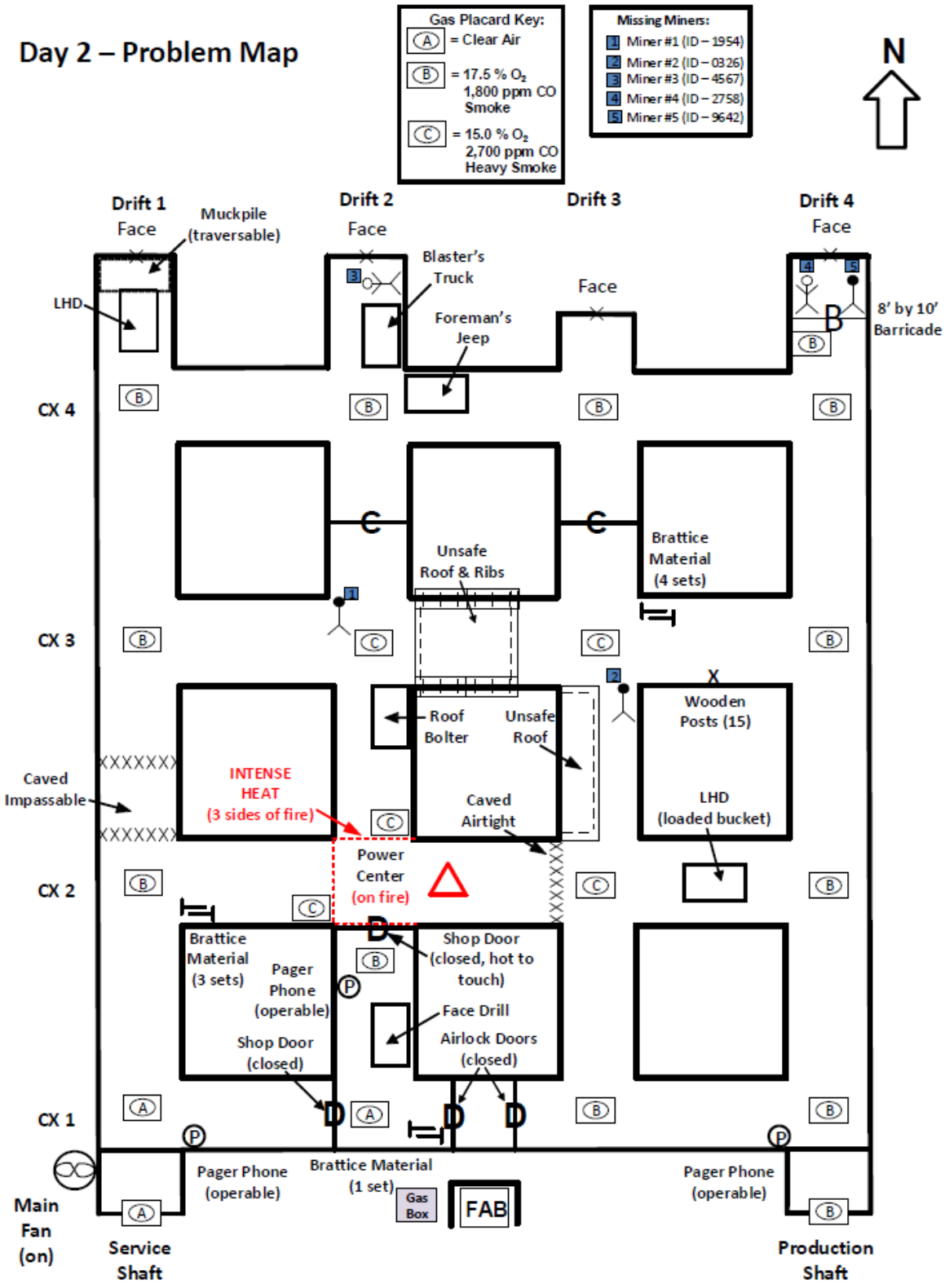
Ore is mined by the traditional room and pillar method. The entries are initially driven 8-feet high and 10-feet wide. Typical pillars dimensions are 15-feet by 15-feet (W x L). The immediate roof, or back, is supported by six-foot rock bolts. The back is fairly competent, but problem areas are supported by wooden posts or stacked crib blocks. The mine has no history of water problems in the active workings.

This morning at 5:00 a.m., a foreman and his five-person crew went underground to start the day shift. At about 6:15 a.m., the foreman called out from the underground shop and informed the hoist engineer that there was a fire in the mine and dark black smoke was filling the drifts. The foreman said that he was going to assemble the crew and exit the mine. At that time, communication was lost. The hoist engineer called the superintendent who immediately gave the order to activate the warning system to evacuate the mine. A short time later, one miner called out from the Production Shaft station and asked to be hoisted out of the mine. The miner reported that he was operating an LHD transporting ore to the dump pocket when the mine filled with heavy black smoke. The miner had no specific information as to what had happened nor was he aware of the condition or location of the rest of their crew. Since that time, no one has entered or exited the mine. We do not know the status of the mine's communication system since there has been no further contact with the missing miners.

All power to the underground has been de-energized, locked out, and guarded. Both hoists are operational and the Main Fan is operating. Continuous gas monitoring has been established at both shafts. The latest readings show "clear air" at the Service Shaft and 17.5 % oxygen (O_2) and 1,800 ppm carbon monoxide (CO) with smoke at the Production Shaft.

We have called all of the government agencies for help. Guards have been posted at the shafts and at the main power supply for the mine. There is a fully equipped mine rescue team located on the surface and they are ready to serve as your team's backup.

Day 2 – Problem Map



Note: Main Fan Not Reversible

If your team is willing to help, we would like you to account for all missing miners; bring any live miners to the surface; extinguish or seal any fires; and explore and map all accessible areas of the mine. **Another team will be sent into the mine to replace you after 90 minutes.**

All available equipment and materials to work the problem are located in the mine and are identified with placards. The materials are stored in several areas underground and can be readily located if needed. If there is something else deemed necessary by the team, upon request, it can be delivered in a reasonable amount of time.

When you reach the mine rescue course, the Mine Manager will introduce you to the judges. Once the Team Captain has started the timer, the Mine Manager will provide you with any changes to the briefing information that you have received. The Mine Manager will not answer any additional questions concerning the team briefing statement. However, if you do not understand a term, it will be defined. The Manager will only respond to questions allowed by the rules while you are working the problem.

The fresh air base attendant and alternate will be assigned a location where they can study the team briefing information, mine information, and map. Only one attendant or alternate will be allowed to assist at the fresh air base. This fresh air base attendant can assist the team and communicate with them while they advance past the fresh air base using the wire communication system. He must maintain an accurate map indicating all initial information that the team relays to him. He may also assist the team by relaying information to the mine manager when required by the problem. He may also assist the team when they retreat to the fresh air base.

The fresh air base attendant and mine rescue team alternate are not allowed to speak to anyone during the working of the problem except their team members, the mine manager, and the judging officials.

GOOD LUCK!

Team Instructions

- Explore and map all conditions found in the mine (problem field) and any changes made by the team;
- Extinguish or seal any fires;
- Account for the five missing miners;
- If necessary, re-ventilate the mine; and
- Bring any live miners to the surface.

Fresh Air Base Instructions

- The fresh air base attendant and assistant will be assigned a location where they can study the team briefing information, mine information, and map.
- Only one attendant or assistant will be allowed to assist at the fresh air base. This person can assist the team and answer any questions the team may ask.
- The fresh air base attendant and assistant are not allowed to speak to anyone during the working of the problem except their team members, mine manager, and the judging officials.

Problem Orientation

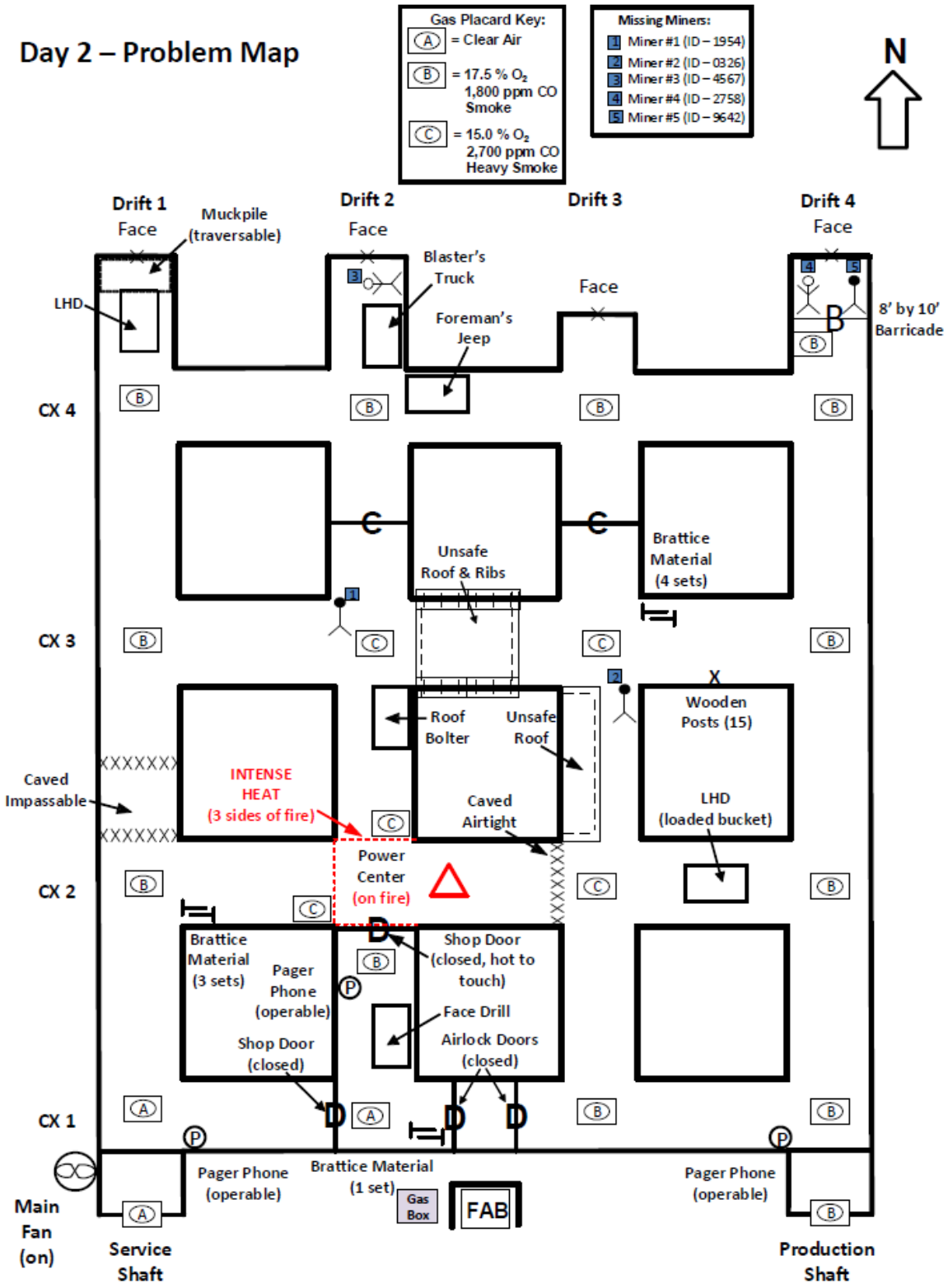
Introduce yourself to the team as the No. 1 Judge and the "Mine Manager." Then, introduce the #2 Judge. The team has been briefed on the problem and the mine information, and been provided with the mine maps in isolation. Read the following instructions to the team:

> **At this time, I have no new information for your team. During the working of the problem, I will answer any question that you may have; however, by problem design, my response may be limited in scope. The fresh air base attendant and assistant must remain at the surface fresh air base. Only the fresh air base attendant can speak with the team via the communication system to discuss the rescue activities performed or proposed. If the team returns to the fresh air base, only the attendant or assistant will be allowed to assist them. However, neither the attendant nor the assistant can physically go beyond the fresh air base to assist the team unless he/she becomes a team member when someone drops out.**
>
> **After the team has completed its 50 foot check, they will not be allowed to physically compare the team map with the fresh air base attendant's map or the assistant's map. No side by side comparison will be allowed and no changes (edits) can be made to any map while the team is at the surface fresh air base.**
>
> **The fresh air base attendant and assistant not allowed to converse with anyone <u>except</u> the team members, the mine manager, or the judges.**
>
> **At the end of the problem, both the team map and the fresh air base attendant's map will be collected and scored. All map editing must take place prior to stopping the clock. The assistant's map will also be collected at this time but it will not be scored.**
>
> **Do you understand these instructions?**

When they verify understanding the instructions, have the Team Captain start the clock and hand the team their copies of the Team Briefing Information, the Mine Information Sheets, and the <u>three</u> mine maps.

Remember to add: **"Good Luck!"**

Day 2 – Problem Map



Note: Main Fan Not Reversible

Problem Solution

DISCLAIMER:
There are many ways to successfully solve this problem. The following outlines one possible way for use during MSHA field judges' training.

Each team will receive a briefing in isolation. At that time, the teams will be allowed to review the team briefing statement, mine information sheet, mine maps, and instructions for rescue teams and fresh air base attendants. However, copies of these documents and maps will be collected at the conclusion of the briefing session.

Upon arrival at the fresh air base, the team will meet the Mine Manager (Judge #1) and will be introduced to Judge #2. The Mine Manager will read the Problem Orientation and update the team with any information obtained since their briefing.

When the team verifies that they understand the instructions, the captain immediately starts the official clock. He writes the month, day, year, and the team position number on the sign-in board (or sheet). The captain's failure to perform any of these tasks will result in discounts (4 x each infraction) per Judge 1 – Surf Rule #8.

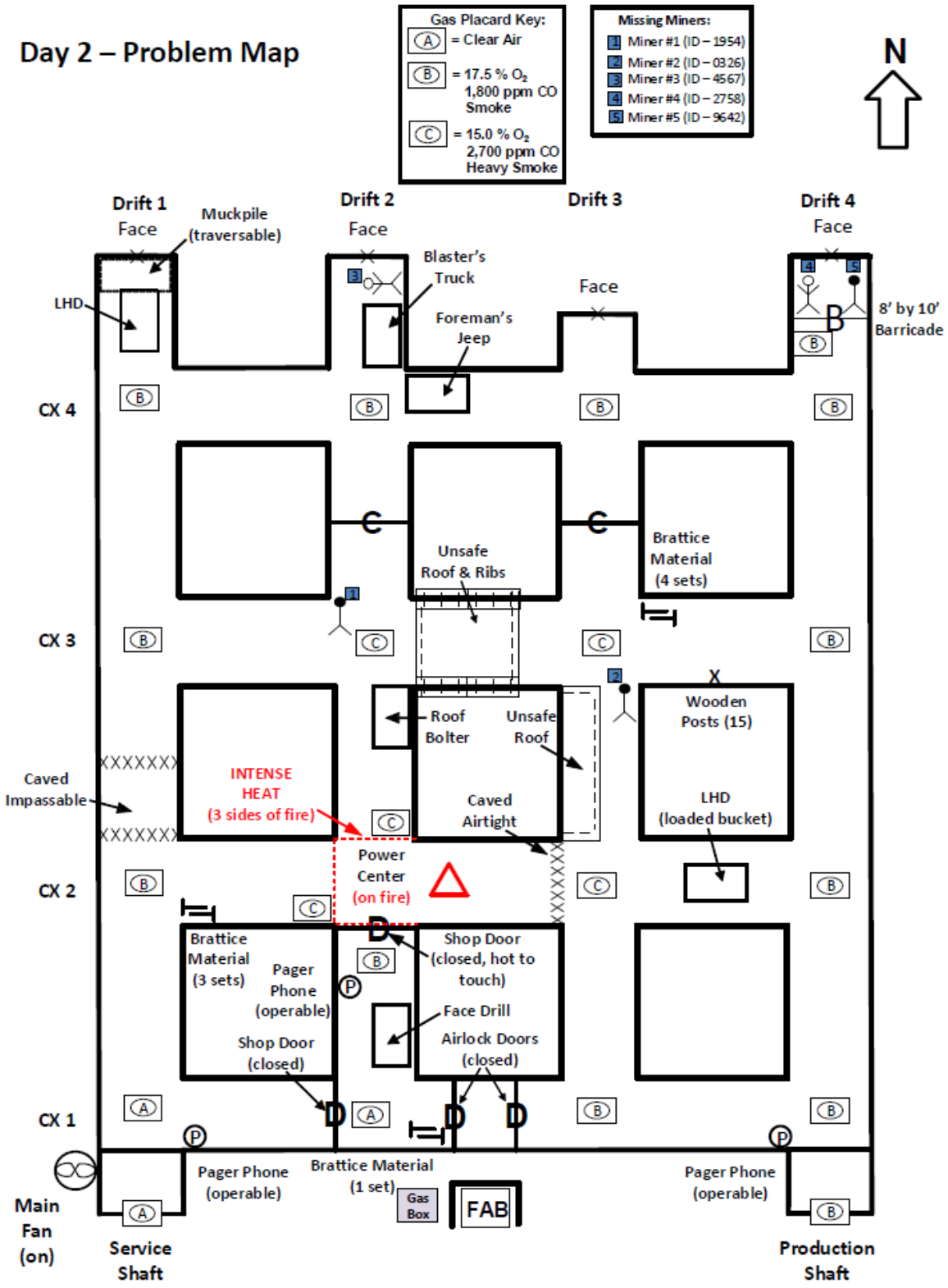
After receiving the information from the Mine Manager (i.e., team briefing statement, mine information sheet, instructions for rescue teams and fresh air base attendants, and the mine maps), the team may discuss the conditions presented by the problem and the map. The team is not required to check their equipment again. These equipment checks were conducted prior to reporting to the field and the team is fully equipped, physically fit, and ready to go. However, deficiencies with the team's equipment, identified by the judges during the working of the problem, should be discounted appropriately.

Since the mine is a Category VI, the team does not need to use non-sparking tools to work the problem. However, if the team does not have non-sparking tools and requests them from the official in charge, the tools that they brought with them will be deemed non-sparking.

Note: The brattice material available for use by the team is relatively lightweight and compact (10-foot strips of brattice cloth with clips on each end). Therefore, for the sake of realism, the team will only be allowed to carry two sets of material at any one given time. This information was provided to the team on the Mine Information Sheet.

When ready, the team must examine the mine openings. Both shafts must be examined while under oxygen. In air clear of smoke, these checks may be made without a lifeline, provided the entire team does not go into the entrance.

Day 2 – Problem Map



Note: Main Fan Not Reversible

The team's failure to wear apparatus while checking the mine openings will result in individual endangerment discounts (15 x each person) per Judge 1 – UG Rule #10(a)(6).

Note: These checks must be made to assure the conditions are safe to proceed. The team's failure to take necessary gas tests where required (each gas and each infraction) assess discounts (1x each omission) per Judge 2 - UG - Rule #1.

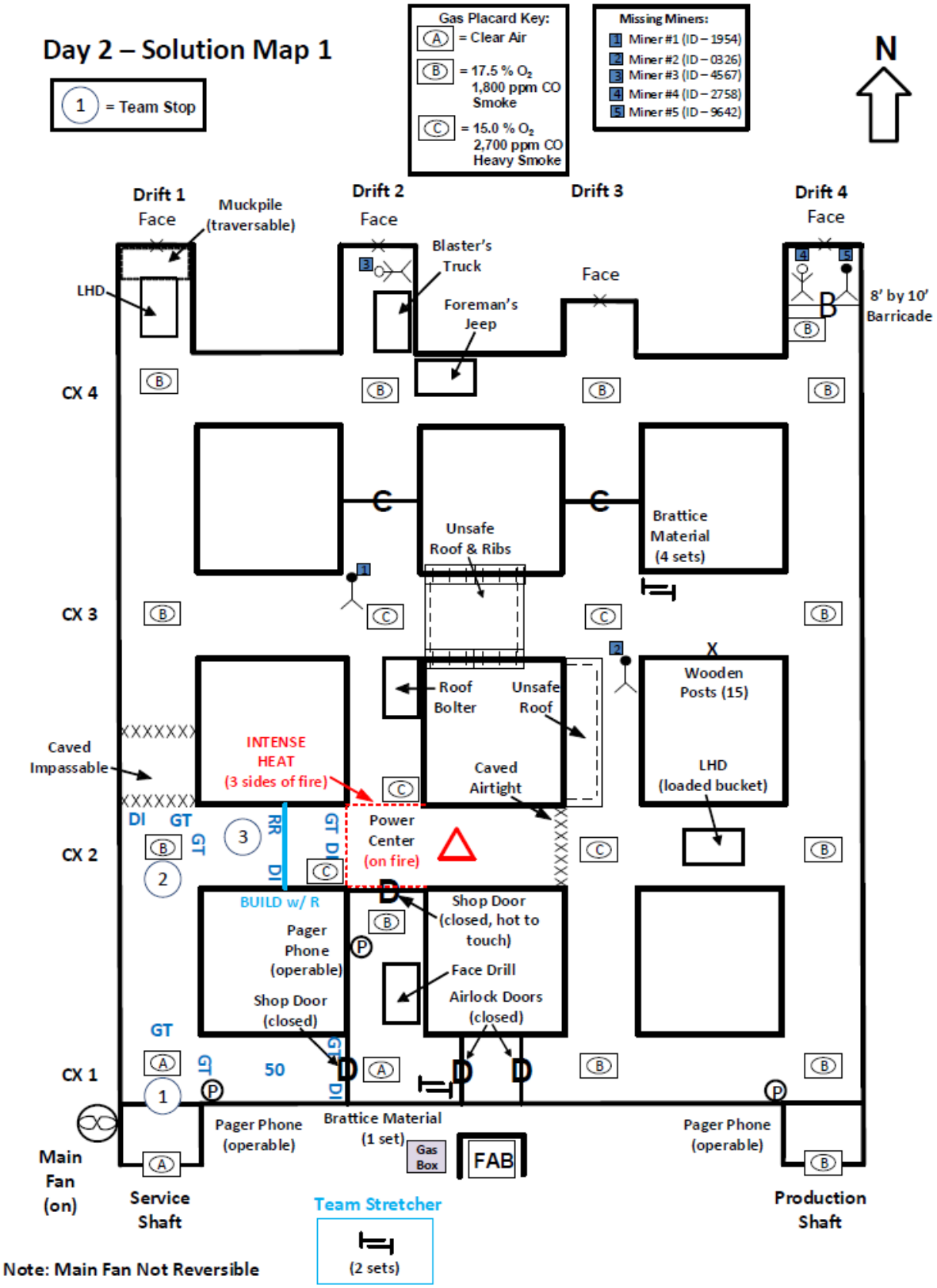
Service Shaft checks reveal:
A placard at the shaft shows "Clear Air." The conveyance will be at the top of the shaft and the team will place combustible material on the cage and send it down, using the posted Nevada hoisting signal codes. The team must then signal the cage to return to the surface. When the material is checked, it will be intact and dry. The team's failure to check both shafts for damage will result in a team endangerment (75 discounts) per Judge 1 – UG Rule #10(b)(1).

Note: At each shaft, Judge No. 1 will allow 10 seconds for the conveyance to travel in each direction.

Production Shaft checks reveal:
A placard at the shaft shows 17.5 % oxygen (O_2) and 1,800 ppm carbon monoxide (CO) with smoke. The conveyance will be at the top of the shaft and the team will place combustible material on the cage and send it down, using the posted Nevada hoisting signal codes. The team must then signal the cage to return to the surface. When the material is checked, it will be intact and dry.

Note: Gas concentrations found at this shaft was provided to the team during their briefing. Therefore, the team must perform an apparatus and personnel check before entering smoke at this location. They must also be attached to their lifeline. The team's failure to conduct a team check before entering smoke will result in discounts (5 x each infraction) per Judge 1 – UG Rule #12. Additionally, a team member's failure to be attached to or have hold of the lifeline when in smoke will result in discounts (2 x each infraction) per Judge 2 – UG Rule #9.

Gas Box Testing Station:
The team will also find the gas box testing station located at the fresh air base. A team member must use the team's multi-gas instrument to determine the gas concentrations in the unknown mixture. The team must provide its own calibration cup to report: O_2, CH_4, CO, and NO_2. **This will be the only gas box on the mine rescue field.** Judge No. 2 will assess the team's measurements and, if warranted, apply appropriate discounts (15 x each incorrect gas measurement) per Judge 2 – UG Rule #4.


Day 2 – Solution Map 1
1 = Team Stop
Gas Placard Key:
A = Clear Air
B = 17.5 % O2 1,800 ppm CO Smoke
C = 15.0 % O2 2,700 ppm CO Heavy Smoke
Missing Miners:
1 Miner #1 (ID – 1954)
2 Miner #2 (ID – 0326)
3 Miner #3 (ID – 4567)
4 Miner #4 (ID – 2758)
5 Miner #5 (ID – 9642)
N
Drift 1
Face
Muckpile (traversable)
Drift 2
Face
Drift 3
Face
Drift 4
Face
Blaster's Truck
Foreman's Jeep
LHD
8' by 10' Barricade
CX 4
CX 3
CX 2
CX 1
Unsafe Roof & Ribs
Brattice Material (4 sets)
Roof Bolter
Unsafe Roof
Wooden Posts (15)
LHD (loaded bucket)
Caved Impassable
INTENSE HEAT (3 sides of fire)
Caved Airtight
Power Center (on fire)
BUILD w/ R
Pager Phone (operable)
Shop Door (closed, hot to touch)
Face Drill
Airlock Doors (closed)
Shop Door (closed)
50
Pager Phone (operable)
Brattice Material (1 set)
Gas Box
FAB
Pager Phone (operable)
Main Fan (on)
Service Shaft
Team Stretcher
(2 sets)
Production Shaft
Note: Main Fan Not Reversible

Note: Team Stop Nos. 1 - 3 (see Solution Map 1)

Team Stop No. 1

The team can travel to the Service Shaft. They must count off before entering the cage (first time they go underground). Then, they must close the shaft gate and signal the hoist engineer. Afterward, the team will descend to the Service Shaft station in Crosscut 1 (designated as CX 1 on the team and fresh air base maps).

The team's failure to "count off" upon first entry into and final exit from the mine will result in discounts (2 x each infraction) per Judge 1 – Surf Rule #10.

The team's failure to close the shaft gate will result in discounts (5 x each infraction) per Judge 1 – UG Rule #7.

The team's failure to use the posted hoisting signals will result in discounts (1 x each infraction) per Judge 1 – UG Rule #6.

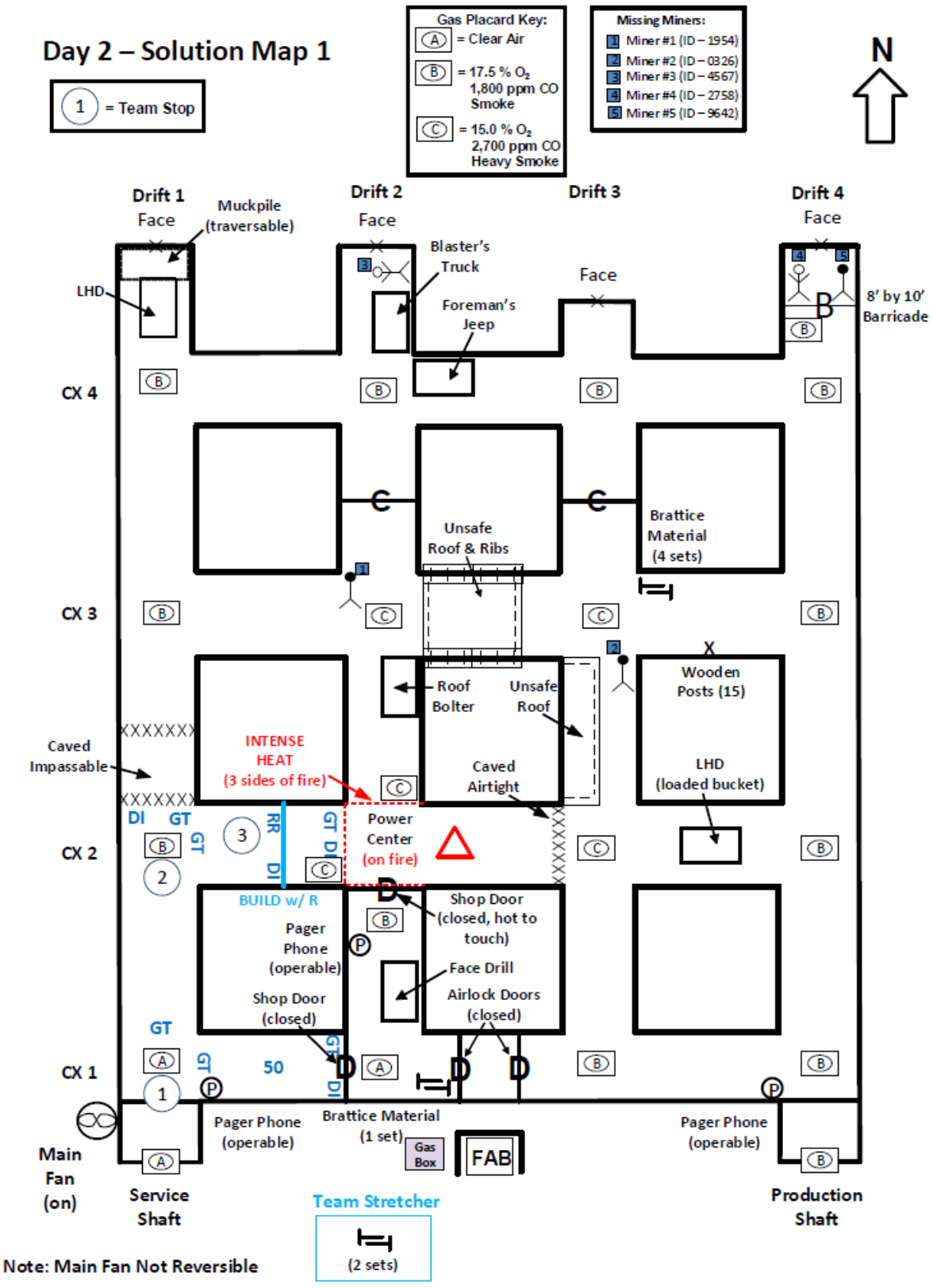
Before exiting the cage the captain must check for loose roof in front of the cage. A gas check will show "clear air." After exiting the cage, the team will close the shaft gate. At the shaft station, the team will find a working mine phone. They will also find that Drift 1 to the north and CX 1 to the east are open. The captain will check the roof or back and the team will conduct necessary gas tests. They will find "clear air." The team can stretch eastward in CX 1 to find the southernmost shop door closed. The captain will check the roof or back and the team will conduct necessary gas tests. The captain must date and initial (D&I) the door as their furthest point of advance in this direction.

Note: Conditions behind the shop door are unknown. Therefore, the door cannot be opened without the team erecting a temporary stopping. At this point in the problem, no building materials have been found. If the door is opened, the team's failure to erect a temporary stopping will result in discounts (10 x each infraction) per Judge 2 – UG Rule #10.

The captain's failure to verbally indicate he/she is checking the back or roof where required will result in discounts (5 x each occurrence) per Judge 1 – UG Rule #8(b)(4).

The team's failure to take necessary gas tests where required (each gas and each infraction) assess discounts (1x each omission) per Judge 2 - UG Rule #1. **Areas requiring gas testing by the team are shown on the Solution Maps as "GT".**

The captain's failure to D&I where required (at the point of farthest advance of the team in any direction such as at stoppings, faces of rooms and drifts, water over knee deep, impassable falls, barricades, fires out of control, and at the location of any survivors or bodies) assess discounts (2 x each place – max 10) per Judge 1 - UG Rule #9. **Areas requiring a D&I by the team captain are shown on the Solution Maps as "DI".**


Day 2 – Solution Map 1
1 = Team Stop
Gas Placard Key:
A = Clear Air
B = 17.5 % O2 1,800 ppm CO Smoke
C = 15.0 % O2 2,700 ppm CO Heavy Smoke
Missing Miners:
1 Miner #1 (ID – 1954)
2 Miner #2 (ID – 0326)
3 Miner #3 (ID – 4567)
4 Miner #4 (ID – 2758)
5 Miner #5 (ID – 9642)
N
Drift 1 Face
Muckpile (traversable)
Drift 2 Face
Drift 3 Face
Drift 4 Face
Blaster's Truck
Foreman's Jeep
LHD
8' by 10' Barricade
CX 4
CX 3
CX 2
CX 1
Unsafe Roof & Ribs
Brattice Material (4 sets)
Roof Bolter
Unsafe Roof
Wooden Posts (15)
LHD (loaded bucket)
Caved Impassable
INTENSE HEAT (3 sides of fire)
Caved Airtight
Power Center (on fire)
BUILD w/ R
Pager Phone (operable)
Shop Door (closed, hot to touch)
Face Drill
Airlock Doors (closed)
Shop Door (closed)
50
Pager Phone (operable)
Brattice Material (1 set)
Gas Box
FAB
Pager Phone (operable)
Main Fan (on)
Service Shaft
Team Stretcher
(2 sets)
Production Shaft
Note: Main Fan Not Reversible

Note: After advancing not more than fifty (50) feet from the fresh air base, the captain must give a signal for the team to stop. At this time, all team members and their apparatus must be checked. After the first 50 feet apparatus check, the team is required to conduct apparatus examinations not exceeding 20-minute intervals while working the problem. Additionally, apparatus removed in order to enter a confined area or apparatus that has sustained possible damage from impact must be checked before continuing. If team fails to conduct 50 foot check, assess 10 discounts per Judge 1 – UG Rule #3. Also, if the team fails to conduct apparatus examinations exceeding 20-minute intervals, assess discounts per Judge 1 - UG Rule #5 (5x each occurrence).

Note: No physical comparison of the fresh air base map and team map will be allowed after this initial entry into the mine. No changes can be made to any map while the team is at the surface fresh air base. See Judge 2 – Surf Rule #5 (25 total discounts).

Team Stop No. 2

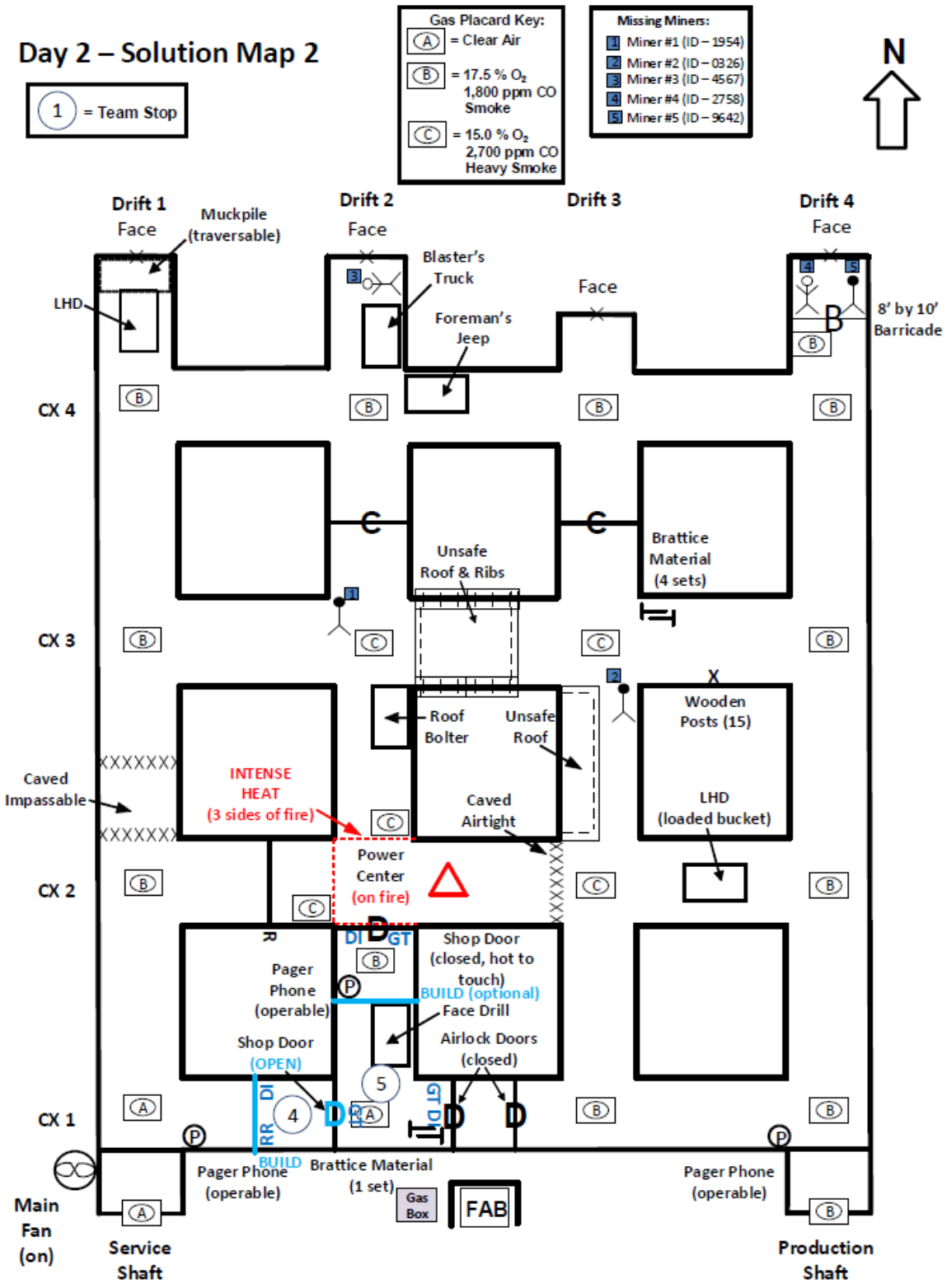
The team will retreat to Drift 1 and advance northward in the drift toward CX 2. At the intersection, the captain will check the roof or back and the team will conduct necessary gas tests. They will find "17.5 % O_2 and 1,800 ppm CO with smoke." To the north, the team will find that the drift is blocked by an impassable cave stretching rib-to-rib. The captain must D&I the cave as their furthest point of advance in this direction.

The team's failure to conduct a team check before entering smoke at this location will result in discounts (5 x each infraction) per Judge 1 – UG Rule #12. Additionally, a team member's failure to be attached to or have hold of the lifeline when in smoke will result in discounts (2 x each infraction) per Judge 2 – UG Rule #9.

Team Stop No. 3

Since CX 2 to the east is open, the team can advance eastward to Drift 2. As they travel, they will find three sets of brattice material lying along the southern rib. They can take two sets with them for future use. As the team approaches the intersection with Drift 2, they will find a gas placard indicating "15.0 % O_2 and 2,700 ppm CO with heavy smoke." They will also find a placard indicating "intense heat." The captain must D&I the location of the "intense heat." Then, the team must erect a seal across the drift to isolate the fire, leaving a regulator to avoid making a ventilation change. The captain must D&I the build. **Without undue delay**, the team must find and seal all other approaches to the fire. As the team retreats westward to Drift 1, they can retrieve the remaining set of brattice material and carry it with them for future use (two sets onboard their stretcher).

If a team member advances past the placard indicating "intense heat" assess individual endangerment discounts (15 x each person) per Judge 1 – UG Rule #10(a)(4). Also, if the captain doesn't check the roof and rib prior to building a temporary stopping, assess 5 discounts per Judge 1- UG Rule #8(b)(3). If the captain does not D&I the build, assess discounts per Judge 1 – UG Rule #9 (2x each place - 10 max).



Note: Main Fan Not Reversible

Note: Team Stop Nos. 4 - 5 (see Solution Map 2)

Team Stop No. 4

Now, the team has the materials necessary to build a temporary stopping. They can retreat southward in Drift 1 and then advance eastward in CX 1. A temporary stopping can be erected in CX1 to allow access to the southernmost shop door. However, before building the temporary stopping, the captain must check the roof and ribs in the immediate area. Afterward, the stopping can be erected and the captain must D&I the installation. Then, the shop door can be opened and the captain must check the roof or back before any team member passes through. A gas test made inby the shop door indicates "clear air." The team can stretch eastward to the westernmost airlock door to find that it is closed. The captain will check the roof or back and the team will conduct necessary gas tests. The captain must D&I the door as their furthest point of advance in this direction.

If the captain doesn't check the roof and rib prior to building a temporary stopping, assess 5 discounts per Judge 1- UG Rule #8(b)(3). If the captain does not D&I the build, assess discounts per Judge 1 – UG Rule #9 (2x each place - 10 max).

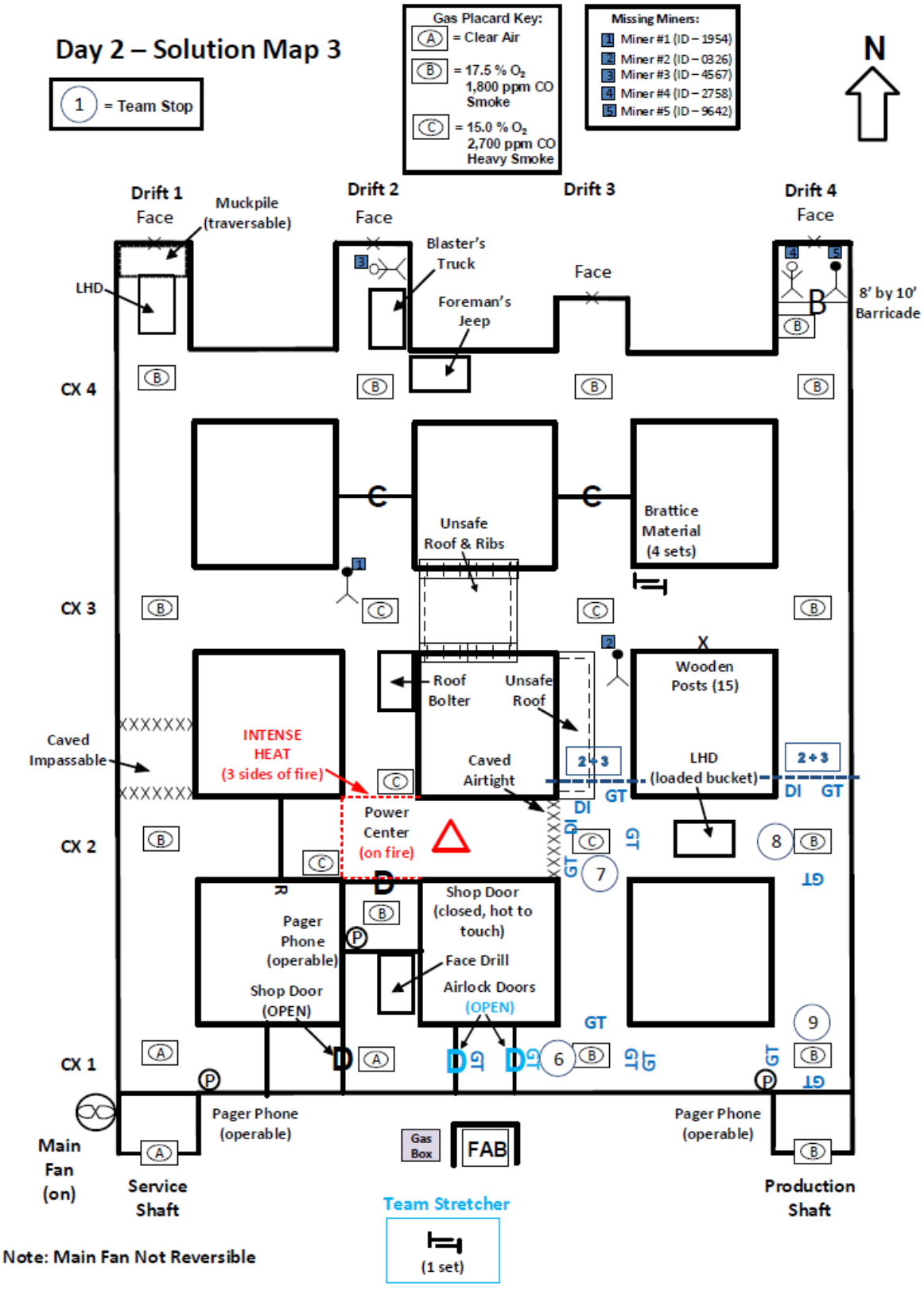
Team Stop No. 5

The team will advance northward in Drift 2 toward CX 2. As they travel, they will find a face drill parked along the eastern rib and an operable pager phone along the western rib. They will also find a placard indicating that the northernmost shop door is closed and "hot to touch." The captain will check the roof or back and the team will conduct necessary gas tests. A gas placard near the door shows "17.5 % O_2 and 1,800 ppm CO with smoke." Conditions behind the shop door are unknown. However, with evidence of fire behind the door (heat and smoke), the team should leave the door closed since this approach to the fire is already sealed. The captain must D&I the shop door as their furthest point of advance in this direction.

Since the team has two sets of brattice material available for use, they may decide to erect a seal across the drift to ensure that the fire is controlled in this direction and does not spread into the shop. This is shown as an "optional" build on Solution Map 2.

Note: If the team decides to open the door, they must first erect a temporary stopping. When the door is opened, a placard on the other side indicates "Intense Heat." At that time, the team can retreat and close the shop door behind them.

If a team member advances past the placard indicating "intense heat" assess individual endangerment discounts (15 x each person) per Judge 1 – UG Rule #10(a)(4).


Day 2 – Solution Map 3
1 = Team Stop
Gas Placard Key:
A = Clear Air
B = 17.5 % O2 1,800 ppm CO Smoke
C = 15.0 % O2 2,700 ppm CO Heavy Smoke
Missing Miners:
1 Miner #1 (ID – 1954)
2 Miner #2 (ID – 0326)
3 Miner #3 (ID – 4567)
4 Miner #4 (ID – 2758)
5 Miner #5 (ID – 9642)
N
Drift 1
Face
Muckpile (traversable)
Drift 2
Face
Drift 3
Face
Drift 4
Face
Blaster's Truck
Foreman's Jeep
LHD
8' by 10' Barricade
CX 4
CX 3
CX 2
CX 1
Unsafe Roof & Ribs
Brattice Material (4 sets)
Roof Bolter
Unsafe Roof
Wooden Posts (15)
Caved Impassable
INTENSE HEAT (3 sides of fire)
Caved Airtight
LHD (loaded bucket)
Power Center (on fire)
Pager Phone (operable)
Shop Door (OPEN)
Shop Door (closed, hot to touch)
Face Drill
Airlock Doors (OPEN)
Pager Phone (operable)
Pager Phone (operable)
Main Fan (on)
Service Shaft
Gas Box
FAB
Production Shaft
Team Stretcher
(1 set)
Note: Main Fan Not Reversible

Note: Team Stop Nos. 6 - 9 (see Solution Map 3)

Team Stop No. 6
Since CX 1 is still blocked by the temporary stopping erected by the team to the west and there is clear air in the shop near the westernmost airlock door, the airlock door can be opened. The captain must check the roof or back before any team member passes through. A gas test made inby the airlock door indicates that the gas concentrations have not changed from their previous location (clear air.) The team can stretch eastward to the next airlock door to find that it is closed. Again, the door can be opened and the captain must check the roof or back before any team member passes through. A gas test made inby the airlock door. Afterward, the team can advance to Drift 3. At the intersection, the captain will check the roof or back and the team will conduct necessary gas tests. They will find "17.5 % O_2 and 1,800 ppm CO with smoke."

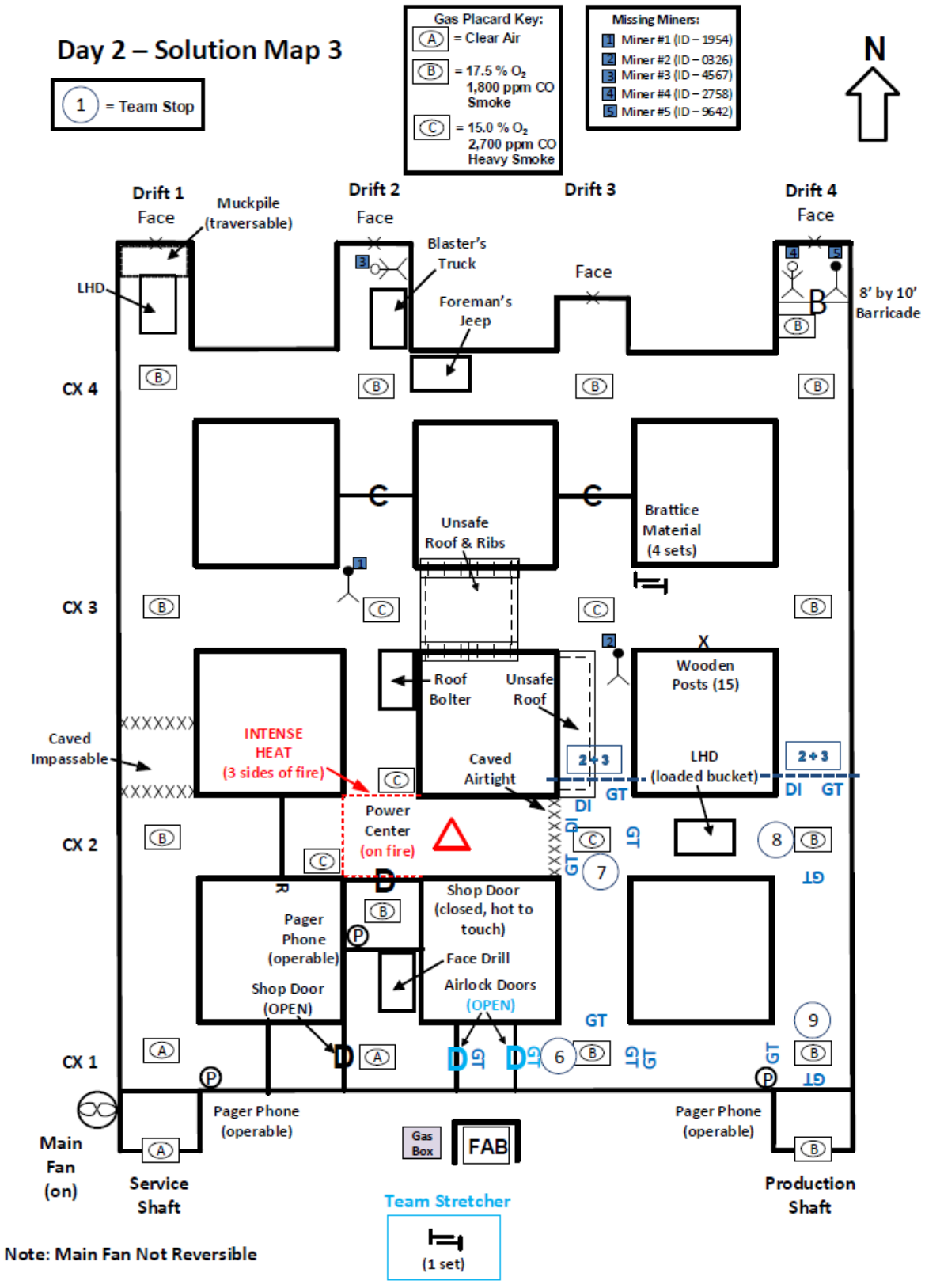
The team's failure to conduct a team check before entering smoke at this location will result in discounts (5 x each infraction) per Judge 1 – UG Rule #12. Additionally, a team member's failure to be attached to or have hold of the lifeline when in smoke will result in discounts (2 x each infraction) per Judge 2 – UG Rule #9.

Team Stop No. 7
Without undue delay, the team must find and seal all other approaches to the fire. The team must advance northward in Drift 3 to CX 2. At the intersection, the captain will check the roof or back and the team will conduct necessary gas tests. They will find "15.0 % O_2 and 2,700 ppm CO with heavy smoke" and CX 2 is open to the east. To the north in the drift, the captain will find an area of unsafe roof extending approximately 5 feet from the western rib. The captain must warn the other team members to avoid the hazard. To the west, they will find that access to CX 2 is block by an airtight cave stretching rib-to-rib. The captain must D&I the cave as their furthest point of advance in this direction.

Note: The team cannot advance beyond 3 feet past CX 2, because they had not tied-in the entries behind them.

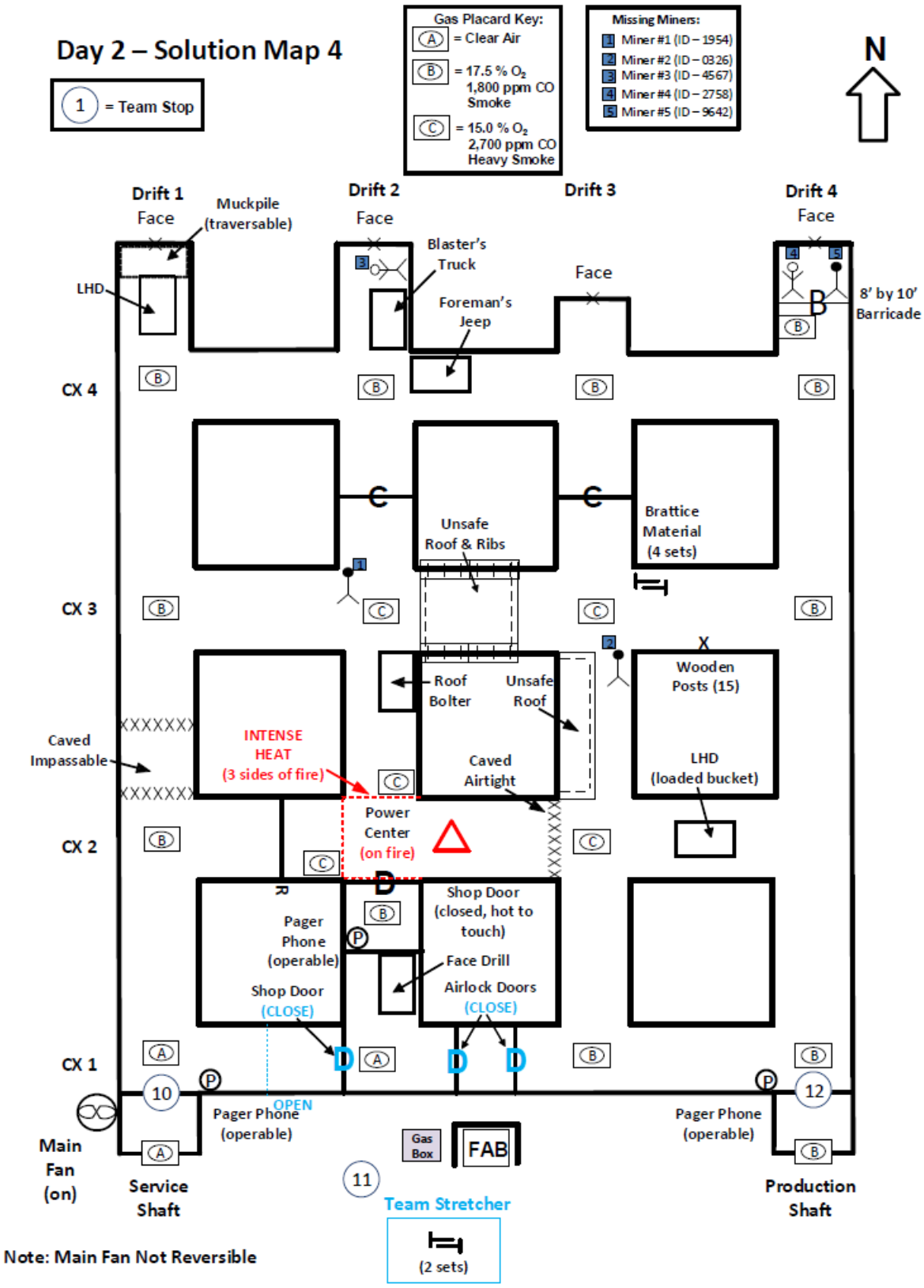
Team Stop No. 8
To tie-in behind, the team must travel eastward in CX 2 to Drift 4. As they travel, the team will find an LHD (with a loaded bucket) parked in the middle of the crosscut and they can continue to advance around the machine. At the intersection, the captain will check the roof or back and the team will conduct necessary gas tests. They will find "17.5 % O_2 and 1,800 ppm CO with smoke" and the drift is open to the north.

Note: The team cannot advance beyond 3 feet past CX 2, because they had not tied-in the entries behind them.


Day 2 – Solution Map 3
1 = Team Stop
Gas Placard Key:
A = Clear Air
B = 17.5 % O2 1,800 ppm CO Smoke
C = 15.0 % O2 2,700 ppm CO Heavy Smoke
Missing Miners:
1 Miner #1 (ID – 1954)
2 Miner #2 (ID – 0326)
3 Miner #3 (ID – 4567)
4 Miner #4 (ID – 2758)
5 Miner #5 (ID – 9642)
N
Drift 1 Face
Muckpile (traversable)
Drift 2 Face
Drift 3 Face
Drift 4 Face
Blaster's Truck
Foreman's Jeep
LHD
8' by 10' Barricade
CX 4
CX 3
CX 2
CX 1
Unsafe Roof & Ribs
Brattice Material (4 sets)
Roof Bolter
Unsafe Roof
Wooden Posts (15)
Caved Impassable
INTENSE HEAT (3 sides of fire)
Caved Airtight
LHD (loaded bucket)
Power Center (on fire)
Shop Door (closed, hot to touch)
Pager Phone (operable)
Face Drill
Airlock Doors (OPEN)
Shop Door (OPEN)
Pager Phone (operable)
Pager Phone (operable)
Main Fan (on)
Service Shaft
Gas Box
FAB
Production Shaft
Team Stretcher
(1 set)
Note: Main Fan Not Reversible

Team Stop No. 9
The team can now advance southward in Drift 4 to CX 1. At the intersection, the captain will check the roof or back and the team will conduct necessary gas tests. They will find that the gas concentrations have not changed from their previous location. At the Production Shaft Station, the team will find an operable pager phone. They can stretch westward in CX 1 to tie-in.

Note: At this time, the team must find all other approaches to the fire without undue delay and remain systematic in their exploration of the mine. Therefore, they must exit the mine and re-enter through the Production Shaft.


Day 2 – Solution Map 4
1 = Team Stop
Gas Placard Key:
A = Clear Air
B = 17.5 % O2 1,800 ppm CO Smoke
C = 15.0 % O2 2,700 ppm CO Heavy Smoke
Missing Miners:
1 Miner #1 (ID – 1954)
2 Miner #2 (ID – 0326)
3 Miner #3 (ID – 4567)
4 Miner #4 (ID – 2758)
5 Miner #5 (ID – 9642)
N
Drift 1
Face
Muckpile (traversable)
Drift 2
Face
Drift 3
Face
Drift 4
Face
Blaster's Truck
Foreman's Jeep
LHD
8' by 10' Barricade
CX 4
CX 3
CX 2
CX 1
Unsafe Roof & Ribs
Brattice Material (4 sets)
Roof Bolter
Unsafe Roof
Wooden Posts (15)
Caved Impassable
INTENSE HEAT (3 sides of fire)
Caved Airtight
LHD (loaded bucket)
Power Center (on fire)
Pager Phone (operable)
Shop Door (closed, hot to touch)
Face Drill
Shop Door (CLOSE)
Airlock Doors (CLOSE)
OPEN
Pager Phone (operable)
Pager Phone (operable)
Gas Box
FAB
Main Fan (on)
Service Shaft
Team Stretcher
(2 sets)
Production Shaft
Note: Main Fan Not Reversible

Note: Team Stop Nos. 10 - 12 (see Solution Map 4)

Team Stop No. 10
The team must retreat the way they came and return to the airlock doors in CX 1. After they pass through the doors, they can close each door behind them. Then, they can travel westward through the shop and exit the southernmost shop door and close it behind them. Afterward, they can tear down the temporary stopping that they had previously built in CX 1 and carry it with them for future use (2 sets onboard their stretcher). Once they reach the Service Shaft Station, the team will enter the hoist, close the shaft gate, signal the hoist engineer and ascend to the surface.

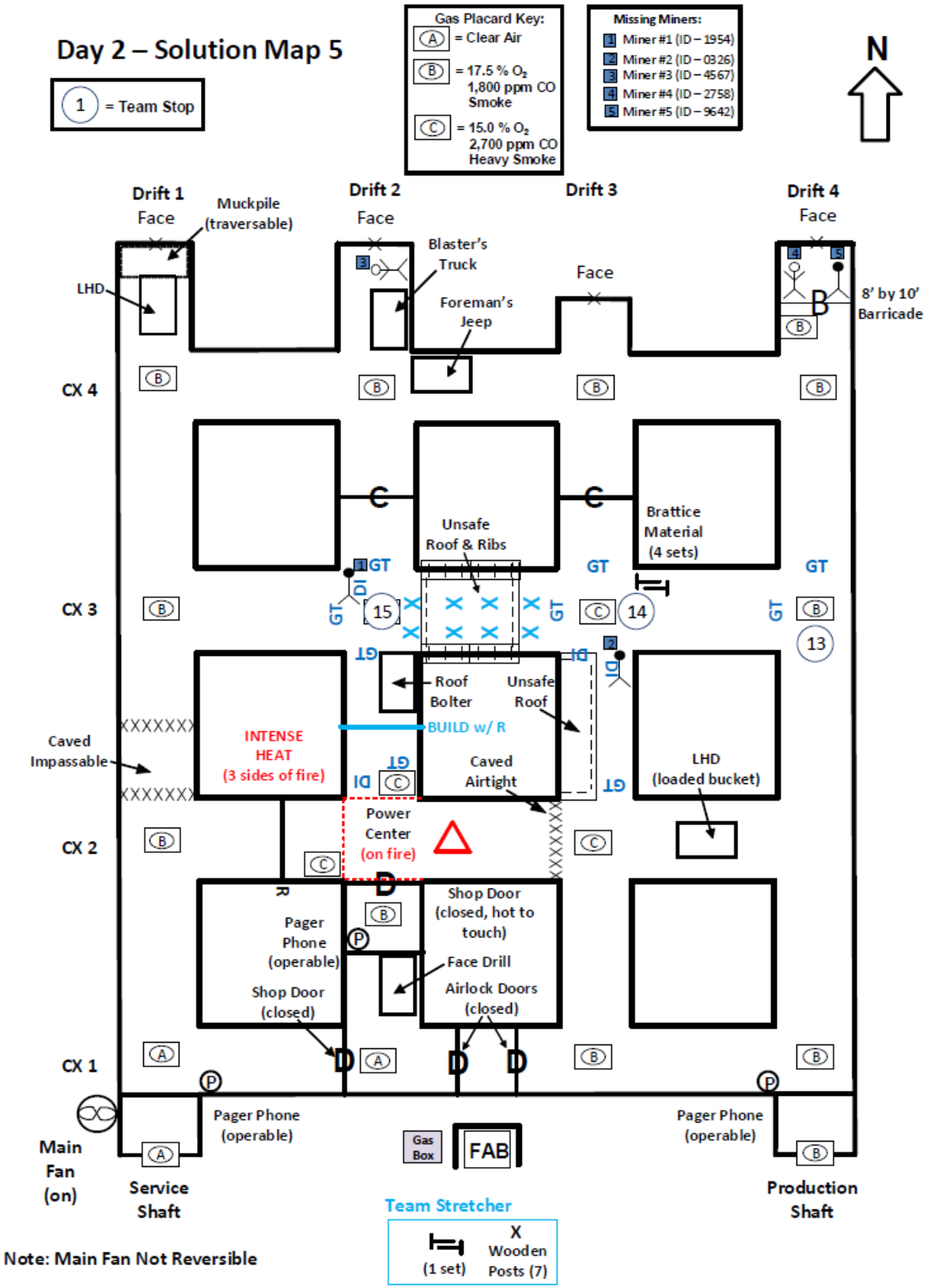
Team Stop No. 11
Once on the surface, the team will exit the hoist, close the shaft gate, and travel to the Production Shaft.

Team Stop No. 12
At the Production Shaft, the team will enter the escape hoist, close the shaft gate, signal the hoist engineer and descend to the mine level.

Note: Due to gas concentrations at this shaft, the team must perform an apparatus and personnel check before entering smoke at this location (per Judge 1 – UG Rule #12). They must also be attached to their lifeline (per Judge 2 – UG Rule #9).

Note: All three team stops (10 – 12 above):
The team's failure to close the shaft gate will result in discounts (5 x each infraction) per Judge 1 – UG Rule #7.

The team's failure to use the posted hoisting signals will result in discounts (1 x each infraction) per Judge 1 – UG Rule #6.


Day 2 – Solution Map 5
1 = Team Stop
Gas Placard Key:
A = Clear Air
B = 17.5 % O2 1,800 ppm CO Smoke
C = 15.0 % O2 2,700 ppm CO Heavy Smoke
Missing Miners:
1 Miner #1 (ID – 1954)
2 Miner #2 (ID – 0326)
3 Miner #3 (ID – 4567)
4 Miner #4 (ID – 2758)
5 Miner #5 (ID – 9642)
N
Drift 1 Face
Muckpile (traversable)
Drift 2 Face
Drift 3 Face
Drift 4 Face
Blaster's Truck
Foreman's Jeep
LHD
8' by 10' Barricade
CX 4
CX 3
CX 2
CX 1
Unsafe Roof & Ribs
Brattice Material (4 sets)
GT
DI
15
14
13
Roof Bolter
Unsafe Roof
BUILD w/ R
Caved Impassable
INTENSE HEAT (3 sides of fire)
Caved Airtight
LHD (loaded bucket)
Power Center (on fire)
Shop Door (closed, hot to touch)
Pager Phone (operable)
Face Drill
Airlock Doors (closed)
Shop Door (closed)
Pager Phone (operable)
Pager Phone (operable)
Gas Box
FAB
Main Fan (on)
Service Shaft
Production Shaft
Team Stretcher
(1 set)
X Wooden Posts (7)
Note: Main Fan Not Reversible

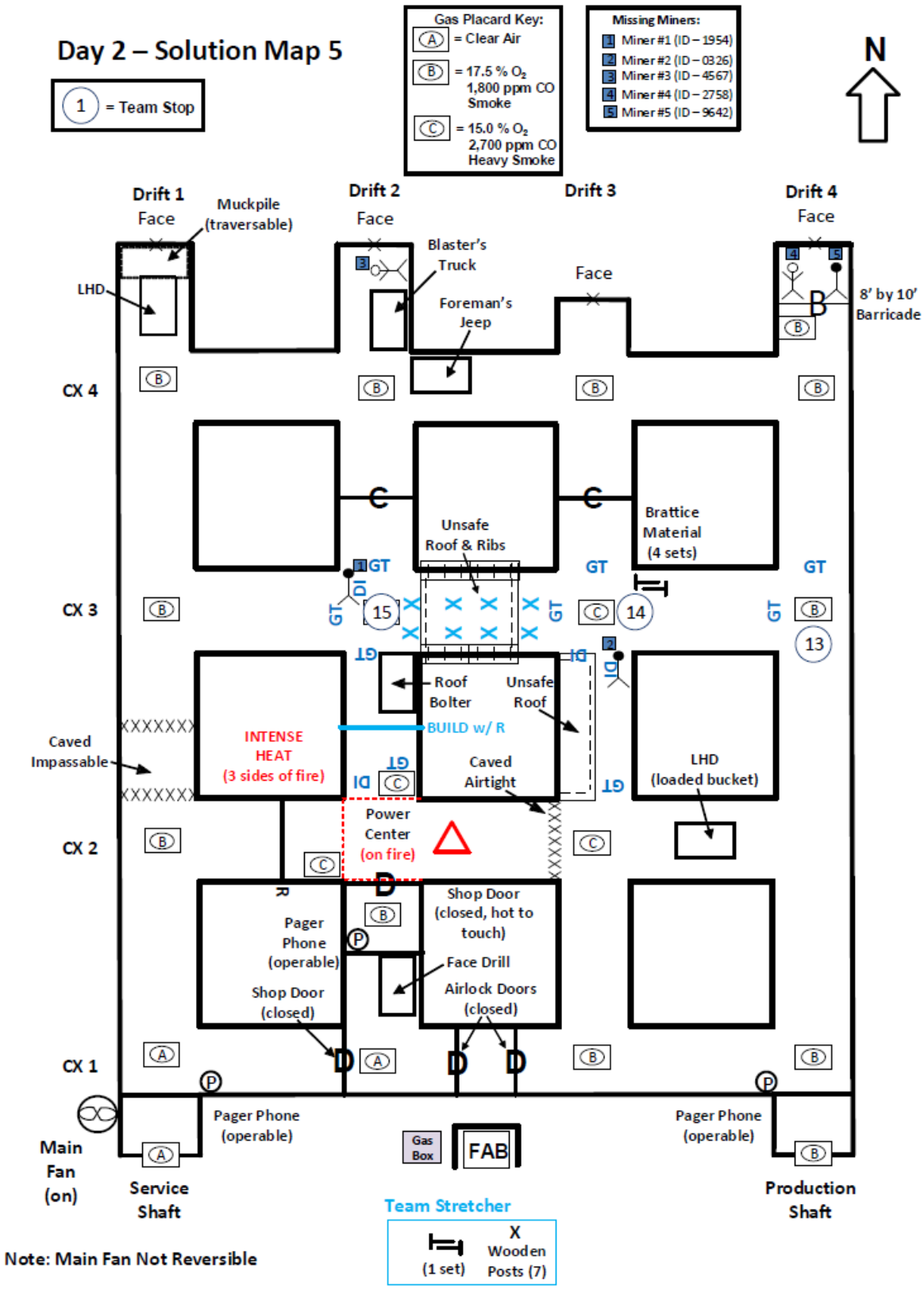
Note: Team Stop Nos. 13 - 15 (see Solution Map 5)

Team Stop No. 13
To continue systematic exploration of the mine and find all other approaches to the fire without undue delay, the team will exit the cage and close the shaft gate. Then, they can advance northward in Drift 4 toward CX 3. At the intersection, the captain performs roof or back checks and the team conducts necessary gas tests. They will find "17.5 % O_2 and 1,800 ppm CO with smoke." They will also find that the drift is open to the north and the crosscut is open to the west.

Team Stop No. 14
The team will advance westward in CX 3 toward Drift 3. As they travel, they will find 15 wooden posts along the southern rib. They can take the posts with them for future use. The team will also find 4 sets of brattice material lying along the northern rib. They must leave them at this location since they already have 2 sets on their stretcher. At the intersection, the captain performs roof or back checks and the team conducts necessary gas tests. They will find "15.0 % O_2 and 2,700 ppm CO with heavy smoke." The team will also find that Drift 3 is open to the north and CX 3 is open to the west.

To the south, they will find the northern extent of the area of unsafe roof extending approximately 5 feet out from the western rib. The captain must warn the other team members to avoid this hazard. They will also find the first missing miner lying along the eastern rib, Miner #2 (ID – 0326), who is unresponsive. The team captain must perform necessary roof or back checks over the miner. After a primary assessment, the #1 Judge will hand the team member a placard which reads: **"The miner exhibits no vital signs. The miner is dead."** The captain must D&I the location of the body. Afterward, the team can then stretch southward in the Drift 3 to tie-in.

Team Stop No. 15
Now, the team can retreat to CX 3 and advance westward toward Drift 2. As they travel, they will find a placard indicating an area of "unsafe roof and ribs" extending from rib-to-rib (approximately 5 feet from the CX 3 / Drift 3 intersection). The captain must warn the other team members to avoid this hazard and D&I the location. Afterward, the team can proceed to support the area using 8 of the 15 wooden posts that they had found previously in the crosscut and carried on their stretcher. **The team should follow the example shown in Figure 3 on page 37 of the 2017 - 2018 Metal and Nonmetal Mine Rescue Contest Rules booklet.** If the team removes any installed post after it has been set, assess a team endangerment (75 discounts) or individual endangerment (15 x each person) per Judge 1 – UG Rule #10(b)(7).

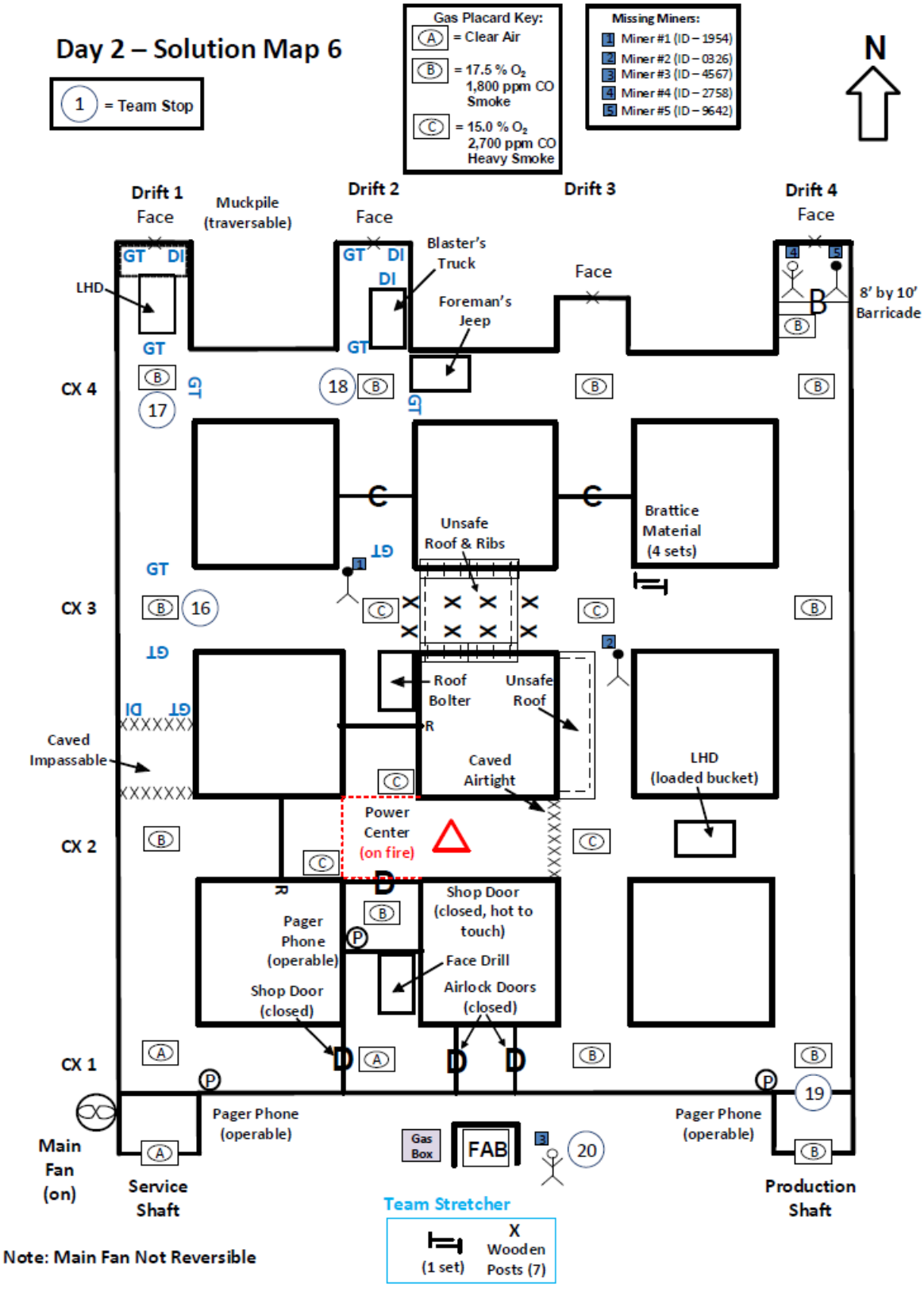

Day 2 – Solution Map 5
1 = Team Stop
Gas Placard Key:
A = Clear Air
B = 17.5 % O2 1,800 ppm CO Smoke
C = 15.0 % O2 2,700 ppm CO Heavy Smoke
Missing Miners:
1 Miner #1 (ID – 1954)
2 Miner #2 (ID – 0326)
3 Miner #3 (ID – 4567)
4 Miner #4 (ID – 2758)
5 Miner #5 (ID – 9642)
N
Drift 1
Face
Muckpile (traversable)
Drift 2
Face
Drift 3
Face
Drift 4
Face
Blaster's Truck
Foreman's Jeep
LHD
8' by 10' Barricade
CX 4
CX 3
CX 2
CX 1
Unsafe Roof & Ribs
Brattice Material (4 sets)
GT
DI
Roof Bolter
Unsafe Roof
BUILD w/ R
Caved Impassable
INTENSE HEAT (3 sides of fire)
Caved Airtight
LHD (loaded bucket)
Power Center (on fire)
Shop Door (closed, hot to touch)
Pager Phone (operable)
Face Drill
Airlock Doors (closed)
Shop Door (closed)
Pager Phone (operable)
Pager Phone (operable)
Main Fan (on)
Service Shaft
Gas Box
FAB
Production Shaft
Team Stretcher
(1 set)
X Wooden Posts (7)
Note: Main Fan Not Reversible

Team Stop No. 15 (continued)
At the intersection with Drift 2, the captain performs roof or back checks and the team conducts necessary gas tests. They will find that the gas concentrations have not changed from their previous location and that the drift is open to the north and the crosscut is open to the west. The team will also find the second missing miner, Miner #1 (ID – 1954), who is unresponsive. The team captain must perform necessary roof or back checks over the miner. After a primary assessment, the #1 Judge will hand the team member a placard which reads: **"The miner is severely burned and exhibits no vital signs. The miner is dead."** The captain must D&I the location of the body.

Now, the team can stretch southward in Drift 2 to tie-in. As they travel, they will find a roof bolter parked along the eastern rib. They can stretch beside the machine toward CX 2. At the intersection, they will find a gas placard indicating "15.0 % O_2 and 2,700 ppm CO with heavy smoke." They will also find a placard indicating "intense heat." Then, the team must erect a seal across the drift to isolate the fire, leaving a regulator to avoid making a ventilation change. The captain must D&I the build.

If a team member advances past the placard indicating "intense heat" assess individual endangerment discounts (15 x each person) per Judge 1 – UG Rule #10(a)(4). Also, if the captain doesn't check the roof and rib prior to building a temporary stopping, assess 5 discounts per Judge 1- UG Rule #8(b)(3). If the captain does not D&I the build, assess discounts per Judge 1 – UG Rule #9 (2x each place - 10 max).

At this point, seals have been erected at all approaches in order to contain the fire and airflow has been regulated through the area. The team can now continue exploring the accessible areas of the mine in order to locate the remaining three missing miners.


Day 2 – Solution Map 6
1 = Team Stop
Gas Placard Key:
A = Clear Air
B = 17.5 % O2 1,800 ppm CO Smoke
C = 15.0 % O2 2,700 ppm CO Heavy Smoke
Missing Miners:
1 Miner #1 (ID – 1954)
2 Miner #2 (ID – 0326)
3 Miner #3 (ID – 4567)
4 Miner #4 (ID – 2758)
5 Miner #5 (ID – 9642)
N
Drift 1
Face
Muckpile (traversable)
Drift 2
Face
Drift 3
Face
Drift 4
Face
Blaster's Truck
Foreman's Jeep
8' by 10' Barricade
LHD
GT
DI
CX 4
CX 3
CX 2
CX 1
Unsafe Roof & Ribs
Brattice Material (4 sets)
Roof Bolter
Unsafe Roof
Caved Impassable
Caved Airtight
LHD (loaded bucket)
Power Center (on fire)
Shop Door (closed, hot to touch)
Pager Phone (operable)
Face Drill
Airlock Doors (closed)
Shop Door (closed)
Pager Phone (operable)
Pager Phone (operable)
Gas Box
FAB
Main Fan (on)
Service Shaft
Production Shaft
Team Stretcher
(1 set)
X Wooden Posts (7)
Note: Main Fan Not Reversible

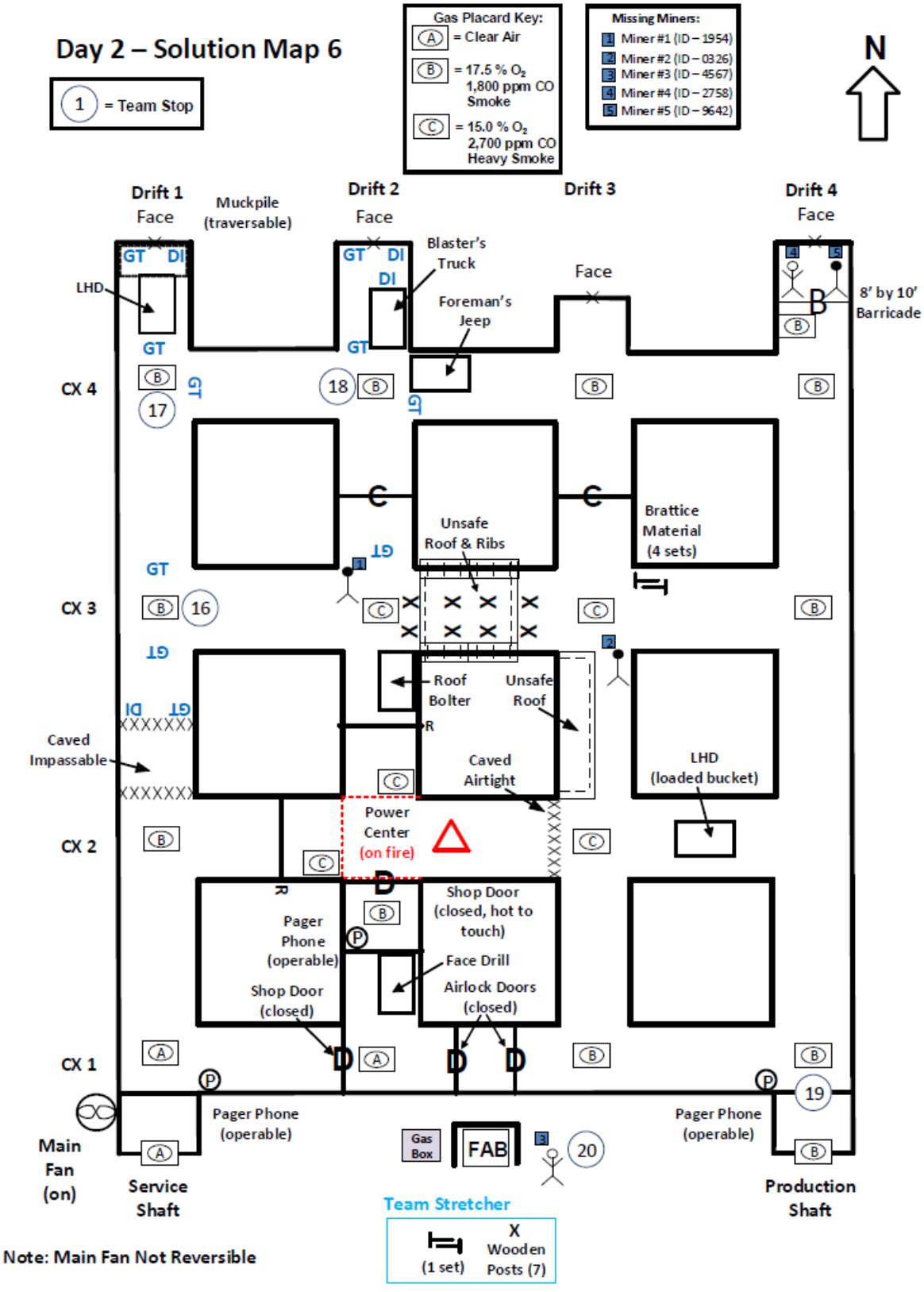
Note: Team Stop Nos. 16 - 20 (see Solution Map 6)

Team Stop No. 16
The team will continue to explore eastward in CX 3 toward Drift 1. At the intersection, the captain performs roof or back checks and the team conducts necessary gas tests. The team will find "17.5 % O_2 and 1,800 ppm CO with smoke." They can stretch southward in the drift to tie in. About 7.5 feet from the intersection, the team will find that the northernmost extend of the impassable cave stretching rib-to-rib. The captain must D&I the cave as their furthest point of advance in this direction.

Team Stop No. 17
Now, the team can advance northward in Drift 1 toward CX 4. At the intersection, the captain performs roof or back checks and the team conducts necessary gas tests. They will find that the gas concentrations in this area had not changed from their previous location. The team can stretch into the face area of the drift to find an LHD parked in the middle of the drift. They can stretch along side of the LHD to find a muckpile extending approximately 4 feet from the face. The placard at this location indicates that the muckpile is traversable. Therefore, the captain can check the roof or back while the team conducts necessary gas tests. Before leaving the area, the captain must D&I the face as the team's furthest point of advance in this direction.

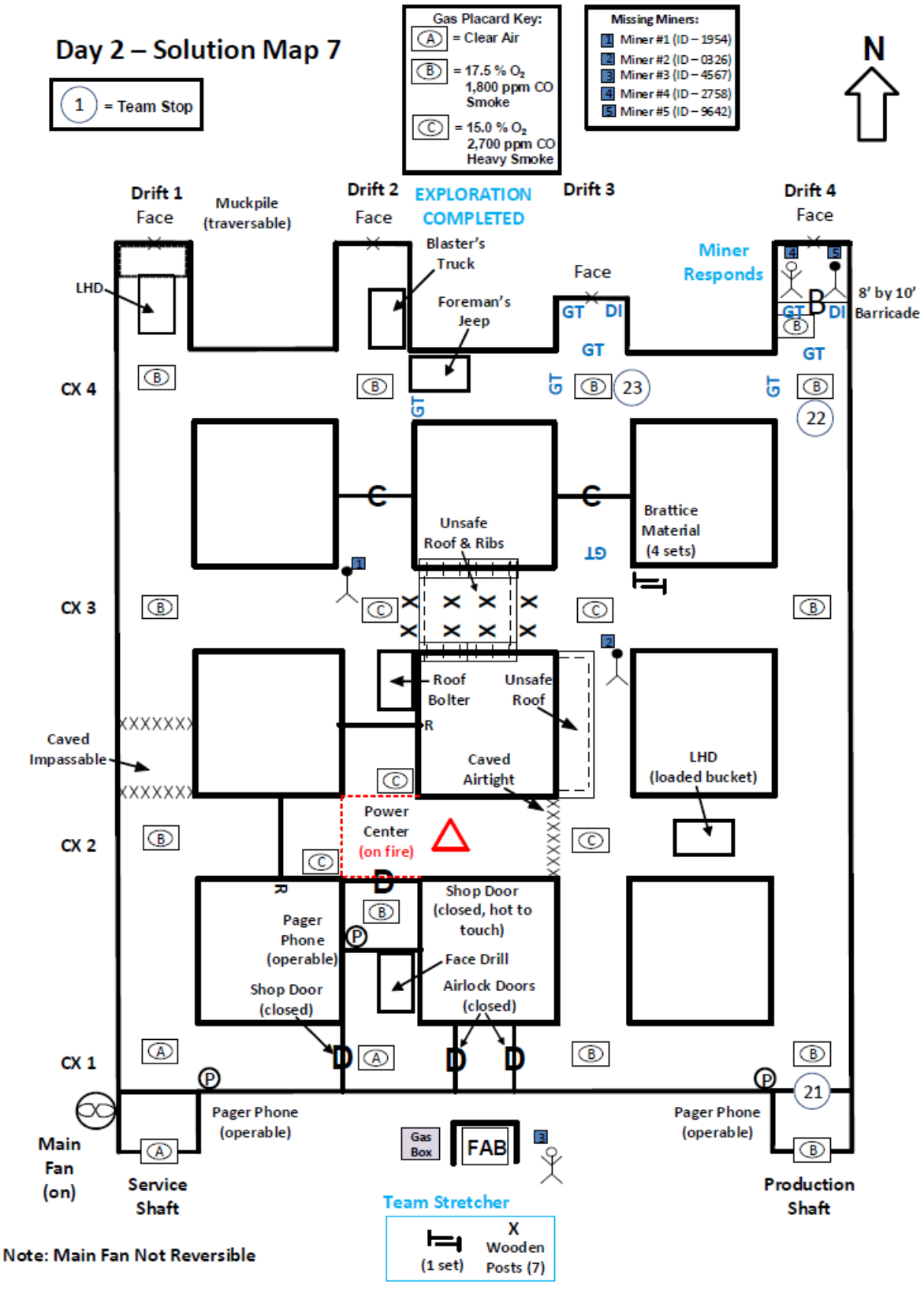
Team Stop No. 18
The team will advance eastward in CX 4 to Drift 2. At the intersection, the captain performs roof or back checks and the team conducts necessary gas tests. They will find that the gas concentrations in this area had not changed from their previous location. To the north, they will find a blaster's truck parked along the eastern rib extending toward the face. To the east, they will find a foreman's jeep parked along the northern rib extending eastward in the crosscut. To the south, they can stretch through the check curtain to tie-in. Finally, the team can retreat to CX 4 and advance northward into the face area. As they advance beside the blaster's truck, they will find the third missing miner (Miner #3, ID – 4567), who is unresponsive and lying in front of the truck. The captain must examine the roof or back over Miner #3. After a team member conducts a primary assessment, the #1 Judge will hand the team a placard which reads: ***"The miner is unconscious with no apparent injuries."*** Since there are no injuries, the team must follow the prescribed treatment for prevention of shock (listed in Brady's 10th Edition on page 397). The team can continue with their secondary survey and prepare Miner #3 for transport by securing the miner to their stretcher. The unconscious miner must also be fitted with proper respiratory protection (i.e., a 4-hour breathing apparatus, per Judge 1 - UG Rule 18d and page 30 of the Rules booklet for unconscious survivor).

At the face, the captain will perform roof or back checks as a team member conducts necessary gas tests. Before leaving the area, the captain must D&I the location of the miner and the face (as their furthest point of advance in this direction).


Day 2 – Solution Map 6
1 = Team Stop
Gas Placard Key:
A = Clear Air
B = 17.5 % O2 1,800 ppm CO Smoke
C = 15.0 % O2 2,700 ppm CO Heavy Smoke
Missing Miners:
1 Miner #1 (ID – 1954)
2 Miner #2 (ID – 0326)
3 Miner #3 (ID – 4567)
4 Miner #4 (ID – 2758)
5 Miner #5 (ID – 9642)
N
Drift 1
Face
Muckpile (traversable)
Drift 2
Face
Drift 3
Face
Drift 4
Face
Blaster's Truck
Foreman's Jeep
8' by 10' Barricade
LHD
GT
DI
CX 4
CX 3
CX 2
CX 1
Unsafe Roof & Ribs
Brattice Material (4 sets)
Roof Bolter
Unsafe Roof
Caved Impassable
Caved Airtight
LHD (loaded bucket)
Power Center (on fire)
Shop Door (closed, hot to touch)
Pager Phone (operable)
Face Drill
Airlock Doors (closed)
Shop Door (closed)
Pager Phone (operable)
Pager Phone (operable)
Gas Box
FAB
Main Fan (on)
Service Shaft
Production Shaft
Team Stretcher
(1 set)
X Wooden Posts (7)
Note: Main Fan Not Reversible

Team Stop No. 19
Afterward, the team the team must retreat the way they came and return to the Production Shaft. Once they reach the Production Shaft Station, the team will enter the escape hoist, close the shaft gate, signal the hoist engineer and ascend to the surface.

Team Stop No. 20
Once on the surface, the team will exit the hoist, close the shaft gate, and report to the fresh air base. There, they can arrange for follow-up medical treatment for Miner #3. Then, the team can prepare to re-enter the mine.


Day 2 – Solution Map 7
1 = Team Stop
Gas Placard Key:
A = Clear Air
B = 17.5 % O2 1,800 ppm CO Smoke
C = 15.0 % O2 2,700 ppm CO Heavy Smoke
Missing Miners:
1 Miner #1 (ID – 1954)
2 Miner #2 (ID – 0326)
3 Miner #3 (ID – 4567)
4 Miner #4 (ID – 2758)
5 Miner #5 (ID – 9642)
N
Drift 1 Face
Muckpile (traversable)
Drift 2 Face
EXPLORATION COMPLETED
Drift 3 Face
Drift 4 Face
Miner Responds
8' by 10' Barricade
LHD
Blaster's Truck
Foreman's Jeep
CX 4
CX 3
CX 2
CX 1
Unsafe Roof & Ribs
Brattice Material (4 sets)
Roof Bolter
Unsafe Roof
Caved Impassable
Caved Airtight
LHD (loaded bucket)
Power Center (on fire)
Pager Phone (operable)
Shop Door (closed, hot to touch)
Face Drill
Airlock Doors (closed)
Shop Door (closed)
Pager Phone (operable)
Pager Phone (operable)
Gas Box
FAB
Main Fan (on)
Service Shaft
Production Shaft
Team Stretcher
(1 set)
X Wooden Posts (7)
Note: Main Fan Not Reversible

Note: Team Stop Nos. 21 - 23 (see Solution Map 7)

Team Stop No. 21
At the Production Shaft, the team will enter the escape hoist, close the shaft gate, signal the hoist engineer and descend to the mine level.

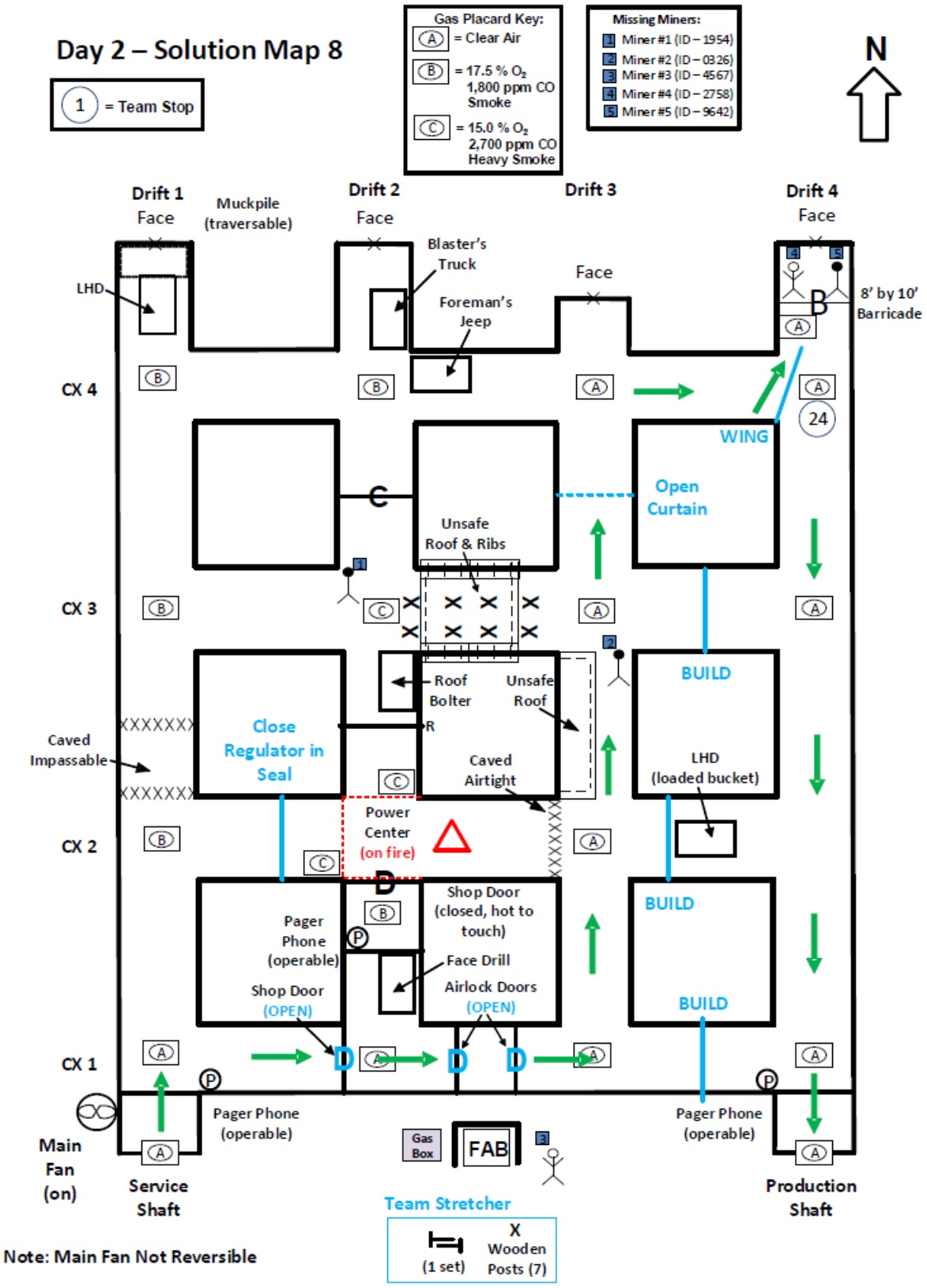
Note: Due to gas concentrations at this shaft, the team must perform an apparatus and personnel check before entering smoke at this location (per Judge 1 – UG Rule #12). They must also be attached to their lifeline (per Judge 2 – UG Rule #9).

Team Stop No. 22
Upon exiting the cage, the team will close the shaft gate, and advance northward in Drift 4 to CX 4. At the intersection, the captain performs roof or back checks and the team conducts necessary gas tests. The team will find "17.5 % O_2 and 1,800 ppm CO with smoke." To the west, they will find that CX 4 is open. As the team advances northward in the drift (approximately 5 feet inby the intersection), the team will find an "8-foot by 10-foot barricade" stretching from rib-to-rib. At the barricade, the captain must perform roof or back checks and the team will conduct necessary gas tests. They will also find a placard indicating "17.5% O_2 and 1,800 ppm CO with smoke." The team can converse with the missing miner inside. Judge No. 1 will hand the team a placard with the following statement:

> *"I am Miner #4 (ID – 2758). I was preparing to load the face of Drift 2 with explosives when the mine filled with smoke. The foreman (Miner #5, ID 9642) told me to follow him out. We could not see, so we retreated and found a place to barricade. The air inside of this barricade seems to be O.K., but the foreman passed out and I cannot revive him. There is a solid face behind us. Please get us out of here."*

Note: Since the atmosphere immediately in front of the barricade contains CO concentrations that represent an IDLH atmosphere, as defined on under "Barricades" on Page 29 of the Rules booklet, the team cannot enter the barricade without first re-ventilating. The team must instruct Miner #4 to remain safely in the barricade with Miner #5 until they can make a ventilation change to clear the barricade.

Team Stop No. 23
Now, the team can advance westward in CX 4 toward Drift 3. At the intersection, the captain performs roof or back checks and the team conducts necessary gas tests. They will find that the gas concentrations in this area had not changed from their previous location. The team can stretch southward in the drift to tie-in. Then, they can advance northward in the drift into the face area. The captain will perform roof or back checks as the team conducts necessary gas tests. The captain must D&I the face as the team's furthest point of advance in this direction. Then, the team can stretch westward in CX 4 to tie-in. **This completes the team's exploration of the mine.**


Day 2 – Solution Map 8
1 = Team Stop
Gas Placard Key:
A = Clear Air
B = 17.5 % O2 1,800 ppm CO Smoke
C = 15.0 % O2 2,700 ppm CO Heavy Smoke
Missing Miners:
1 Miner #1 (ID – 1954)
2 Miner #2 (ID – 0326)
3 Miner #3 (ID – 4567)
4 Miner #4 (ID – 2758)
5 Miner #5 (ID – 9642)
N
Drift 1 Face
Muckpile (traversable)
Drift 2 Face
Drift 3 Face
Drift 4 Face
Blaster's Truck
Foreman's Jeep
LHD
8' by 10' Barricade
CX 4
CX 3
CX 2
CX 1
WING
Open Curtain
Unsafe Roof & Ribs
BUILD
Roof Bolter
Unsafe Roof
Caved Impassable
Close Regulator in Seal
Caved Airtight
LHD (loaded bucket)
Power Center (on fire)
Shop Door (closed, hot to touch)
Pager Phone (operable)
Face Drill
Airlock Doors (OPEN)
Shop Door (OPEN)
Pager Phone (operable)
Pager Phone (operable)
Gas Box
FAB
Main Fan (on)
Service Shaft
Production Shaft
Team Stretcher
(1 set)
X Wooden Posts (7)
Note: Main Fan Not Reversible

Note: Team Stop No. 24 (see Solution Map 8) – Re-ventilation

Team Stop No. 24
Now, the team must make a ventilation change to direct fresh air toward the face area of Drift 4 in order sweep the gas concentrations away from the barricade. They must discuss the needed changes with the Mine Manager and the Fresh Air Base. That is:

1) Build temporary stoppings in three crosscuts (CX 1, CX 2, and CX 3) between Drift 3 and Drift 4;

2) Open the check curtain located in Drift 3 between CX 3 and CX 4;

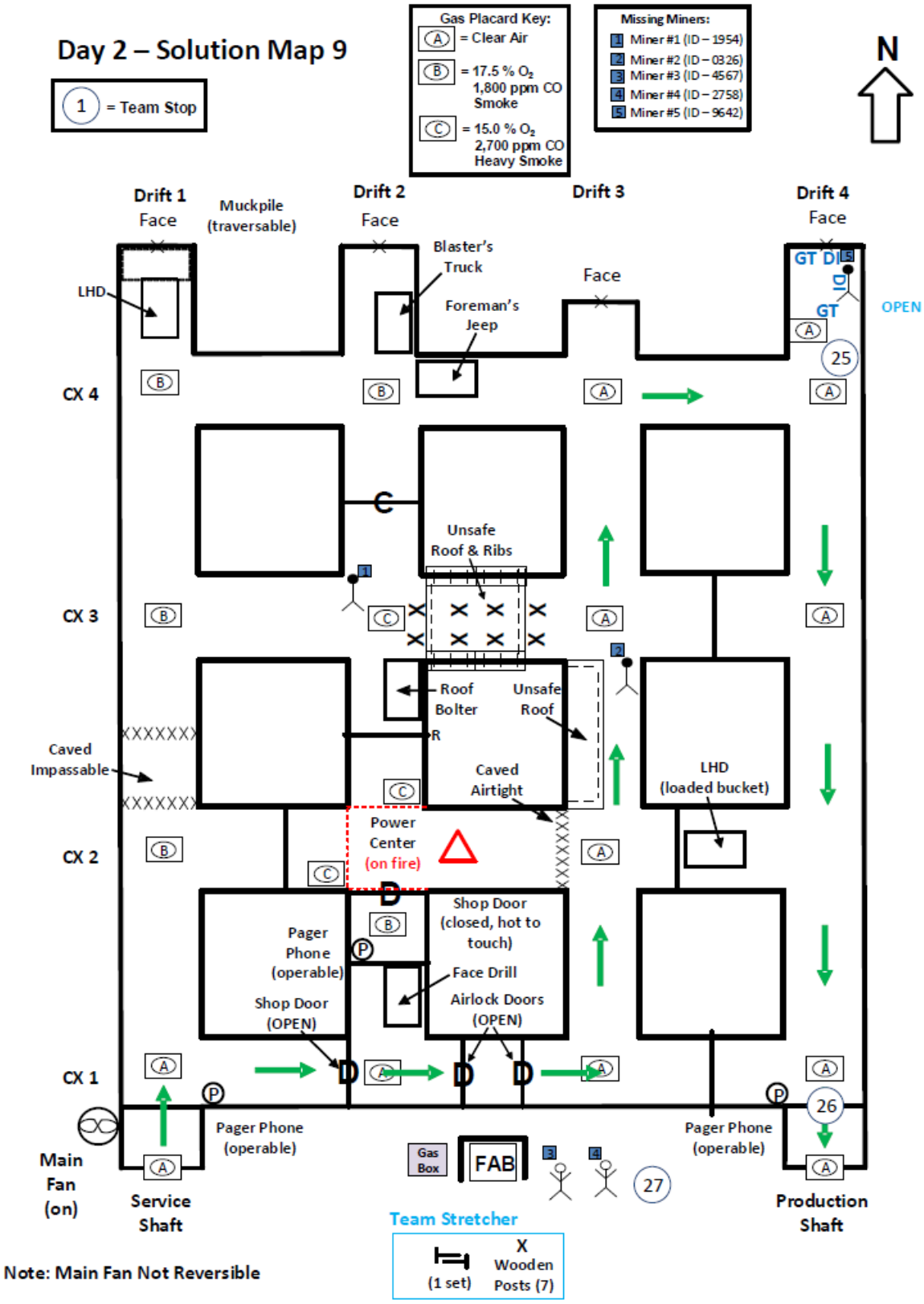
3) Open both of the airlock doors located in CX 1;

4) Open the southernmost shop door located in CX 1; and

5) Close the regulator in the fire seal located in CX 2 between Drift 1 and Drift 2.

If all of these changes are made, nine gas placards along the way from the intersection of Drift 3 and CX 1 along the route in Drift 3 and Drift 4 back to the Production Shaft (Placard - Nos. 16, 18, 20, 21, 23, 46, 53, 54 and 60) can be flipped to show “clear air.”

Finally, the team will need to erect a “wing” curtain in CX 4 to direct additional airflow toward the face area of Drift 4 and flush the last remaining contaminants away from the barricade. At that time, the last placard (No. 55) can be flipped to show “clear air.”


Day 2 – Solution Map 9
1 = Team Stop
Gas Placard Key:
A = Clear Air
B = 17.5 % O2 1,800 ppm CO Smoke
C = 15.0 % O2 2,700 ppm CO Heavy Smoke
Missing Miners:
1 Miner #1 (ID – 1954)
2 Miner #2 (ID – 0326)
3 Miner #3 (ID – 4567)
4 Miner #4 (ID – 2758)
5 Miner #5 (ID – 9642)
N
Drift 1
Face
Muckpile (traversable)
Drift 2
Face
Drift 3
Face
Drift 4
Face
LHD
Blaster's Truck
Foreman's Jeep
GT DI
GT
OPEN
25
CX 4
CX 3
CX 2
CX 1
Unsafe Roof & Ribs
Roof Bolter
Unsafe Roof
Caved Impassable
Caved Airtight
LHD (loaded bucket)
Power Center (on fire)
Shop Door (closed, hot to touch)
Pager Phone (operable)
Face Drill
Shop Door (OPEN)
Airlock Doors (OPEN)
Pager Phone (operable)
Pager Phone (operable)
26
Main Fan (on)
Service Shaft
Gas Box
FAB
27
Production Shaft
Team Stretcher
(1 set)
X Wooden Posts (7)
Note: Main Fan Not Reversible

Note: Team Stop Nos. 25 - 27 (see Solution Map 9)

Team Stop No. 25
With "clear air," the team can open the barricade. Inside they will find the last two missing miners. Miner #4 (ID – 2758) is standing and alert. Team members can assess the miner's condition and find that he is not injured and able to walk out with the team. They will also find Miner #5 (9642), who is unresponsive and lying near the eastern rib. The team captain must perform necessary roof or back checks over the miner. After a primary assessment, the #1 Judge will hand the team member a placard which reads: **"The miner exhibits no vital signs. The miner is dead."** The captain must D&I the location of the body. Before leaving the area, the captain can perform back checks and the team can conduct necessary gas tests. The captain must D&I the face as the team's furthest point of advance in this direction, as well as the location of the two miners. Then, the team can escort Miner #3 southward toward the Production Shaft station.

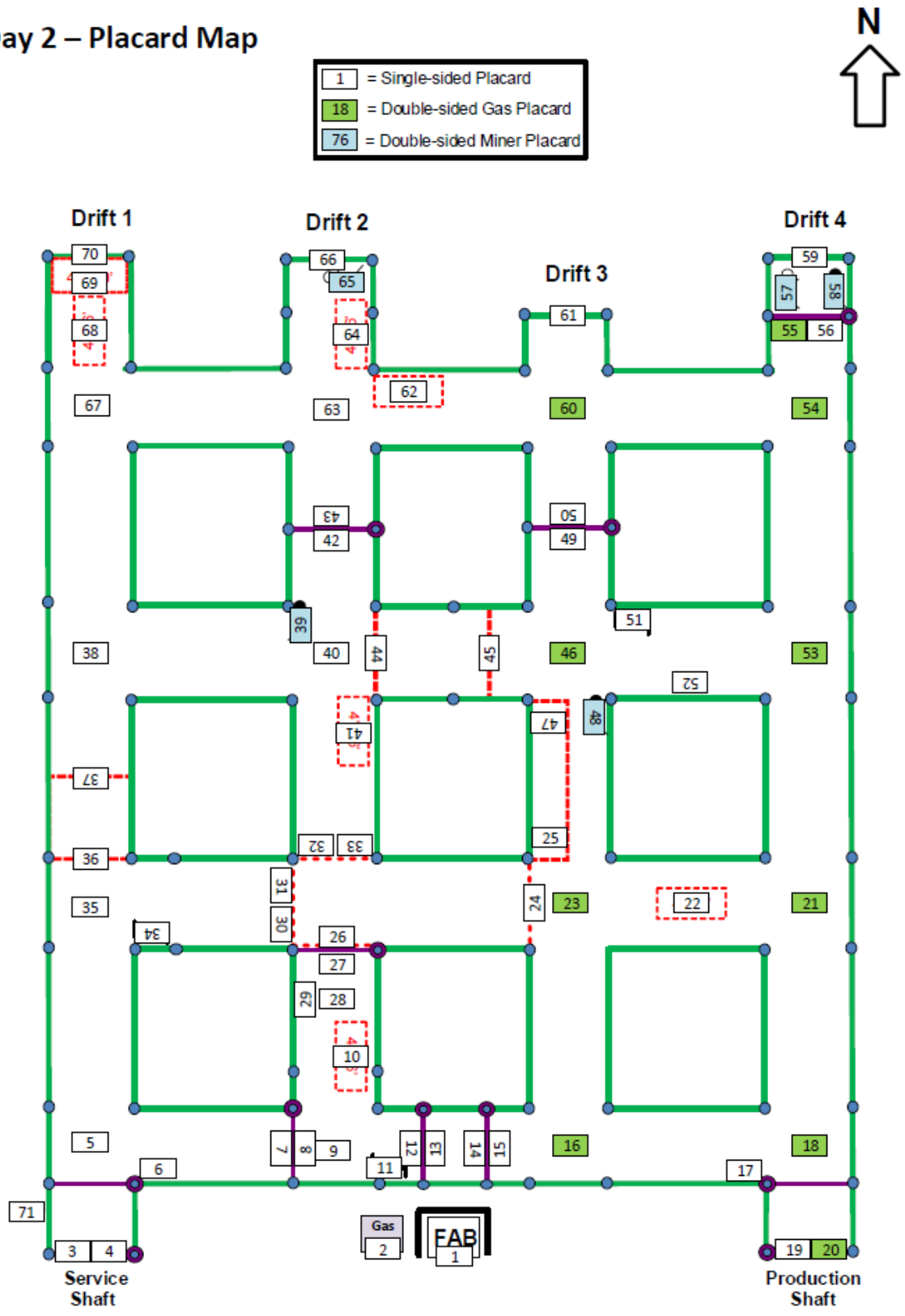
Note: All areas that had been cleared of smoke or toxic or dangerous gases must be gas tested (rib-to-rib) along the route that they travel.

Team Stop No. 26
Once at the Production Shaft Station, they can enter the conveyance, close the shaft gate, signal the hoist engineer and ascend in the escape hoist to the surface.

Team Stop No. 27
Upon exiting the cage, the team must count off (this is the last time that the team exits the mine). Afterward, they can leave Miner #4 with the attendants for any follow-up medical treatment. Then, the captain can inform the mine manager that the team has completed their mission. That is, they have explored all accessible areas of the mine, sealed the fire, re-ventilated as needed, located the five missing miners, and brought two of them out alive.

***** THE END *****

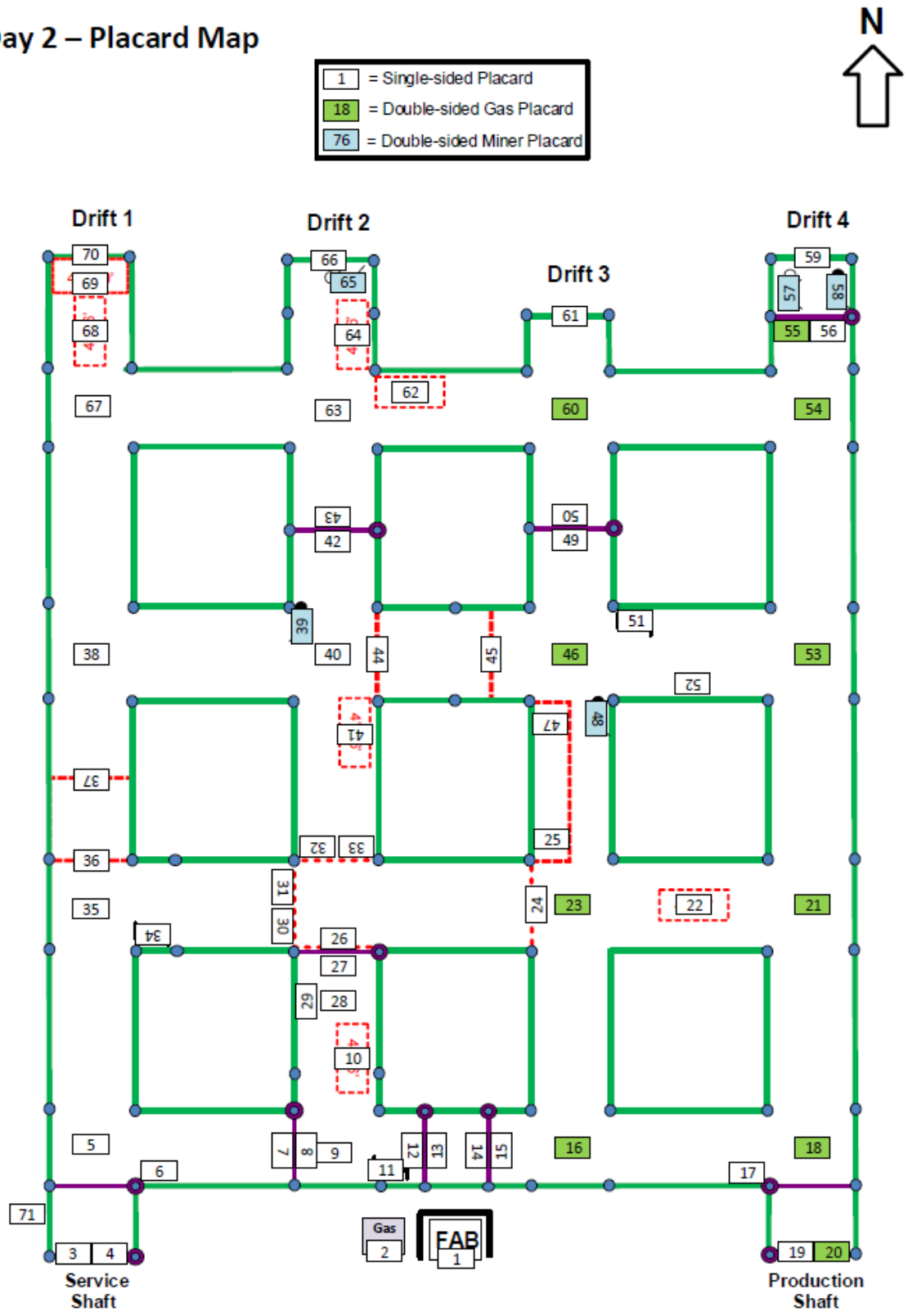
Day 2 – Placard Map



Placard Key:

1. Fresh Air Base
2. Gas Test Station
3. Service Shaft
4. Clear Air
5. Clear Air
6. Pager Phone (operable)
7. Shop Door (closed)
8. Shop Door (closed)
9. Clear Air
10. Face Drill
11. Brattice Material (1 set)
12. Airlock Door (closed)
13. Airlock Door (closed)
14. Airlock Door (closed)
15. Airlock Door (closed)
16. 17.5 % O_2
    1,800 ppm CO
    Smoke
17. Pager Phone (operable)
18. 17.5 % O_2
    1,800 ppm CO
    Smoke
19. Production Shaft
20. 17.5 % O_2
    1,800 ppm CO
    Smoke Clear Air
21. 17.5 % O_2
    1,800 ppm CO
    Smoke
22. LHD (loaded bucket)
23. 15.0 % O_2
    2,700 ppm CO
    Heavy Smoke
24. Caved Airtight
25. Unsafe Roof
26. Intense Heat
27. Shop Door (closed, hot to touch)
28. 17.5 % O_2
    1,800 ppm CO
    Smoke
29. Pager Phone (inoperable)
30. Intense Heat
31. 15.0 % O_2
    2,700 ppm CO
    Heavy Smoke
32. Intense Heat
33. 15.0 % O_2
    2,700 ppm CO
    Heavy Smoke
34. Brattice Material (3 sets)

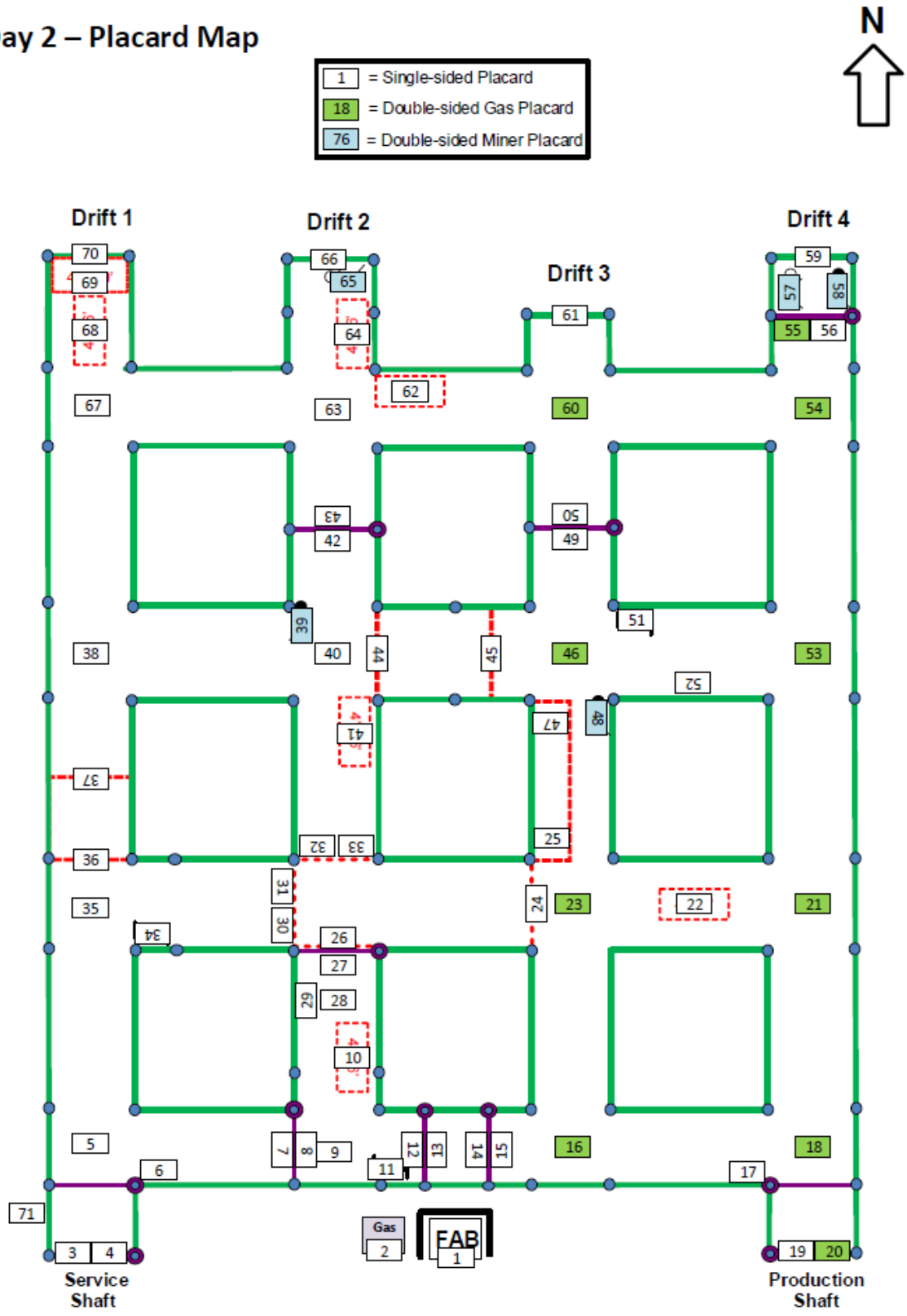
Day 2 – Placard Map



Placard Key (continued):

35. 17.5 % O_2
    1,800 ppm CO
    Smoke
36. Caved Impassable
37. Caved Impassable
38. 17.5 % O_2
    1,800 ppm CO
    Smoke
39. Person / Miner #1 (ID – 1954)
40. 15.0 % O_2
    2,700 ppm CO
    Heavy Smoke
41. Roof Bolter
42. Check Curtain
43. Check Curtain
44. Unsafe Roof & Ribs
45. Unsafe Roof & Ribs
46. 15.0 % O_2
    2,700 ppm CO
    Heavy Smoke
47. Unsafe Roof
48. Person / Miner #2 (ID – 0326)
49. Check Curtain
50. Check Curtain
51. Brattice Material (4 sets)
52. Wooden Posts (15)
53. 17.5 % O_2
    1,800 ppm CO
    Smoke
54. 17.5 % O_2
    1,800 ppm CO
    Smoke
55. 17.5 % O_2
    1,800 ppm CO
    Smoke
56. 8’ by 10’ Barricade
57. Person / Miner #4 (ID – 2758)
58. Person / Miner #5 (ID – 9642)
59. Face – Drift 4
60. 17.5 % O_2
    1,800 ppm CO
    Smoke
61. Face – Drift 3
62. Foreman’s Jeep
63. 17.5 % O_2
    1,800 ppm CO
    Smoke
64. Blaster’s Truck
65. Person / Miner #3 (ID – 4567)
66. Face – Drift 2

Day 2 – Placard Map



Placard Key (continued):

67. 17.5 % O_2
    1,800 ppm CO
    Smoke

68. LHD

69. Muckpile (traversable)

70. Face – Drift 1

71. Main Fan (ON)

<u>Note</u>: Double-Sided Placards

Five "Person" placards (39, 48, 57, 58 and 65), one for each missing miner, can be flipped to show their respective identification number.

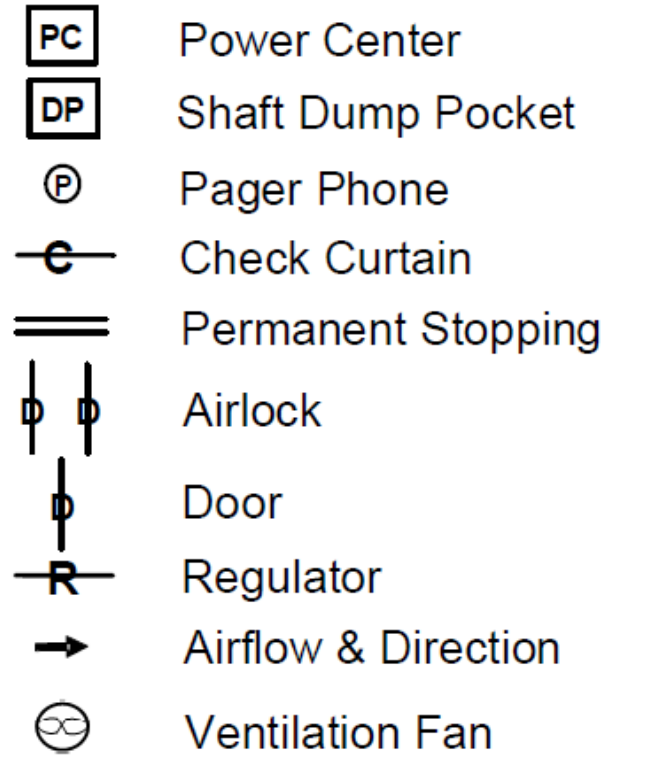
Nine "Gas" placards (16, 18, 20, 21, 23, 46, 53, 54 and 60), can be flipped to show "clear air" when the team has successfully completes changes for re-ventilating the mine.

One additional "Gas" placard (55), can be flipped to show "clear air" if the team erects a "wing" curtain to direct airflow from CX 4 toward the barricade in the face area of Drift 2.

Day 2 – Map Legend

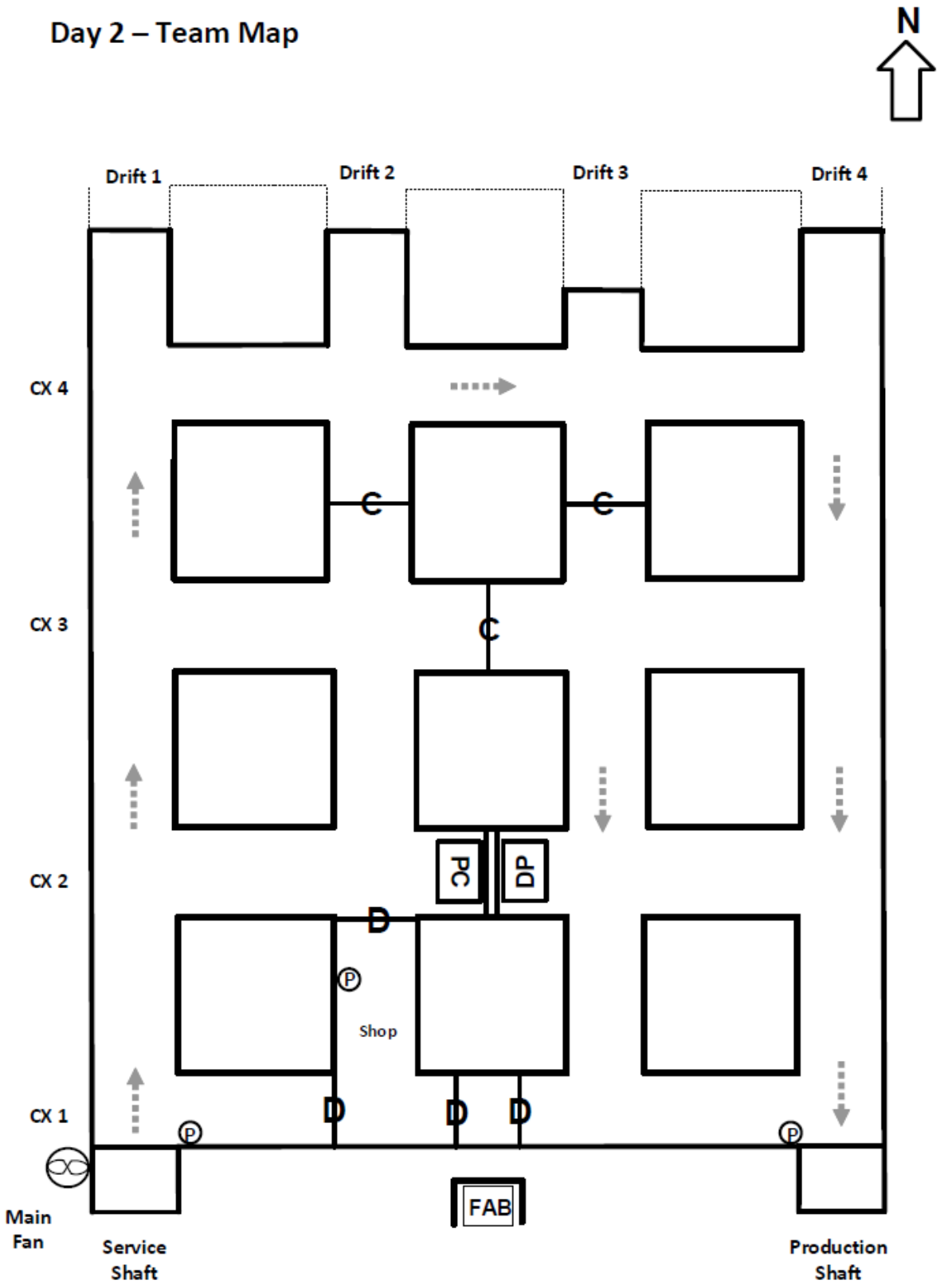
PNP Mining Company
Zipline Mine No. 2
I.D. No. 30-02017
Clymer, NY

Map Legend



Updated June 5, 2017
Approx. Scale 1 in . = 10 ft.

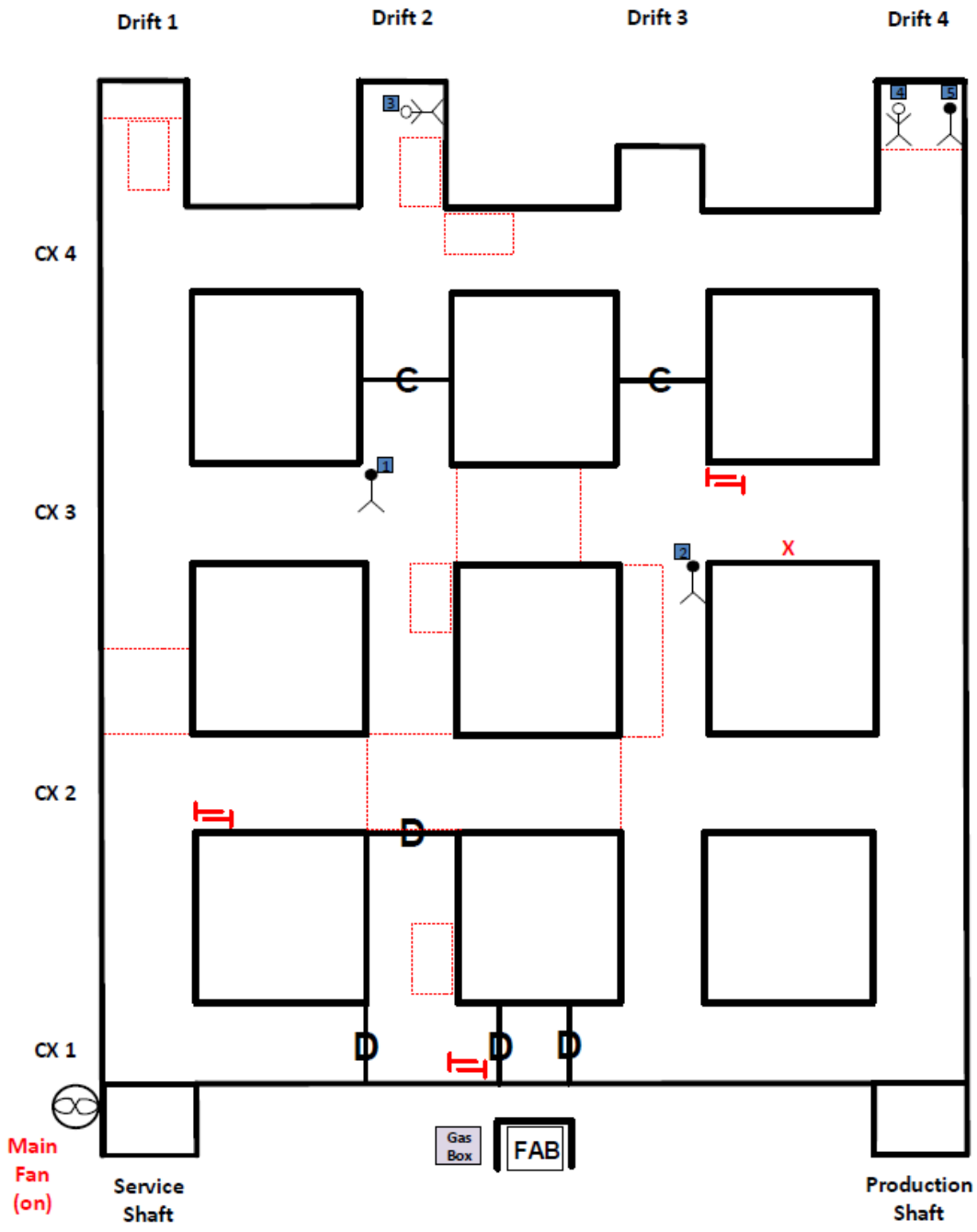
Day 2 – Team Map



Day 2 – Judge's Map

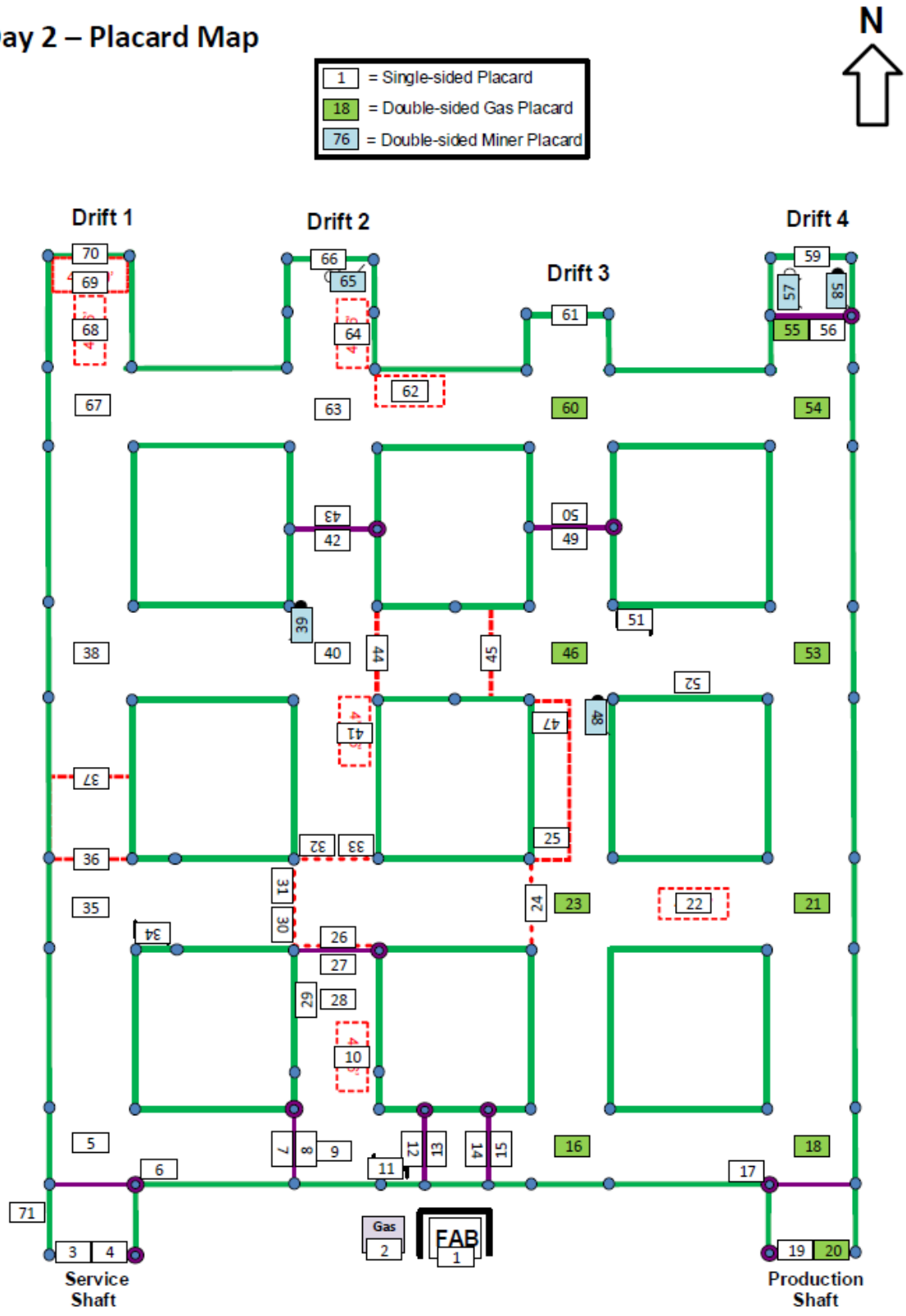
N

Judge No. ____ Name: _____



Note: Main Fan Not Reversible

Day 2 – Placard Map



Day 2 – Construction Map