

*2012 National Metal and Nonmetal  
Mine Rescue Contest*

**JUDGE'S PACKET**  
**Day #2**



*August 1, 2012  
Reno, Nevada*



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## **Introduction**

Welcome to the 2012 National Metal and Nonmetal Mine Rescue Contest. Before we begin, we want to commend each of you for the countless hours that you have volunteered, and your selfless dedication and willingness to participate as a mine rescue team member. We would also like to recognize each team for the hard work spent during this past year while training and preparing to help your fellow miners during a mine emergency.

We have a very challenging problem for you this year. It will make you think and exercise all of your mine rescue skills. Hopefully, each of you will go away feeling that you are better prepared for an actual emergency based on what you have learned.

Even though there can only be a handful of contest winners, the real winners are the miners and their families, the communities, and the companies you represent. It is for all of them that we are here today.

Now, let us continue with the briefing for this year's mine rescue problem.

# DAY 2 – Team Map

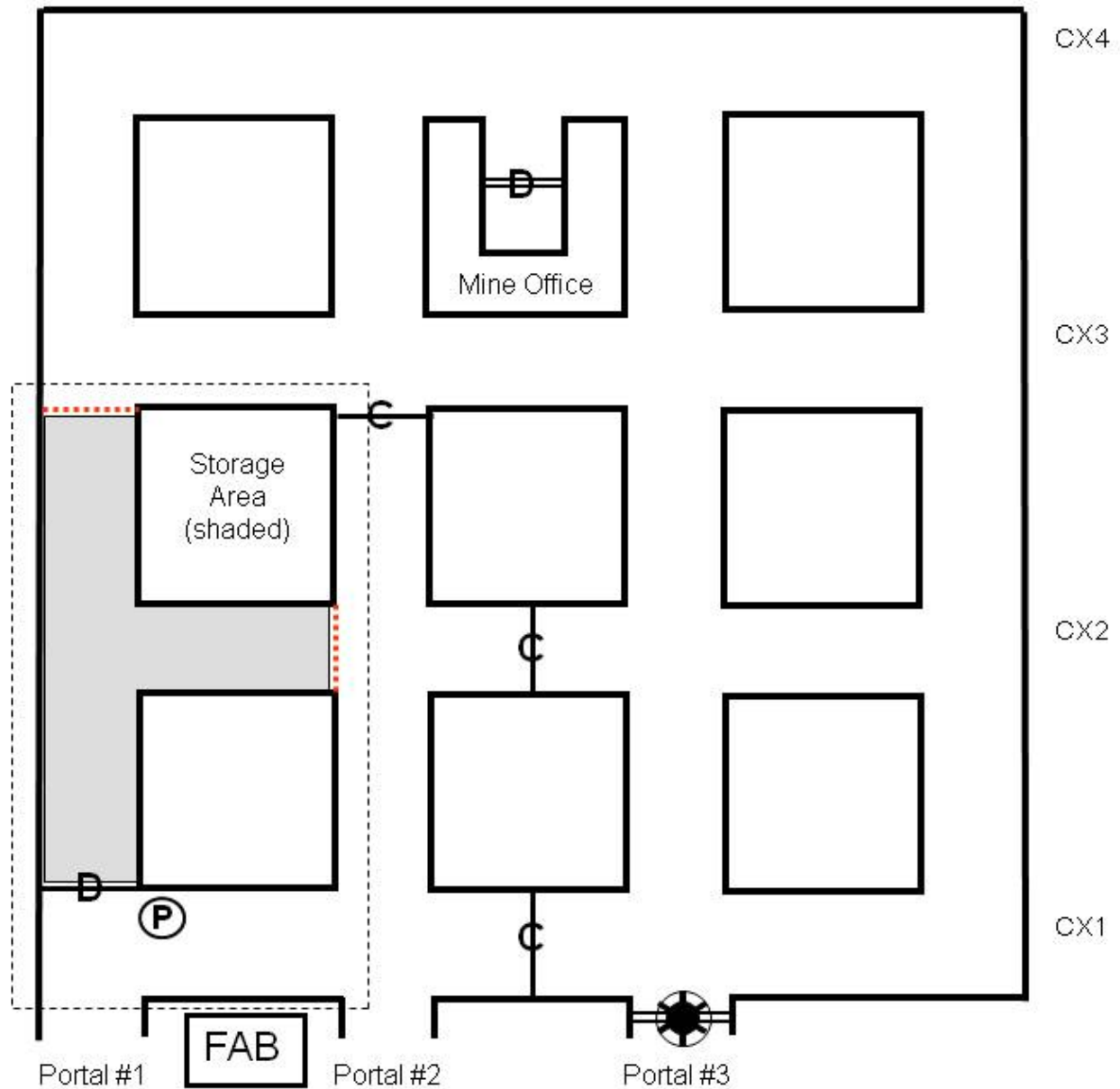


Entry 1

Entry 2

Entry 3

Entry 4



## **MINE INFORMATION SHEET**

### **Reno Mining Company – Reno Mine No. 2**

#### **Mining & Equipment:**

The single-level drift mine is being prepared to use a conventional room and pillar method to extract limestone. The stone will be transported to the outside by load-haul-dumps (LHDs) to a primary crusher located on the surface. The original entries were initially driven 10 feet high by 10 feet wide. Typical pillar dimensions were 20 feet by 20 feet. All underground mobile equipment is diesel-powered (including the LHDs, face drills, mechanical scaling machine, and transport jeeps).

#### **Storage Area:**

When the mine closed in June 2011, a secure Storage Area was built to house vital records and gasoline-powered vehicles (including RV's, boats, and classic cars). When the mine reopened in June 2012, a Petition for Modification (PFM) of 30 CFR 57.4460(b) was granted to allow the storage of limited quantities of gasoline in this area of the mine.

#### **Gas:**

In accordance with Title 30 CFR 57.22003, the mine is classified as Category VI. 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 no presence of methane.

#### **Mine Openings and Ventilation:**

The mine is accessed by two portals: Portal #1 serves as the primary escapeway from the mine; and Portal #2 serves as the secondary escapeway from the mine. The Main Fan is exhausting and located on the surface at the #3 Portal. This portal is used for ventilation purposes only and cannot be accessed. The fan is not reversible. The fan produces approximately 350,000 cfm and operates in the stable portion of its performance curve at the lowest available blade setting. The fan is not operating at this time. Air typically enters the mine through Portals #1 and #2 and exhausts from Portal #3. Air is directed to the faces using permanent (concrete block) and temporary (brattice cloth) ventilation controls. A diesel-powered 50 hp auxiliary fan with 30 feet of vent bag tubing is available to assist in ventilating the active faces.

#### **Other Mines:**

There are several known mines, active and abandoned, in Reno, Nevada. However, none of these are close enough to the Reno Mine No. 2 to cause any concern.

# DAY 2 – Team Map

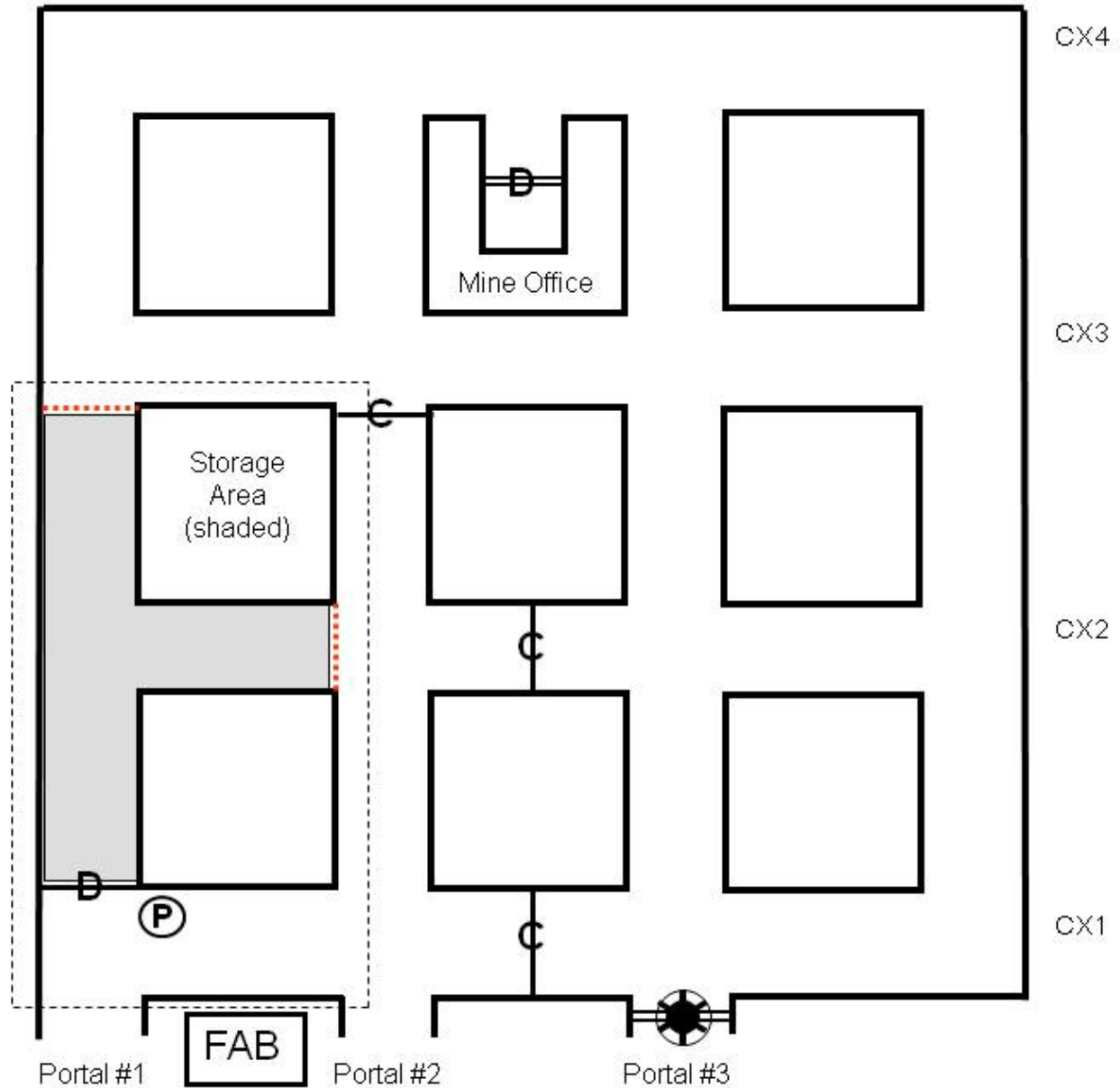


Entry 1

Entry 2

Entry 3

Entry 4





## **MINE INFORMATION SHEET (continued)**

### **Reno Mining Company – Reno Mine No. 2**

#### **Water:**

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

#### **Pumps:**

There are no pumps operating within the mine.

#### **Ground/Rib and Roof Control:**

The immediate roof or back is self-supporting, and no additional roof supports are needed.

#### **Recovery:**

No recovery work (or second mining) has been performed.

#### **Mine Map:**

The mine map was updated July 1, 2012 by the mine's engineering department.

#### **Explosives:**

Explosives are available and stored on the surface. They will be used during the mining cycle, and blasting will be conducted at the end of the day shift while all persons are out of the mine. Only enough explosives for a day's use will be transported underground.

#### **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. These include: timbers, crib blocks, and additional brattice materials.

#### **Communications:**

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

# Problem Map

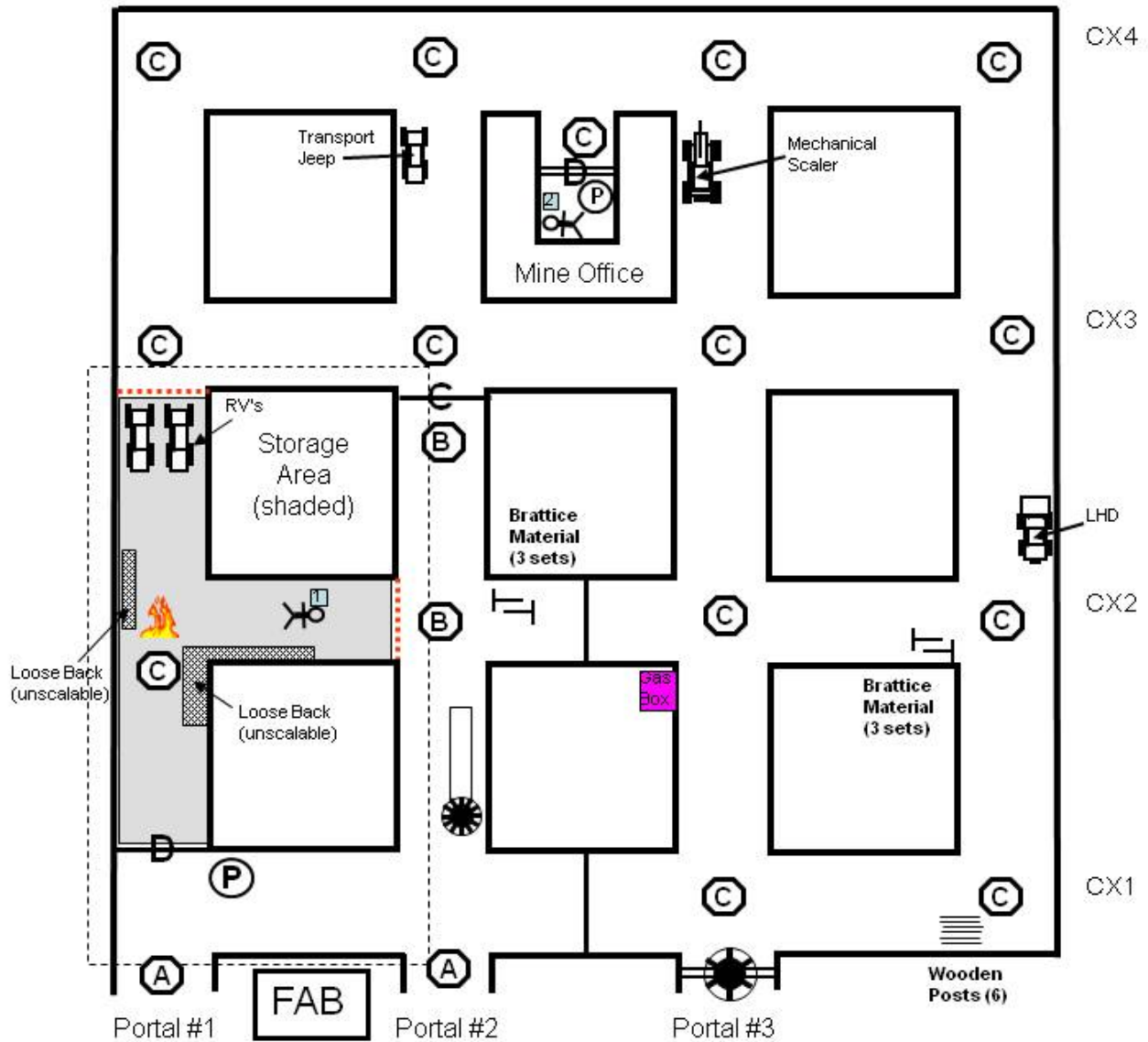


Entry 1

Entry 2

Entry 3

Entry 4



**Missing Miners:**

- 1 Miner #1
- 2 Miner #2

**Gas Placards:**

(A)	(B)	(C)
Clear Air	Light Smoke CO = 1,400 ppm O <sub>2</sub> = 16.0 %	Heavy Smoke CO = 6,000 ppm O <sub>2</sub> = 13.0 %

## Team Briefing Statement

The Reno Mining Company's Reno Mine No. 2 started production on March 21, 2008. The mine was subsequently closed in June 2011 and became an underground storage facility. As shown on the Team and Fresh Air Base maps, the outlined area in the southwestern portion of the mine is owned by the Willy Warehousing Company and is used for bulk storage of various non-hazardous chemicals. The shaded area houses vital records and seasonal storage of RV's, boats, and vintage automobiles.

In June 2012, the owners decided to reopen the mine, and a crew of six miners was hired to begin rehabilitation in preparation of mining. High-grade limestone will be mined by the traditional room and pillar method. The existing entries were driven 10 feet high by 10 feet wide (W x L), leaving 20 feet by 20 feet support pillars. Future projections show similar mining dimensions. There is no second mining conducted at this time. Only diesel-powered equipment is used underground. The immediate roof, or back, has been competent and no roof support has been used in the mine.

The mine is a single-level underground mine opened by three portals. The mine is ventilated using an exhausting system with a surface mounted exhausting main fan operating directly in line with Portal #3. Fresh air enters the mine through Portals #1 and #2. Then, air exits the mine through Portal #3. To conserve power, the fan is not operated between the hours of 6:00 p.m. to 6:00 a.m. During this time, air quality in the mine is generally good without the need for additional air movement.

Access into the mine can only be made through Portals #1 and #2. Once underground, access into the secured Storage Area is limited through a locked door in Crosscut #1 (shown as CX1 on the Team and Fresh Air Base Maps). Other entries into the secured storage area are blocked by heavy iron bars and steel mesh. The warehouse manager carries the key to the secured area. In the event of an emergency, a second key is located in the underground Mine Office and can be used to allow access into the area.

Today at 6:00 a.m., six employees went underground to start their shift. Miner #1, the shift foreman, was in charge of the crew. The crew was to deliver a mechanical scaling machine to Entry #3 to begin rehabilitation. At the conclusion of the shift, four of the miners came out and shut down the main fan as instructed by the shift foreman. The shift foreman and his brother, Miner #2, stayed underground. As the four miners were preparing to leave the property, one of the miners noticed smoke coming from Portal #3. The miners attempted to contact Miners #1 and #2 with no success. The employees did not know the source of the smoke and did not know why the rest of the crew had not evacuated the mine. The miners notified MSHA of the situation at the mine.

# Problem Map

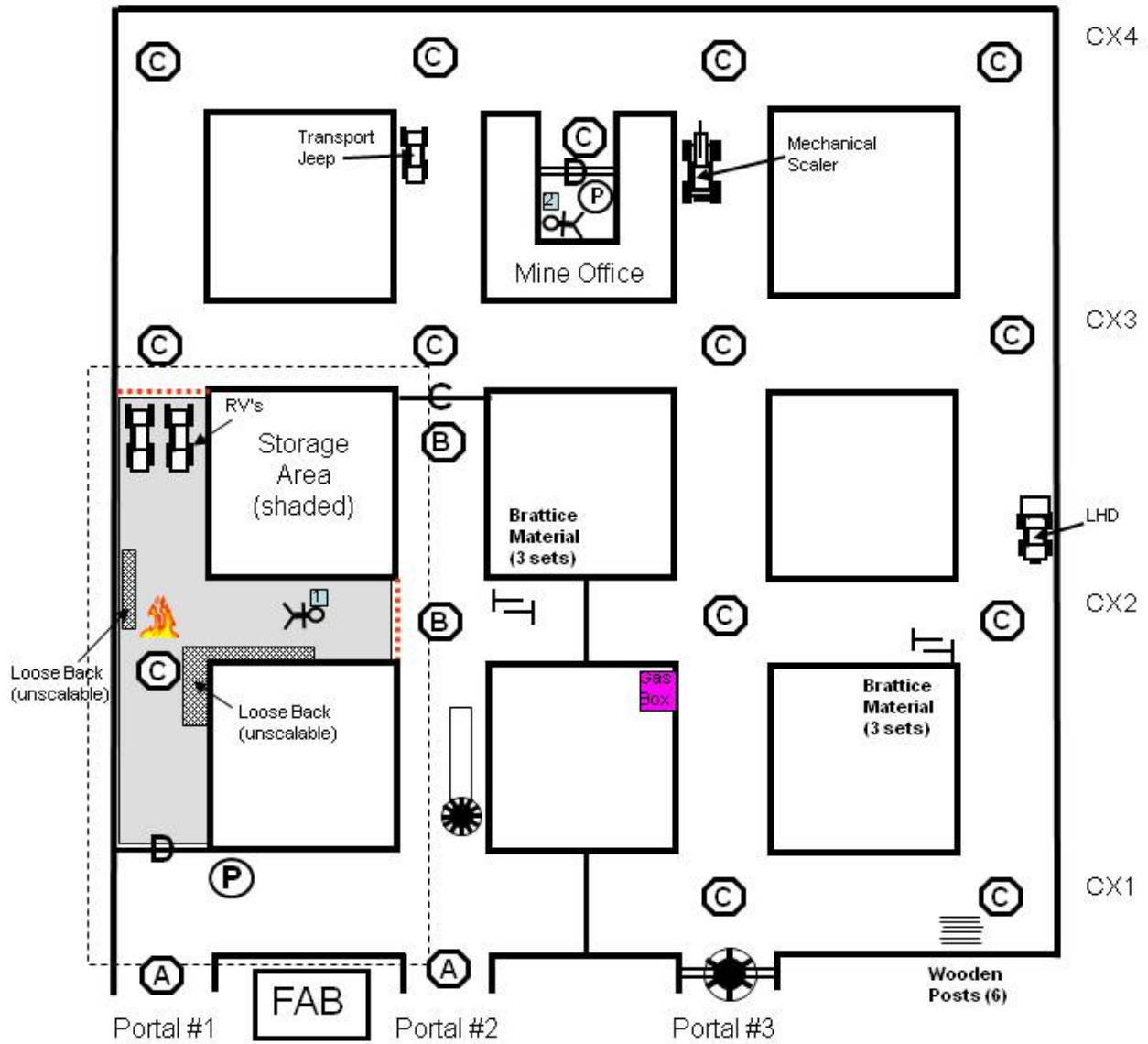


Entry 1

Entry 2

Entry 3

Entry 4



**Missing Miners:**

- 1 Miner #1
- 2 Miner #2

**Gas Placards:**

(A)	(B)	(C)
Clear Air	Light Smoke CO = 1,400 ppm O <sub>2</sub> = 16.0 %	Heavy Smoke CO = 6,000 ppm O <sub>2</sub> = 13.0 %

Currently, you are located at the surface fresh air base established by the company. The ventilation fan has not been restarted. All power to the underground has been locked out and guarded. Gas monitoring at the Return Fan Portal indicates: heavy smoke with oxygen (O<sub>2</sub>) - 13.0% and carbon monoxide (CO) – 6,000 ppm.

We are still not able to establish contact with anyone underground. Guards have been posted at the portals and at the main fan. There is a fully equipped mine rescue team ready to be your team's backup.

If your team is willing to help, we would like you to give us a damage report; extinguish or seal any fires; account for the two (2) missing miners; bring any live miners to the surface; and explore and map all accessible areas of the mine. Most materials needed to work this problem are located in the mine and are identified with placards.

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 again give you the briefing information, the mine information, two copies of the mine map, and the Team and Fresh Air Base Attendant's Instructions. The Mine Manager will **not** answer any questions concerning the team briefing statement. The Manager will only respond to questions allowed by the rules while you are working the problem.

**GOOD LUCK!**

## **Team Instructions**

- Extinguish or seal any fires
- Account for the two (2) missing miners
- Bring any live miners to the surface
- Explore and map all accessible areas of the mine

## **Fresh Air Base Instructions**

- 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 person can assist the team and answer any questions the team may ask. However, this person cannot physically assist the team beyond the fresh air base unless that person becomes an active team member in the event that someone drops out.
- 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 and the mine manager.

## Problem Orientation

Introduce yourself to the team as the “Mine Manager.” Then, introduce the #1, and #2 Judges to the team. **Note: The team has been briefed on the problem and the mine information, and has been provided with the mine maps in isolation.**

Read the following instructions to the team:

**At this time, I have no new information to report to you. I cannot answer any questions concerning the team briefing statement. I can, however, define any term that the team did not understand. 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 or mine rescue team alternate will be required to locate at a designated area where he/she can study the map and team briefing information. He/she can assist the team and answer any questions that the team may ask. Only one attendant or alternate will be allowed to assist at the fresh air base. He/she cannot physically go beyond the fresh air base to assist the team unless he/she becomes a team member when someone drops out.**

**CAUTION** - the fresh air base attendant or mine rescue team alternate is not allowed to communicate with anyone except the team members, the mine manager, or the judging officials.

**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.**

Ask if they understand these instructions.

**When they verify understanding the instructions, have the Team Captain start the clock and hand the team the Team Briefing Information, the Mine Information Sheets, and the Mine Maps. Remember to add: “Good Luck!”**

# Problem Map

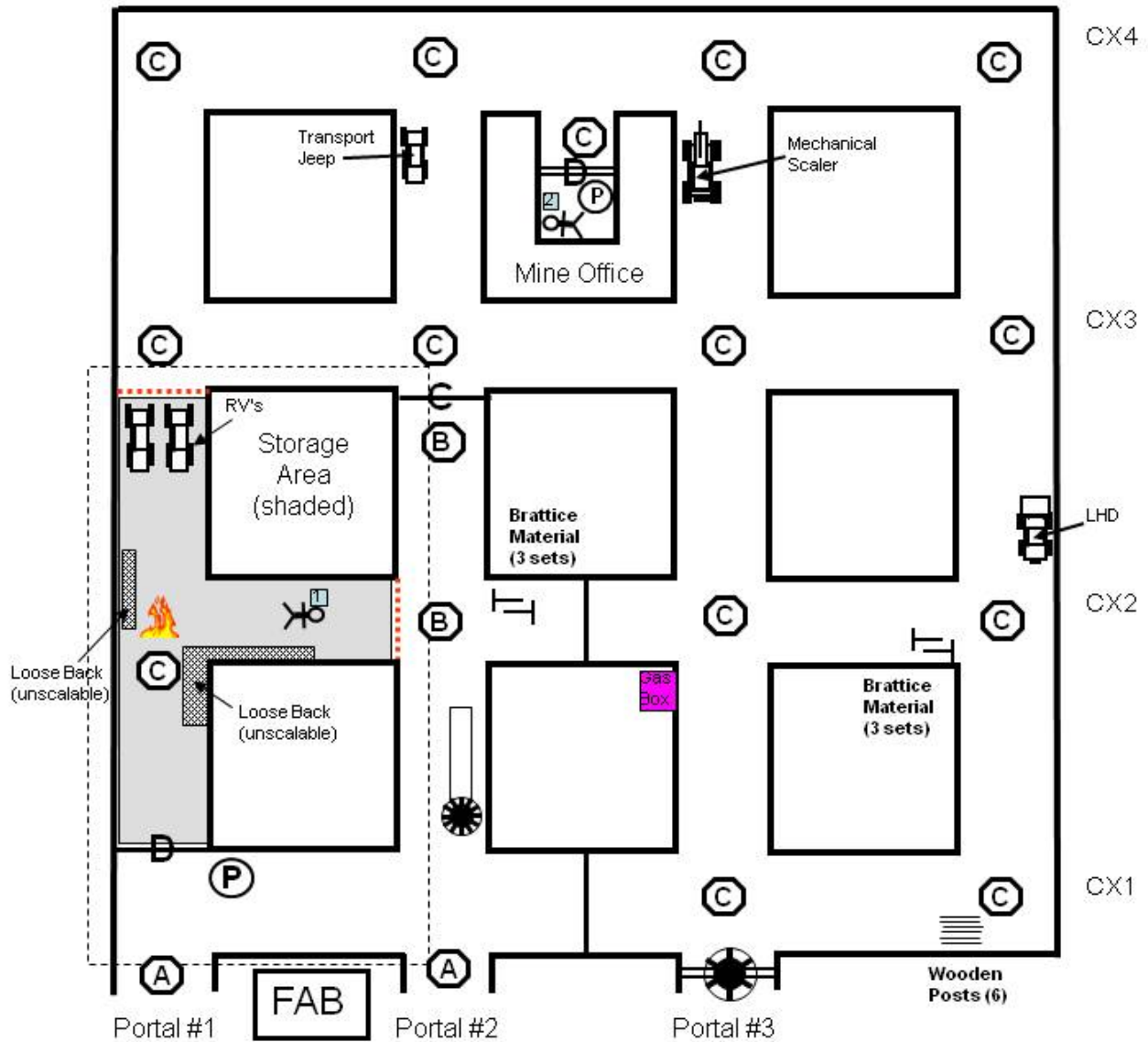


Entry 1

Entry 2

Entry 3

Entry 4



**Missing Miners:**

- 1 Miner #1
- 2 Miner #2

**Gas Placards:**

(A)	(B)	(C)
Clear Air	Light Smoke CO = 1,400 ppm O <sub>2</sub> = 16.0 %	Heavy Smoke CO = 6,000 ppm O <sub>2</sub> = 13.0 %



## 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 prior to arriving at the fresh air base. At the conclusion of the briefing, they will receive the following: the team briefing statement, mine information sheet, mine maps, and instructions for rescue teams and fresh air base attendants.

Upon arrival to the fresh air base the team will meet the Mine Manager and will be introduced to the judges. The Mine Manager will read the Problem Orientation and update the team with any information obtained since their briefing. Questions will be answered only as required by the rules or to explain the meaning of a term.

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.

After receiving the information from the Mine Manager, 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.

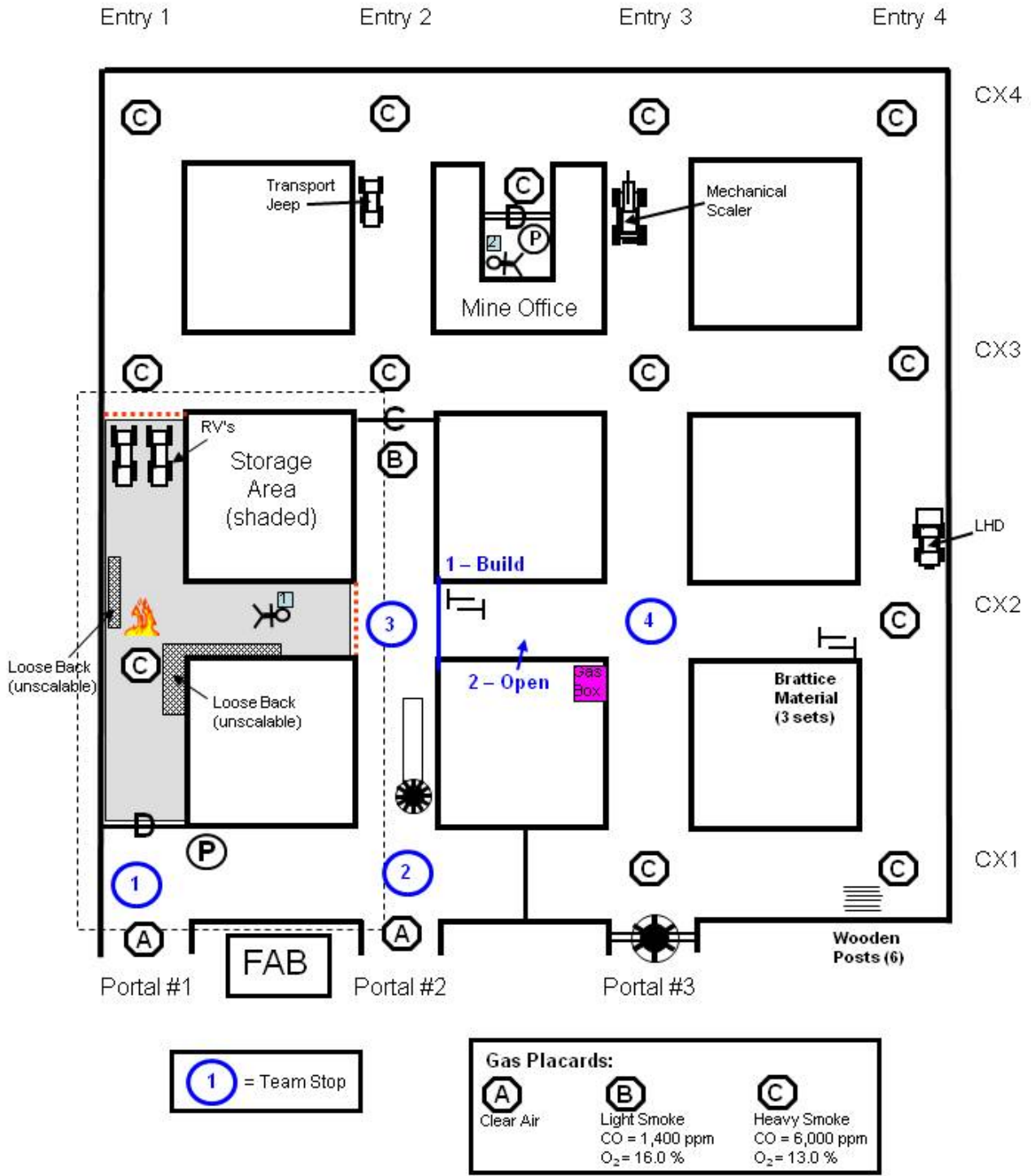
Since the mine is a Category VI and methane hasn't been encountered in the mine, the team does not need to use non-sparking tools to work the problem. However, if the team does not have non-sparking tools and requests them from the official in charge, the tools that they brought with them will be deemed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

Although the team will be using a communications reel during the working of the problem, alternate lifeline signals must be presented to the No. 2 judge.

When ready, the team must examine all openings to the mine.

**Note:** Entrances to all mine openings shall 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. This examination should not cover more than twenty-five (25) feet.

# Solution Map - 1



**Portal #1 checks reveal:**

A placard at the shaft shows "Clear Air."

**Portal #2 checks reveal:**

A placard at the shaft shows "Clear Air."

**Portal #3 Fan checks reveal:**

A placard at the fan reveals "Heavy Smoke" 6,000 ppm CO and 13% O<sub>2</sub>.

**Note: Team Stop Nos. 1 – 4 (see Solution Map - 1)****TEAM STOP NO. 1**

The team can advance in Entry 1 to crosscut No. 1 (designated as CX1 on the Team and Fresh Air Base maps). The captain will perform roof and back checks, and the team will conduct necessary gas tests. To the north, they will encounter a locked door that leads to the storage area. The captain must date and initial the locked door, and the door must be marked on the map as the farthest point of advance. There is a pager phone outside of the storage area. If the team attempts to use the pager they will receive no response. They will prepare to advance.

**Note:** The team must count off before entering Portal #1 (first time they go underground).

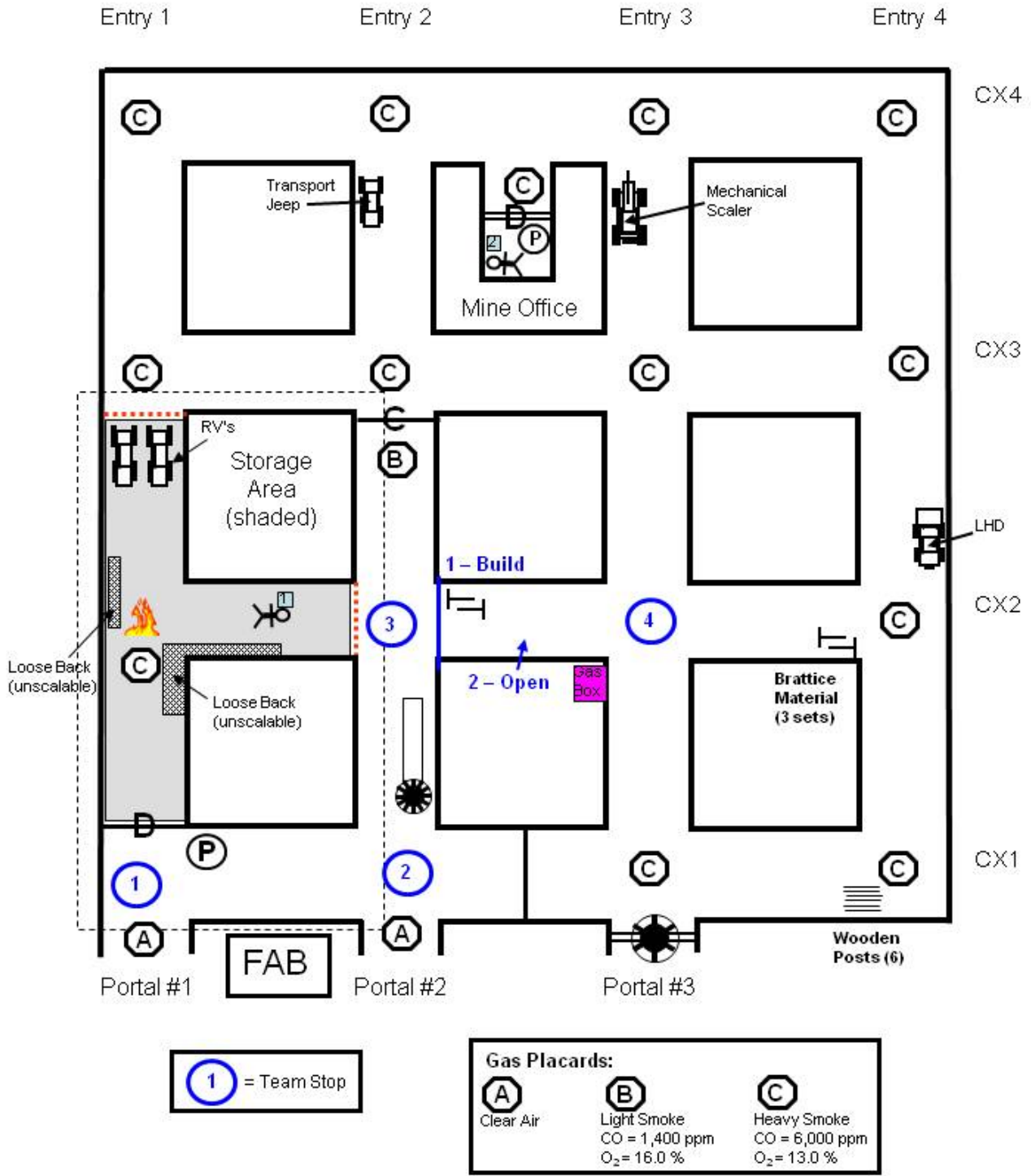
**Note:** No physical comparison of the fresh air base map and team map will be allowed after the initial entry into the mine. No changes can be made to either map while the team is at the fresh air base or out of the mine.

**Note:** After advancing into the mine, not more than fifty (50) feet from the portal, the captain must give a signal for the team to stop. At this team stop, 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 must be checked before continuing.

**TEAM STOP NO. 2**

The team will advance eastward in CX1 toward Entry 2. At the intersection, the captain will perform roof or back checks, and the team will conduct necessary gas checks. They will find clear air. The team can tie in to Portal #2. To the east, the team will encounter a temporary stopping in CX1 between Entries 2 and 3. The captain must date and initial the temporary stopping. The team can stretch northward in Entry 2 where they will find a diesel powered auxiliary ventilation fan with tubing on the right rib of Entry 2 just inby CX1. They will prepare to advance northward in Entry 2.

# Solution Map - 1



### TEAM STOP NO. 3

The team will advance northward in Entry 2 toward CX2. At the intersection, the captain will perform roof or back checks, and the team will conduct necessary gas tests. The team will find light smoke, CO = 1,400 ppm, and O<sub>2</sub> = 16.0%. The team must be on the lifeline and perform a team check as they are entering smoke. To the east, the team will encounter a fixed iron gate that cannot be opened. The captain must D&I the gate as their furthest point of advance in this direction. The team will find a temporary stopping between Entries 2 and 3 in CX2. The captain must date and initial the temporary stopping. The team will also find 3 sets of brattice material on the north rib in CX2 between Entries 2 and 3. The team can only stretch northward 3 feet beyond CX2 as they have not tied in the cross cuts behind them to the east. The team must mark the farthest point of advance on the map.

### TEAM STOP NO. 4

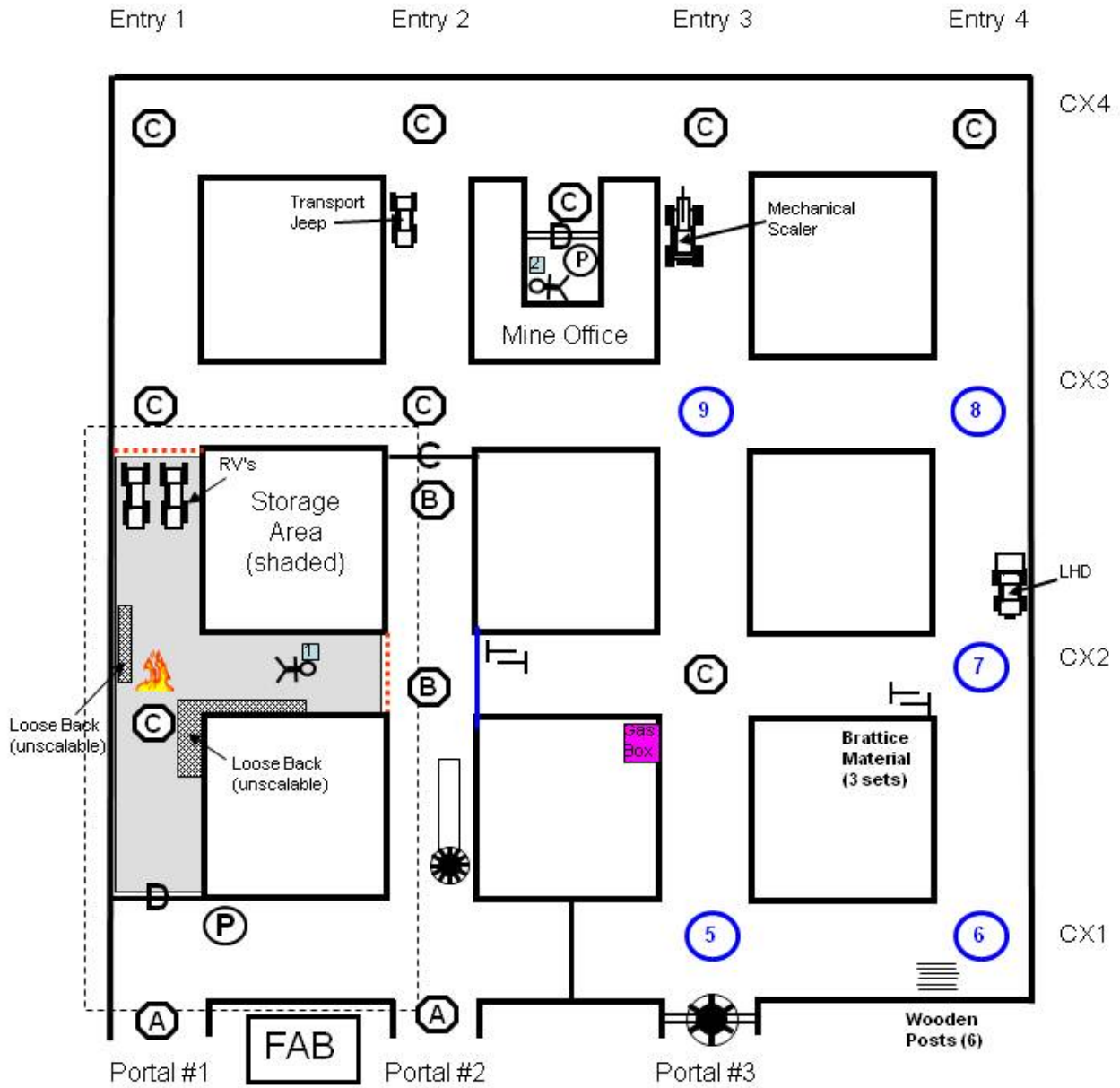
The team is now able to build an airlock to break through the temporary stopping in CX2. The team must airlock because there is an unknown on the other side of the temporary stopping. The captain must check the roof prior to building the airlock and must also check the roof prior to tearing down the temporary stopping. The captain must date and initial the team built stopping.

The team will advance eastward through the temporary stopping in CX2 and will stop in the intersection of CX2 in Entry 3. At the intersection, the captain will verbally state that he is checking the back or roof, and the team will conduct necessary gas checks. They will find heavy smoke, CO = 6,000 ppm, and O<sub>2</sub> = 13.0%. The team should still be on the lifeline as they have not exited smoke. They will also find that the entry is open to the north and south, and the crosscut is open to the east.

**The team will find the gas testing box on the southwest corner of CX2 and Entry 3. A team member must use the team's multi-gas instrument to determine the gas concentrations in the unknown mixture. Judge #2 will assess the team's measurements and, if warranted, apply appropriate discounts (Judge 2 – UG Rule #4).**

**Note:** the team cannot advance beyond 3 feet past the intersection to the north, because they have not tied in the entries behind them.

# Solution Map - 2



**1** = Team Stop

Gas Placards:		
<b>A</b>	<b>B</b>	<b>C</b>
Clear Air	Light Smoke CO = 1,400 ppm O <sub>2</sub> = 16.0 %	Heavy Smoke CO = 6,000 ppm O <sub>2</sub> = 13.0 %

**Note: Team Stop Nos. 5 - 9 (see Solution Map - 2)**

### **TEAM STOP NO. 5**

The team will now advance southward in Entry 3 to CX1. At the intersection, the captain will verbally state that he is checking the back or roof, and the team will conduct necessary gas checks. They will find heavy smoke, CO = 6,000 ppm, and O<sub>2</sub> = 13.0%. The team will encounter the main fan bulkhead. The team will tie in toward Entry 2 and date and initial the temporary stopping.

### **TEAM STOP NO. 6**

The team will now proceed eastward toward Entry 4 and CX1 where they will find heavy smoke, CO = 6,000 ppm and O<sub>2</sub> = 13.0%, and 6 posts. As the captain performs roof or back checks, the team will conduct necessary gas checks.

### **TEAM STOP NO. 7**

The team will advance northward in Entry 4 to CX2. At the intersection, the captain will perform roof or back checks, and the team will conduct necessary gas checks. They will find that the gas concentrations have not changed from their previous location. The team will locate 3 sets of brattice material in CX2 between Entries 3 and 4.

**Note:** Once the team has tied in between Entries 3 and 4 in CX2 the 2+3 rule is no longer applicable.

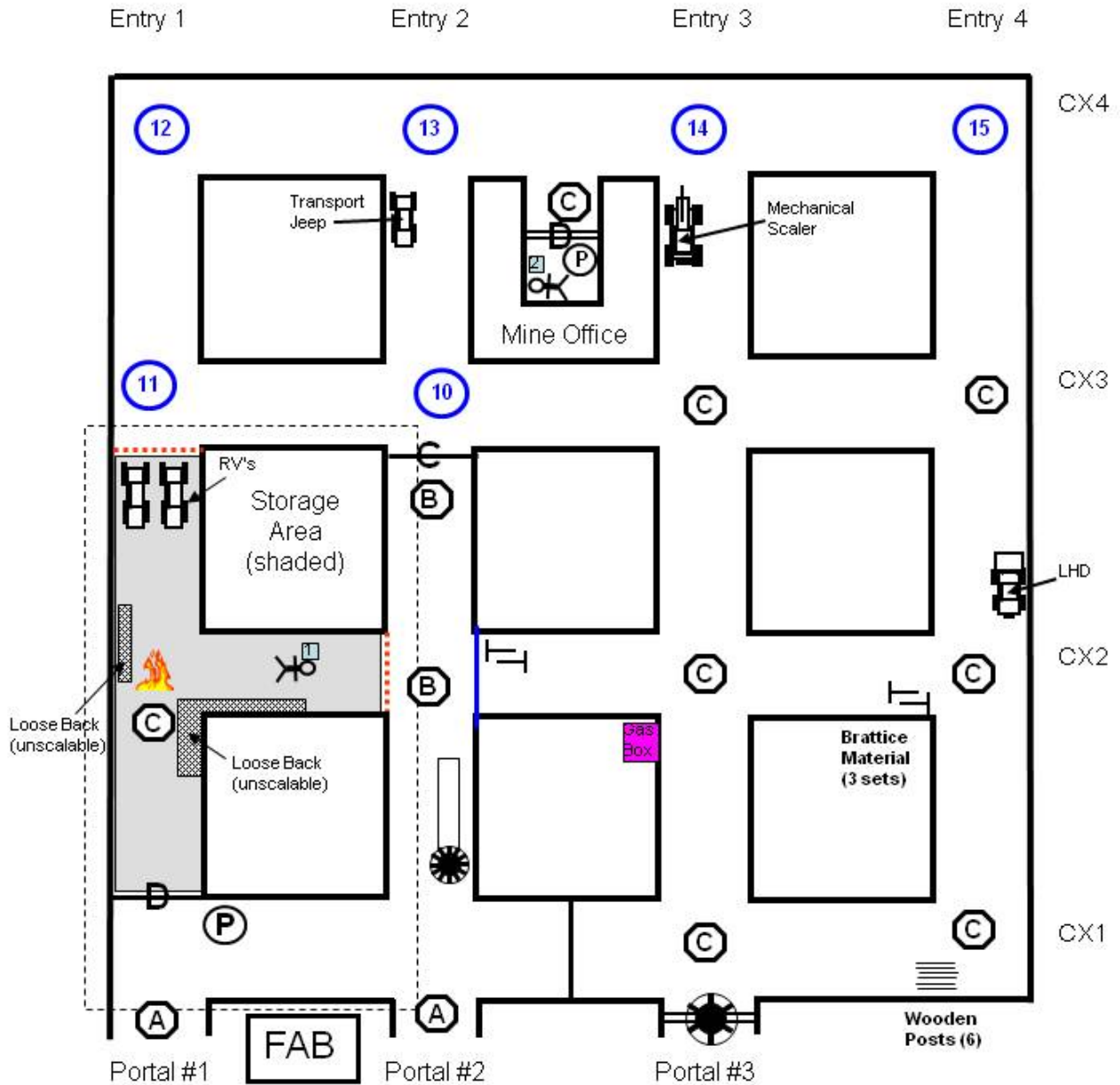
### **TEAM STOP NO. 8**

Now, the team can advance northward in Entry 4 toward CX3. Along the way, they will find an LHD parked along the eastern rib. At the intersection, the captain will verbally state that he is checking the back or roof, and the team will conduct necessary gas checks. They will find that gas concentrations have not changed from their previous location.

### **TEAM STOP NO. 9**

At this time, the team will retreat to the intersection of CX2 in Entry 3. The team will then advance northward in Entry 3 to the intersection of CX3. As the captain performs roof or back checks, the team will conduct necessary gas checks. They will find heavy smoke, CO = 6,000 ppm and O<sub>2</sub> = 13.0%. The team can stretch eastward in the crosscut toward Entry 4 to tie-in.

# Solution Map - 3



1 = Team Stop

**Gas Placards:**

<b>A</b>	<b>B</b>	<b>C</b>
Clear Air	Light Smoke CO = 1,400 ppm O <sub>2</sub> = 16.0 %	Heavy Smoke CO = 6,000 ppm O <sub>2</sub> = 13.0 %



**Note: Team Stop Nos. 10 – 15 (see Solution Map - 3)**

#### **TEAM STOP NO. 10**

The team will advance westward in CX3 toward Entry 2. At the intersection of Entry 2 and CX3, the captain will perform roof or back checks, and the team will conduct necessary gas checks. They will find that the gas concentrations have not changed from their previous location. At this time, the team can stretch southward in Entry 2 through the check curtain toward CX2 to tie-in. In this area, the team will find light smoke, CO = 1,400 ppm and O<sub>2</sub> = 16.0%.

#### **TEAM STOP NO. 11**

The team will retreat to CX3 and advance westward in CX3 toward Entry 1. At the intersection, the captain will perform roof or back checks while the team conducts necessary gas checks. The gas concentrations have not changed from their previous location in CX3. To the south, the team will find a fixed iron gate that cannot be opened. The captain must D&I the gate as their furthest point of advance in this direction.

#### **TEAM STOP NO. 12**

The team will now advance northward Entry 1 toward CX4. At the intersection, the captain will verbally state that he is checking the back or roof, and the team will conduct necessary gas checks. They will find that the gas concentrations have not changed from their previous location in CX3.

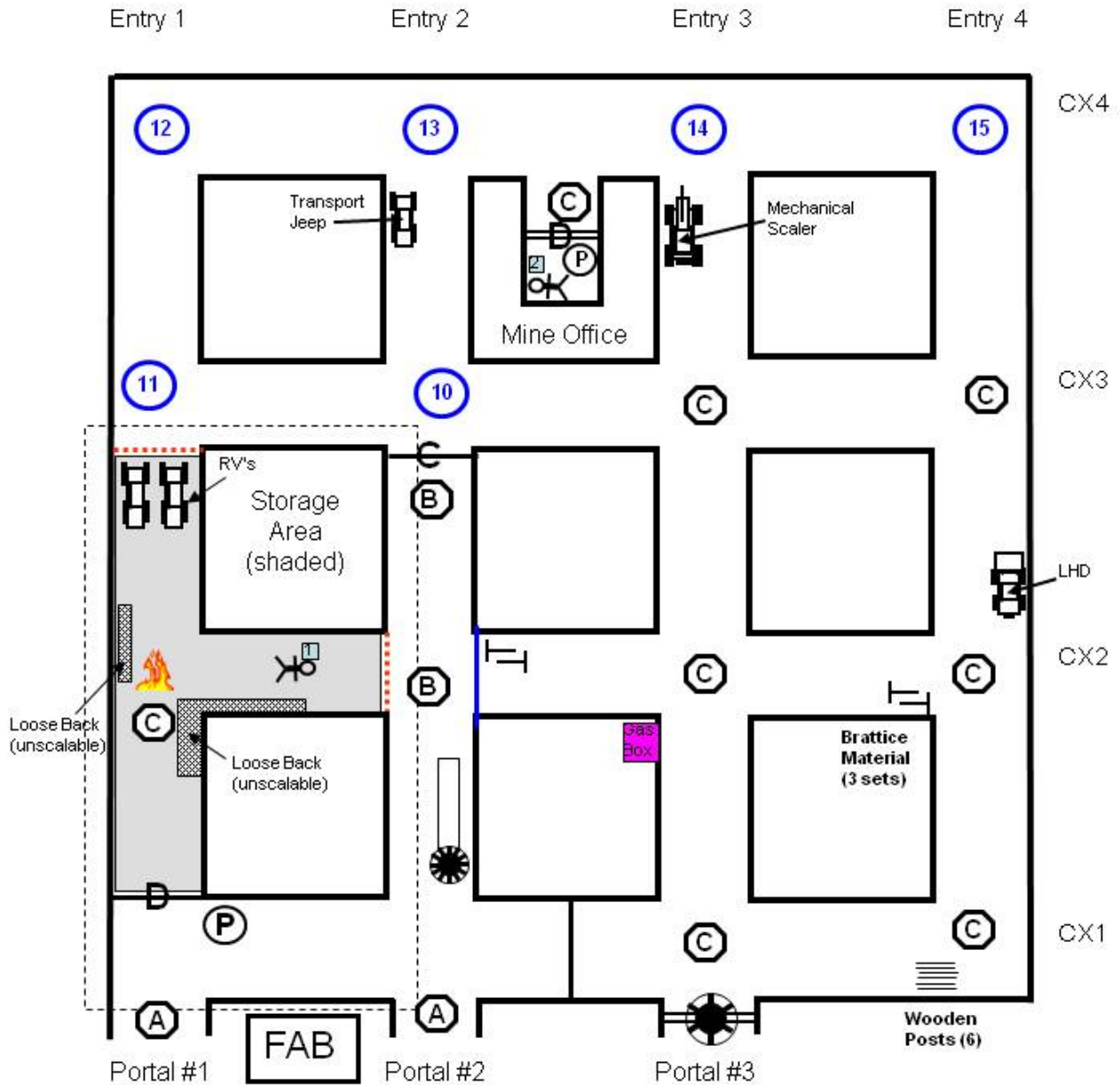
#### **TEAM STOP NO. 13**

The team will advance eastward in CX4 toward Entry 2. As the captain performs roof or back checks, the team will conduct necessary gas checks. They will find that the gas concentrations have not changed from their previous location. The team can now stretch southward in Entry 2 to tie-in. The team will find a Transport Jeep just south of intersection parked along the western rib.

#### **TEAM STOP NO. 14**

The team can now advance eastward in CX4 to Entry 3. The team will find the mine office south of CX4 cut into pillar. As the captain performs roof or back checks, the team will conduct necessary gas checks. They will find that the gas concentrations have not changed from their previous location. The team will attempt to make contact with anyone inside, but there is no response. **The team cannot open the door because of the dangerous gas concentrations in the vicinity.** The captain must D&I the door as their furthest point of advance in this direction.

# Solution Map - 3



1 = Team Stop

**Gas Placards:**

<b>A</b>	<b>B</b>	<b>C</b>
Clear Air	Light Smoke CO = 1,400 ppm O <sub>2</sub> = 16.0 %	Heavy Smoke CO = 6,000 ppm O <sub>2</sub> = 13.0 %

At the intersection with Entry 3, the captain will perform roof or back checks while the team conducts necessary gas checks. They will find that the gas concentrations have not changed from their previous location. The team can now stretch southward in Entry 3 to tie-in. They will find a mechanical scaling machine south of intersection parked along the western rib.

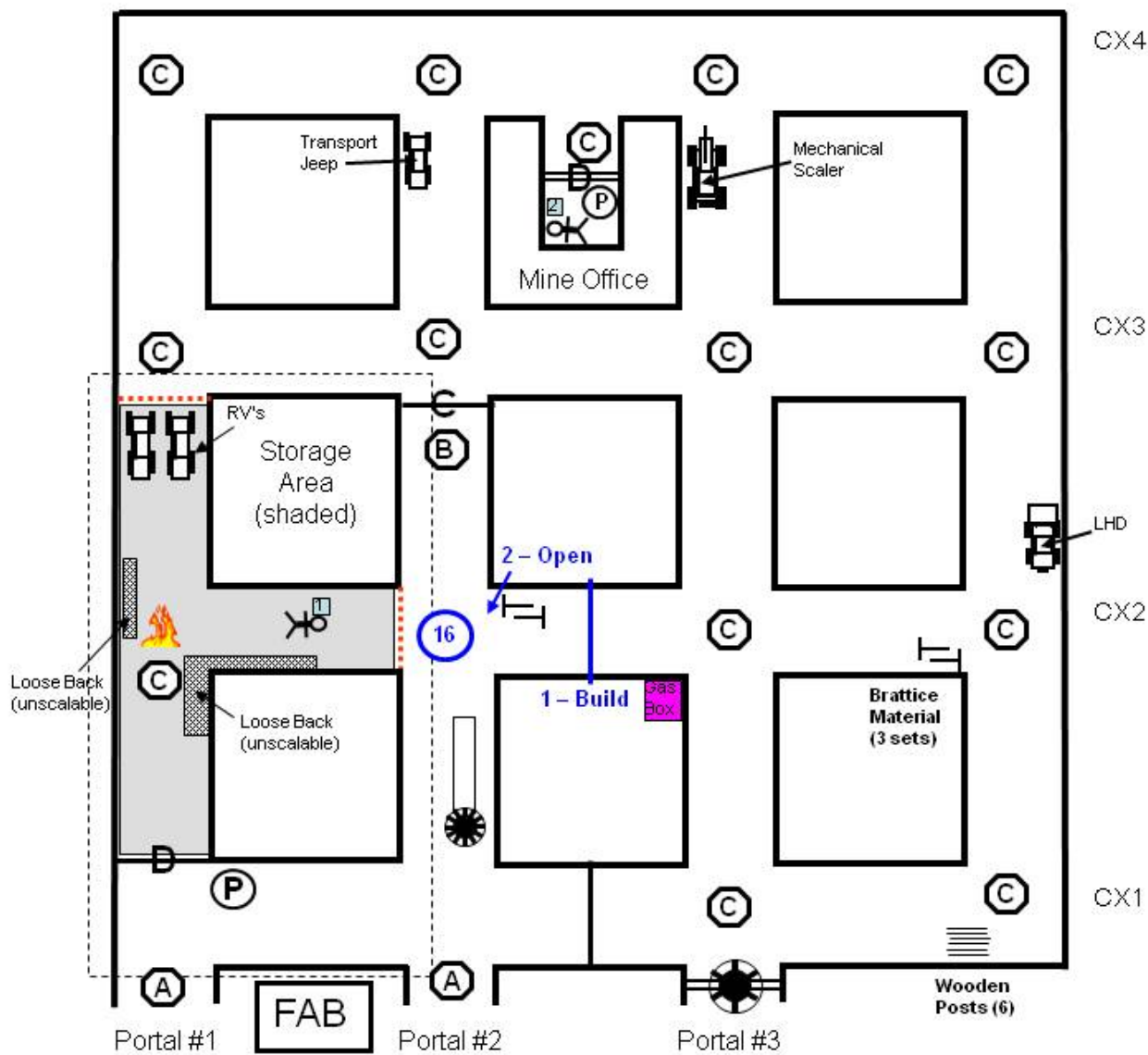
#### **TEAM STOP NO. 15**

The team will advance eastward in CX4 toward Entry 4. At the intersection, the captain will verbally state that he is checking the back or roof, and the team will conduct necessary gas checks. They will find that the gas concentrations have not changed from their previous location. At this point, the team can stretch southward in Entry 4 toward CX3 to tie-in.

# Solution Map - 4



Entry 1                      Entry 2                      Entry 3                      Entry 4



**1** = Team Stop

**Gas Placards:**

<b>A</b> Clear Air	<b>B</b> Light Smoke CO = 1,400 ppm O <sub>2</sub> = 16.0 %	<b>C</b> Heavy Smoke CO = 6,000 ppm O <sub>2</sub> = 13.0 %
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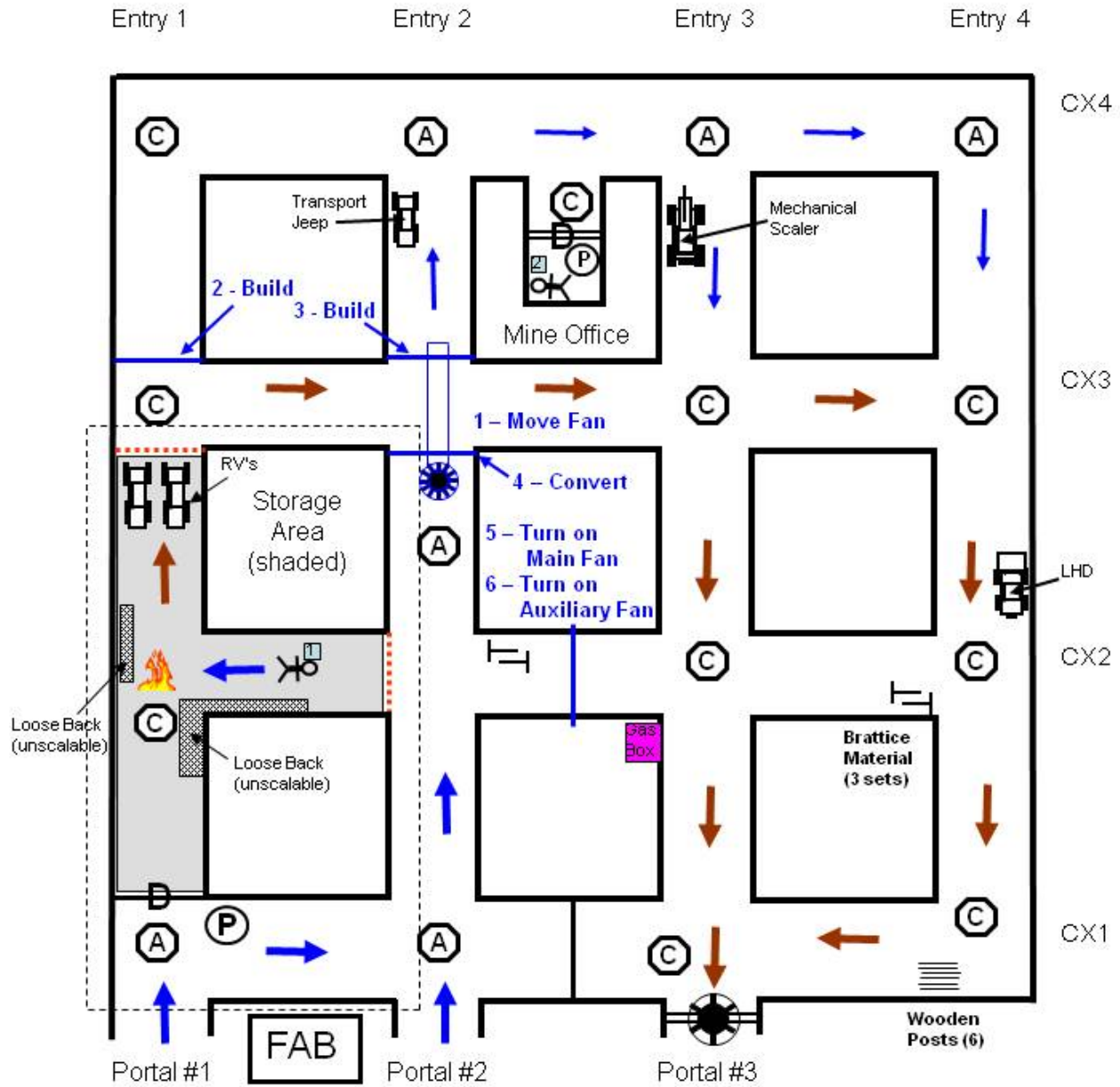
**Note: Team Stop No. 16 (see Solution Map - 4)**

**TEAM STOP NO. 16**

**Now all accessible areas of the mine have been explored.** The team can retreat to the intersection of CX2 and Entry 3. As they travel, the team will airlock from Entry 3 to Entry 2 through CX2.

**In order to complete the problem and recover the two missing miners, the team must make a ventilation change.**

# Solution Map – 5 (Ventilation Change)



1 = Team Stop

Gas Placards:		
<b>A</b>	<b>B</b>	<b>C</b>
Clear Air	Light Smoke CO = 1,400 ppm O <sub>2</sub> = 16.0 %	Heavy Smoke CO = 6,000 ppm O <sub>2</sub> = 13.0 %

**Note: Ventilation Change (see Solution Map - 5)**

At this point, the team has not located Miner #1. They can only conclude that he is located in the storage area. Therefore, the team must propose a ventilation change that will ensure that fresh air continues to flow through the storage area to protect the missing miner. The team must confer with the mine manager through their fresh air base coordinator by using the communication line, or by returning to the surface. In either case, they must explain the necessary ventilation changes prior to implementing them. They outline the following changes to the mine manager:

- 1) Move the auxiliary ventilation fan and tubing so that it draws air from Entry 2 near CX2 and moves the air in Entry 2 toward CX4.
- 2) Construct a stopping in Entry 1 between CX3 and CX4.
- 3) Construct a stopping in Entry 2 between CX3 and CX4. The stopping must be built so that it is airtight around the ventilation tubing without inhibiting airflow through the tubing.
- 4) Convert the check curtain in Entry 2 between CX2 and CX3 to a temporary stopping so that it is airtight around the ventilation tubing without inhibiting airflow through the tubing.
- 5) Start the main fan.
- 6) Start the auxiliary fan.

When the main fan is running, fresh air will continue to travel in Portals #1 and #2 and up to and through the storage area in CX2 between Entries 1 and 2. This will keep fresh air flowing over miner # 1. When the auxiliary fan is running fresh air will be drawn up Entry 2, go through the ventilation tube, and will continue to CX4. The fresh air will continue as shown on the solution map.

The gas concentrations along this route will quickly dissipate, and the placards will revert to Clear Air.

**Note: If the team does not erect the stoppings and turns the main fan on (as described above), certain areas will not clear.**





**Note: Team Stop Nos. 17 – 18 (see Solution Map - 6)**

### **TEAM STOP NO. 17**

At this time, the team can travel from Entry 2 to Entry 3 through CX2. The team will rebuild the airlock in CX2 between Entries 2 and 3 before traveling through the crosscut. Then, they can advance northward in Entry 3 to CX4. As they advance, the team will conduct gas tests. When they reach CX4, they will find “clear air.” However, at the mine office, the team will need to construct a brattice cloth “wing” in order to direct airflow toward the office door and sweep the gases from the area.

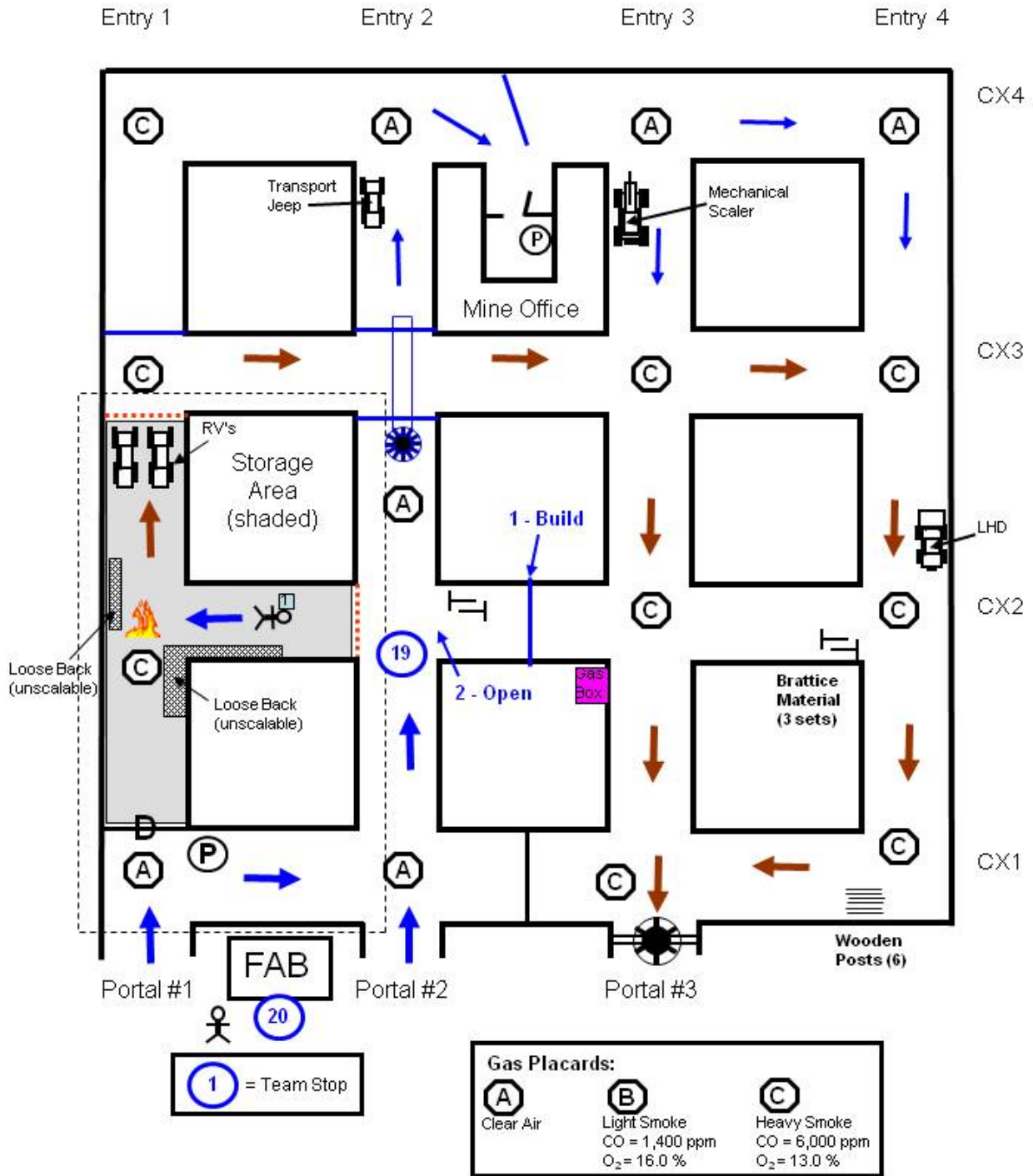
**Note:** If the team does not construct an airlock, they will endanger miner # 1 as the main fan will pull additional contaminants through the storage area.

### **TEAM STOP NO. 18**

Since there has been no response from Miner #2, the team must construct an airlock as they are not aware of the conditions inside of the mine office.

Upon entering the mine office the team will find Miner #2. He is conscious but barely able to speak. After the team members assess his condition, they will find that he is not injured and able to walk out with the team. Miner #2 will give the team a key to the storage area. Before leaving the area, gas tests must be taken inside the mine office, and the captain must D&I the face.

# Solution Map – 7



**Note: Team Stop Nos. 19 – 20 (see Solution Map - 7)**

### **TEAM STOP NO. 19**

Since the path to the fresh air base is not cleared of toxic gases, the team will have to bring Miner #2 out under apparatus. The team will rebuild the airlock in CX2 between Entries 2 and 3 before traveling through the crosscut.

**Note:** If the team does not construct an airlock, they will endanger Miner #1 as the main fan will pull additional contaminants through the storage area.

### **TEAM STOP NO. 20**

The team will escort Miner #2 to the fresh air base. Once there, the team can arrange for any follow-up medical treatment.

**Note:** All areas that have been cleared of smoke or toxic or dangerous gases that the team elects to travel through must be gas tested at all openings along the route they travel.

# Solution Map – 8

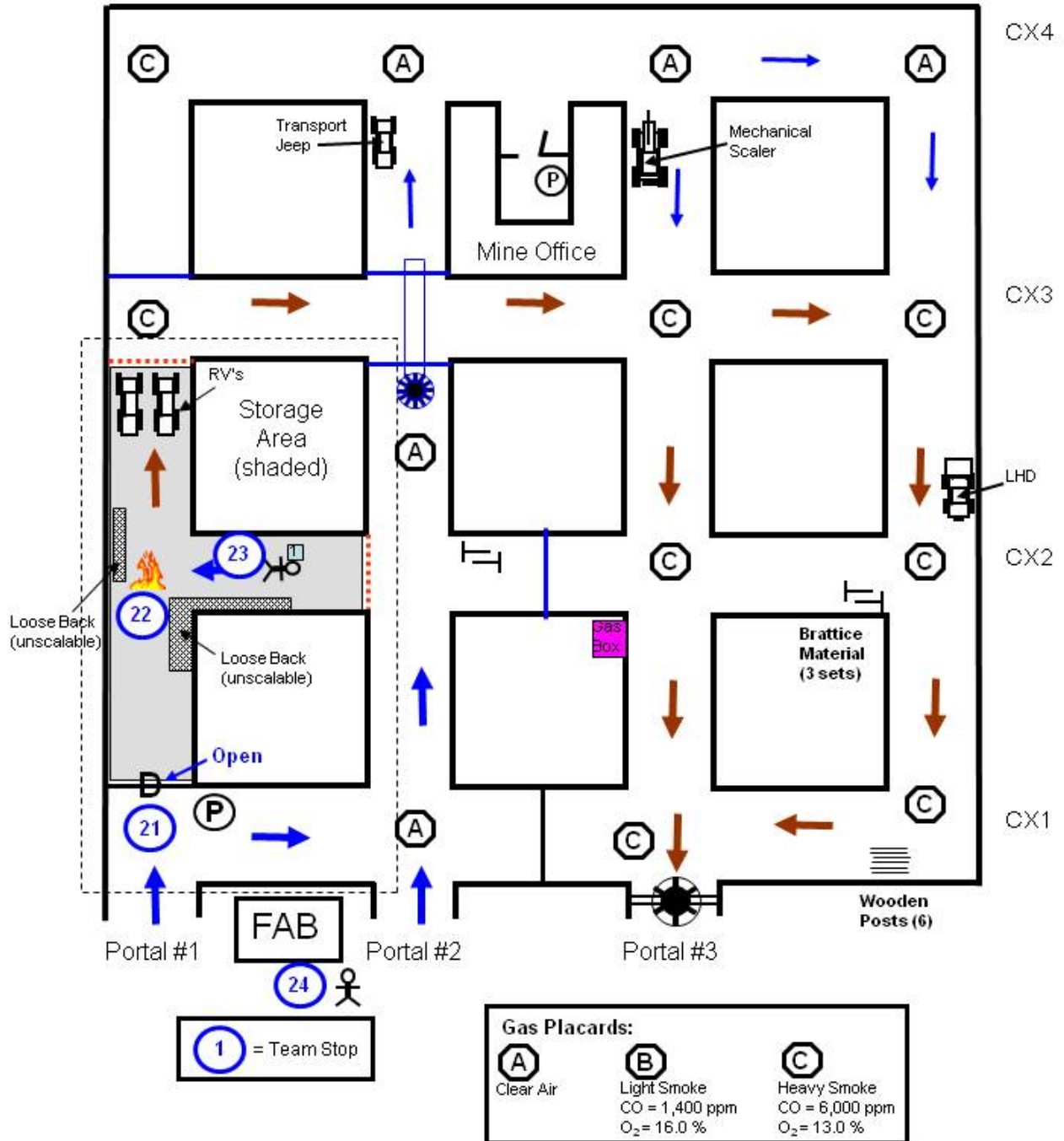


Entry 1

Entry 2

Entry 3

Entry 4



**Note: Team Stop Nos. 21 – 24 (see Solution Map - 8)**

### **TEAM STOP NO. 21**

The team will reenter the mine and unlock the door to the storage area. The team will enter the storage area.

### **TEAM STOP NO. 22**

As the team advances northward in Entry 1, the captain will visually check the roof or back and find an area of loose unscalable back along the eastern rib. The captain must warn the other team members to stay clear of the hazard. At the intersection with CX2, the team will encounter a fire. As the captain performs roof or back checks, the team will conduct necessary gas checks. They will find heavy smoke, CO = 6,000 ppm and O<sub>2</sub> = 13.0%. The team will be able to quickly extinguish the fire with the use of two fire extinguishers. At that time, the team captain will find an area of loose unscalable back along the western rib. He must warn the other team members to avoid the hazard.

**Note:** The smoke and gas concentrations will quickly clear when the fire has been extinguished.

### **TEAM STOP NO. 23**

The team will advance eastward in CX2 and locate Miner #1. 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 unconscious with no obvious injuries”***. The captain must D&I the location of the miner.

Since the air was cleared when the fire was extinguished, the team no longer needs to be attached to their lifeline. The captain and another team member can complete the exploration of Entry 1 while the rest of the team prepares the miner for transport. As they travel northward in Entry 1, they will find two RVs parked in the entry, and the air is clear. The captain must D&I the fixed iron gate as their furthest point of advance in this entry. Then, they can retreat to the intersection with CX2 and stretch eastward in the crosscut toward the second gate. The captain must D&I the fixed iron gate as their furthest point of advance in this crosscut.

**Note:** Since Miner # 1 is unconscious, he will have to be carried to the outside. To remove the miner, he must be secured to the stretcher. Also, the miner will have to be taken out while wearing an apparatus. The team must take extra precautions as to not inflict additional harm to the miner.

# Solution Map – 8

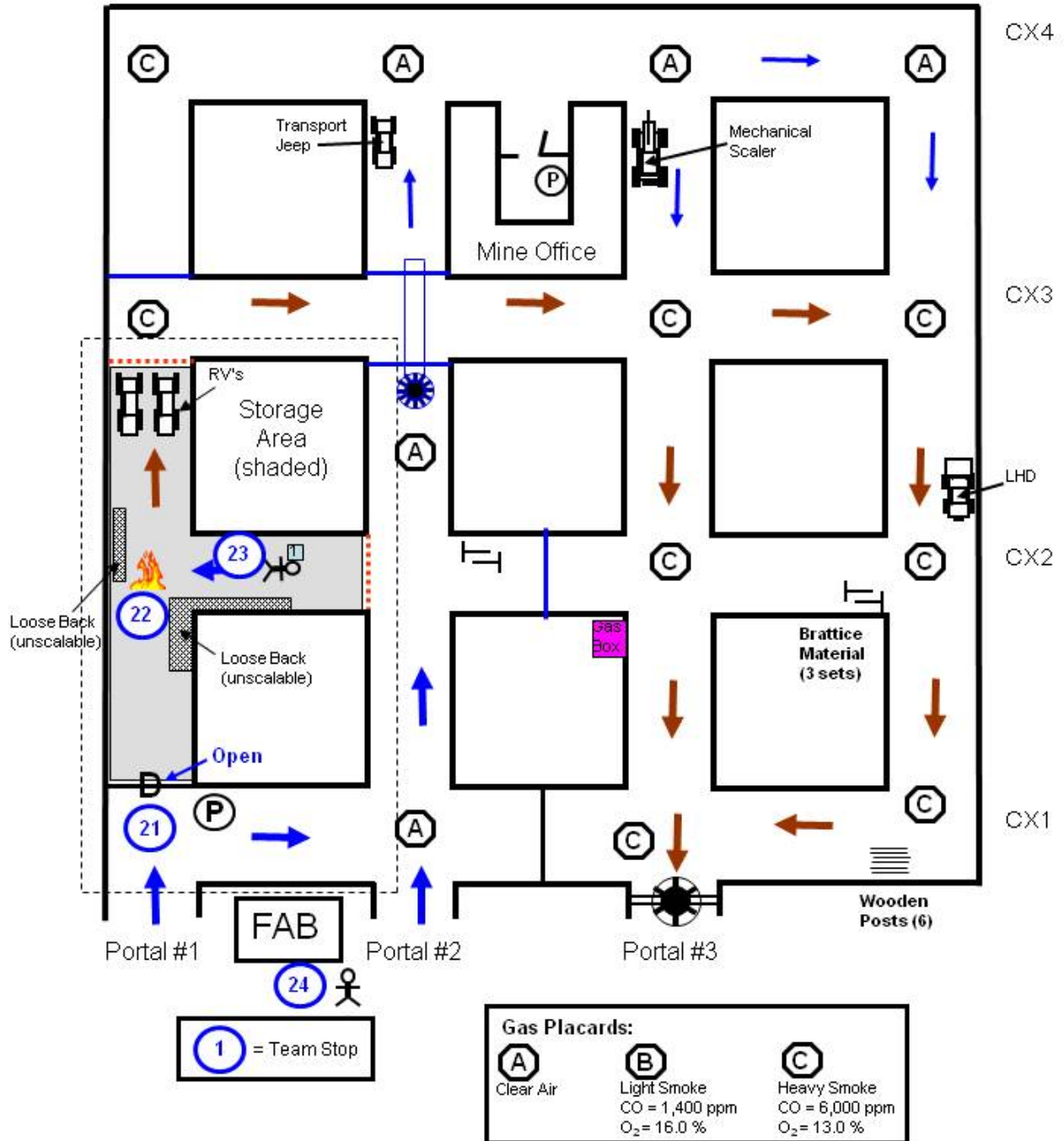


Entry 1

Entry 2

Entry 3

Entry 4



## **TEAM STOP NO. 24 – Problem Completion**

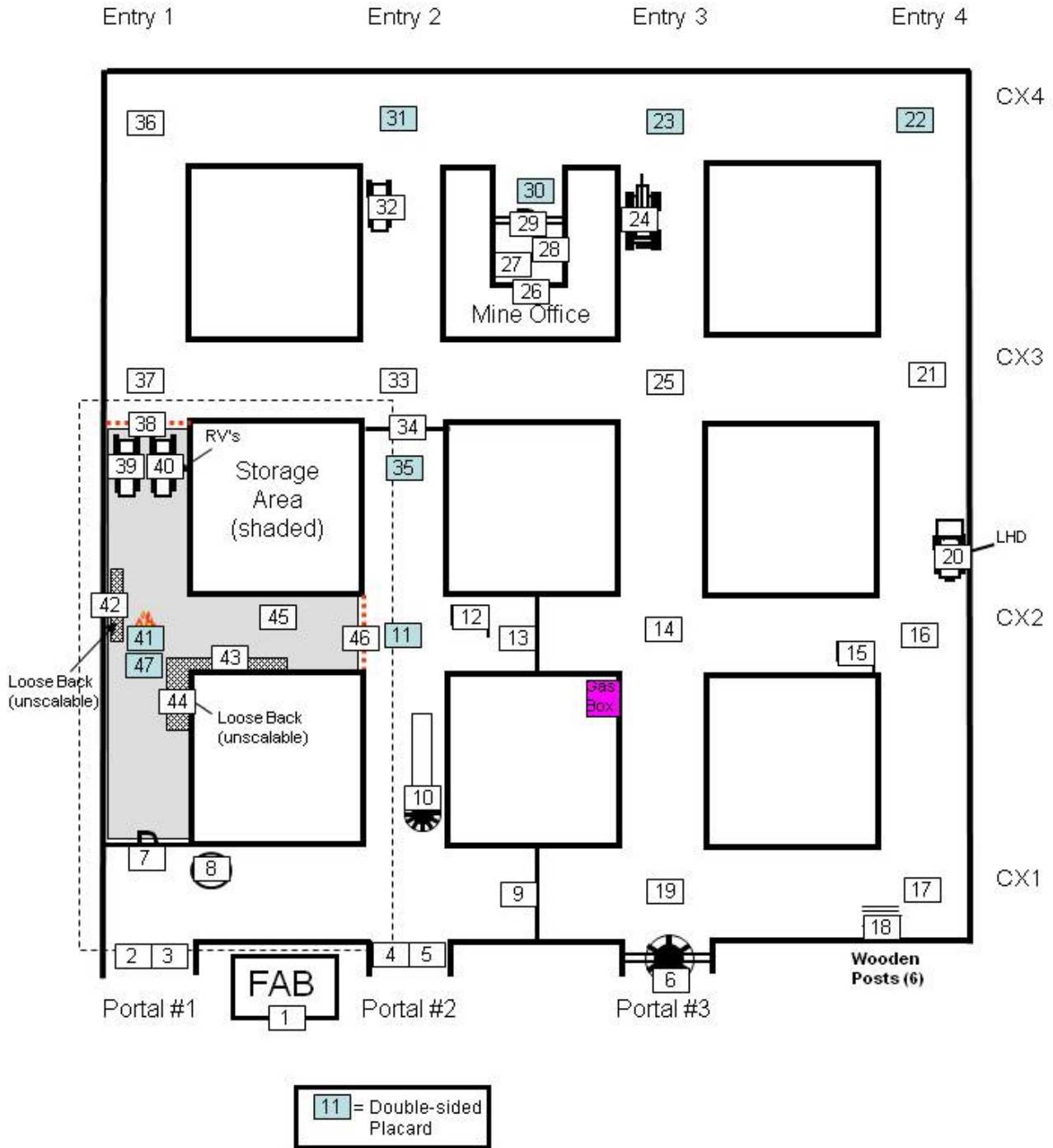
The team will transport Miner #1 to the fresh air base. Once there, the team can arrange for any follow-up medical treatment.

Note: All areas that have been cleared of smoke or toxic or dangerous gases that the team elects to travel through must be gas tested at all openings along the route they travel.

Afterward, the captain can state that the team has completed their mission. That is, they have explored all accessible areas of the mine, extinguished the fire, re-ventilated the mine, and located the two missing miners and brought them out alive.

**\*\*\* THE END \*\*\***

# Day 2 - Placard Map

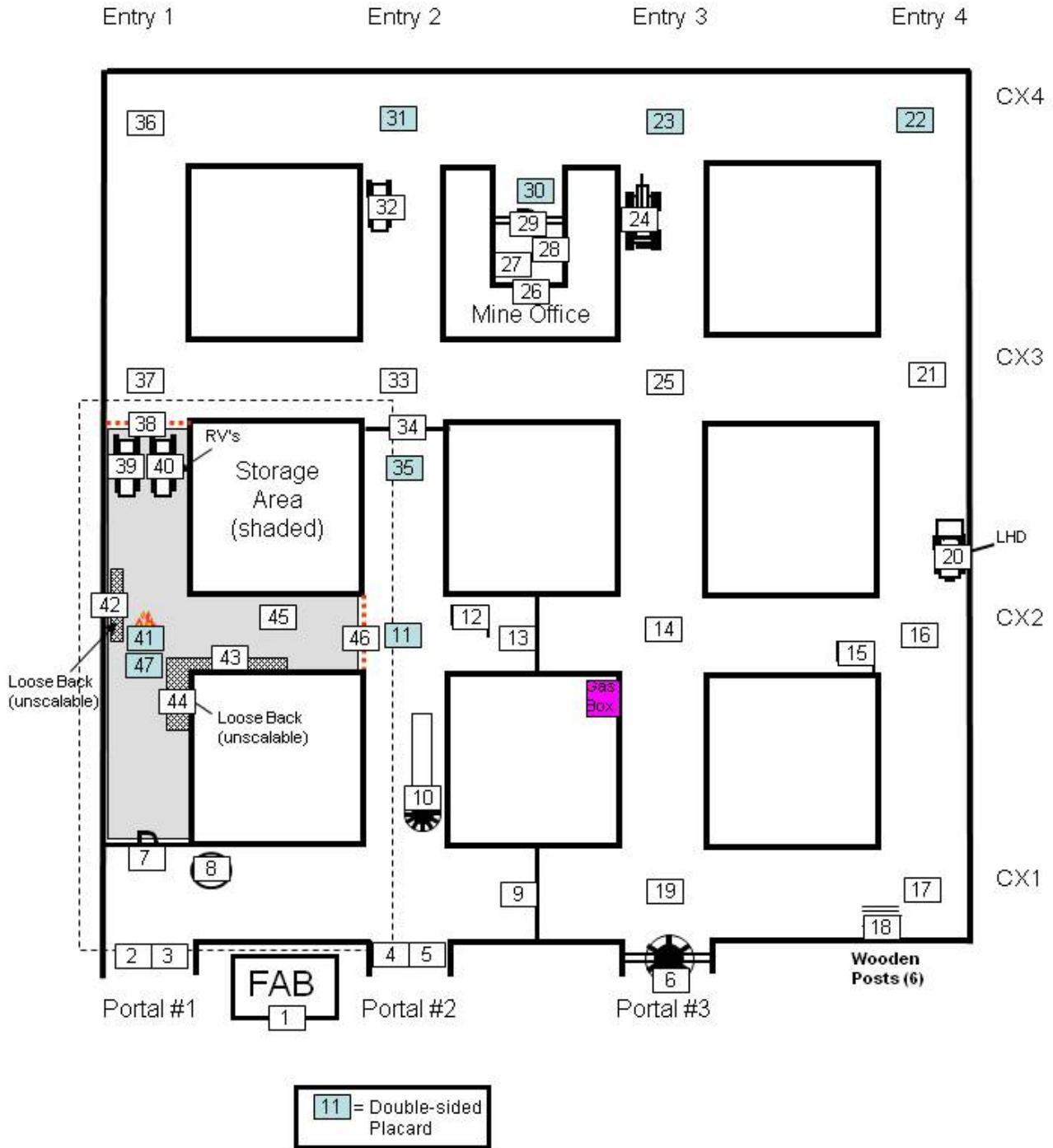




## Placard Key

- |  |  |
|--|--|
| 1. FRESH AIR BASE  | 19. HEAVY SMOKE<br>6,000 ppm CO<br>13.0 % O <sub>2</sub> |
| 2. PORTAL #1   |  |
| 3. CLEAR AIR   | 20. LOAD-HAUL-DUMP (LHD)                                 |
| 4. PORTAL #2   | 21. HEAVY SMOKE<br>6,000 ppm CO<br>13.0 % O <sub>2</sub> |
| 5. CLEAR AIR   |  |
| 6. MAIN FAN  | 22. HEAVY SMOKE<br>6,000 ppm CO<br>13.0 % O <sub>2</sub> |
| 7. LOCKED DOOR TO STORAGE AREA                           |  |
| 8. MINE PHONE (Operable)                                 | 23. HEAVY SMOKE<br>6,000 ppm CO<br>13.0 % O <sub>2</sub> |
| 9. TEMPORARY STOPPING                                    |  |
| 10. AUXILIARY FAN WITH VENT TUBING (30 feet)             | 24. MECHANICAL SCALER                                    |
| 11. LIGHT SMOKE<br>1,400 ppm CO<br>16.0% O <sub>2</sub>  | 25. HEAVY SMOKE<br>6,000 ppm CO<br>13.0 % O <sub>2</sub> |
| 12. BRATTICE MATERIAL (3 Sets)                           | 26. FACE   |
| 13. TEMPORARY STOPPING                                   | 27. MINER #2   |
| 14. HEAVY SMOKE<br>6,000 ppm CO<br>13.0 % O <sub>2</sub> | 28. MINE PHONE (Operable)                                |
| 15. BRATTICE MATERIAL (3 Sets)                           | 29. MINE OFFICE DOOR (Closed)                            |
| 16. HEAVY SMOKE<br>6,000 ppm CO<br>13.0 % O <sub>2</sub> | 30. HEAVY SMOKE<br>6,000 ppm CO<br>13.0 % O <sub>2</sub> |
| 17. HEAVY SMOKE<br>6,000 ppm CO<br>13.0 % O <sub>2</sub> | 31. HEAVY SMOKE<br>6,000 ppm CO<br>13.0 % O <sub>2</sub> |
| 18. WOODEN POSTS (6)                                     | 32. TRANSPORT JEEP                                       |
|  | 33. HEAVY SMOKE<br>6,000 ppm CO<br>13.0 % O <sub>2</sub> |

# Day 2 - Placard Map



- 34. CHECK CURTAIN
- 35. LIGHT SMOKE  
1,400 ppm CO  
16.0% O<sub>2</sub>
- 36. HEAVY SMOKE  
6,000 ppm CO  
13.0 % O<sub>2</sub>
- 37. HEAVY SMOKE  
6,000 ppm CO  
13.0 % O<sub>2</sub>
- 38. FIXED IRON GATE
- 39. RECREATIONAL VEHICLE (RV)
- 40. RECREATIONAL VEHICLE (RV)
- 41. FIRE
- 42. LOOSE BACK (UNSCALABLE)
- 43. LOOSE BACK (UNSCALABLE)
- 44. LOOSE BACK (UNSCALABLE)
- 45. MINER #1
- 46. FIXED IRON GATE
- 47. HEAVY SMOKE  
6,000 ppm CO  
13.0 % O<sub>2</sub>

**Note:**

Seven gas placards (11, 22, 23, 30, 31, 35, and 47) are double-sided. The backside will indicate “Clear Air” when changes have been made by the team to successfully ventilate these areas.

Placard 41 showing “Fire” is also double-sided. The backside will indicate “Fire Out” when the team has taken appropriate action to extinguish the fire.

Reno Mining Company  
Reno Mine No. 2  
I.D. No. 26-02012  
Reno, Nevada

Map Legend:

-  Fixed Iron Gate
-  Pager Phone
-  Check Curtain
-  Permanent Stopping
-  Equipment Door
-  Man Door
-  Airflow Direction
-  Ventilation Fan
-  Auxiliary fan and tubing

Updated July 1, 2012  
Approx. Scale 1 in . = 10 ft.

**DAY 2 – Map Legend**

# DAY 2 – Team Map

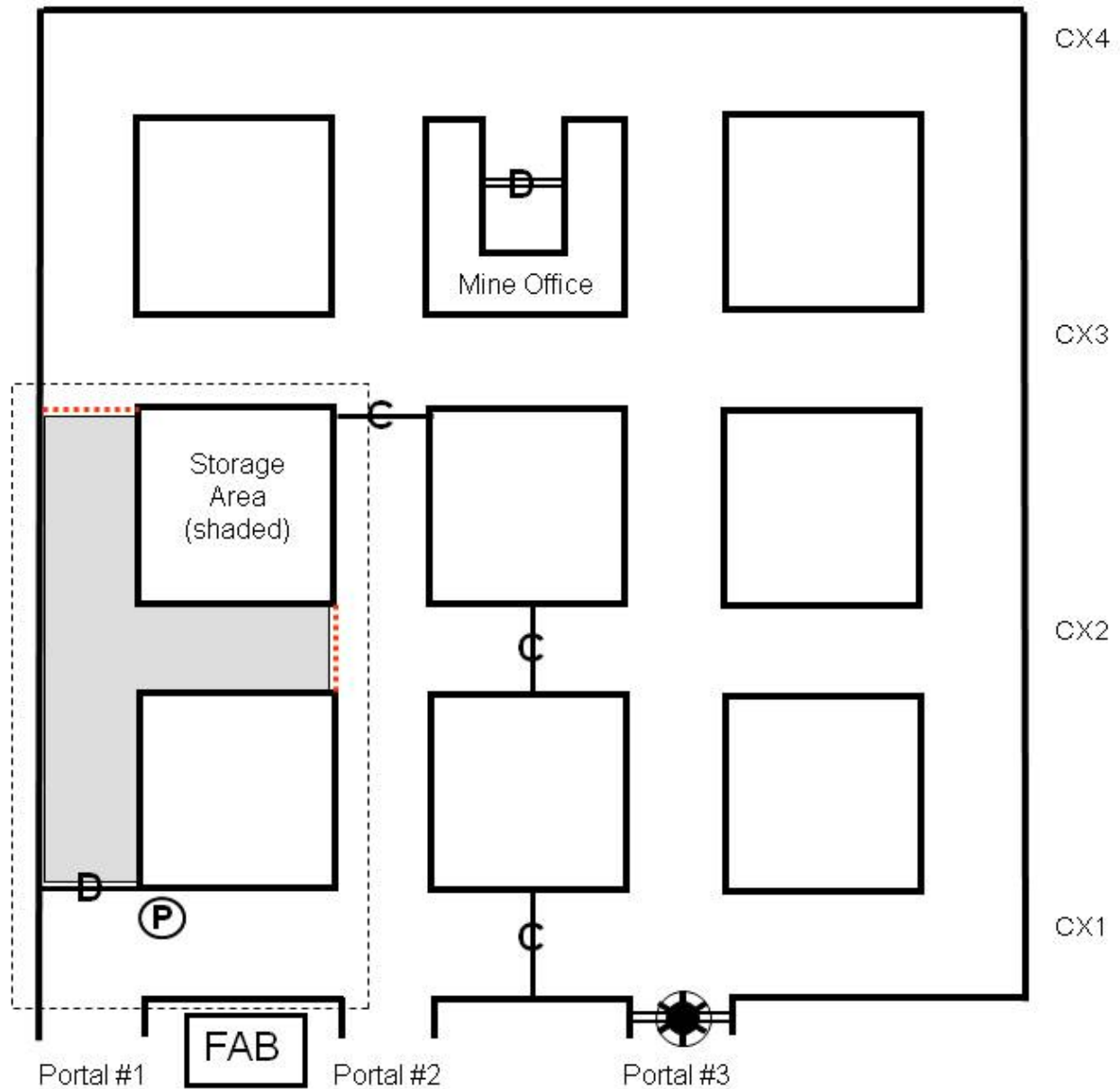


Entry 1

Entry 2

Entry 3

Entry 4



# DAY 2 – Fresh Air Base Map

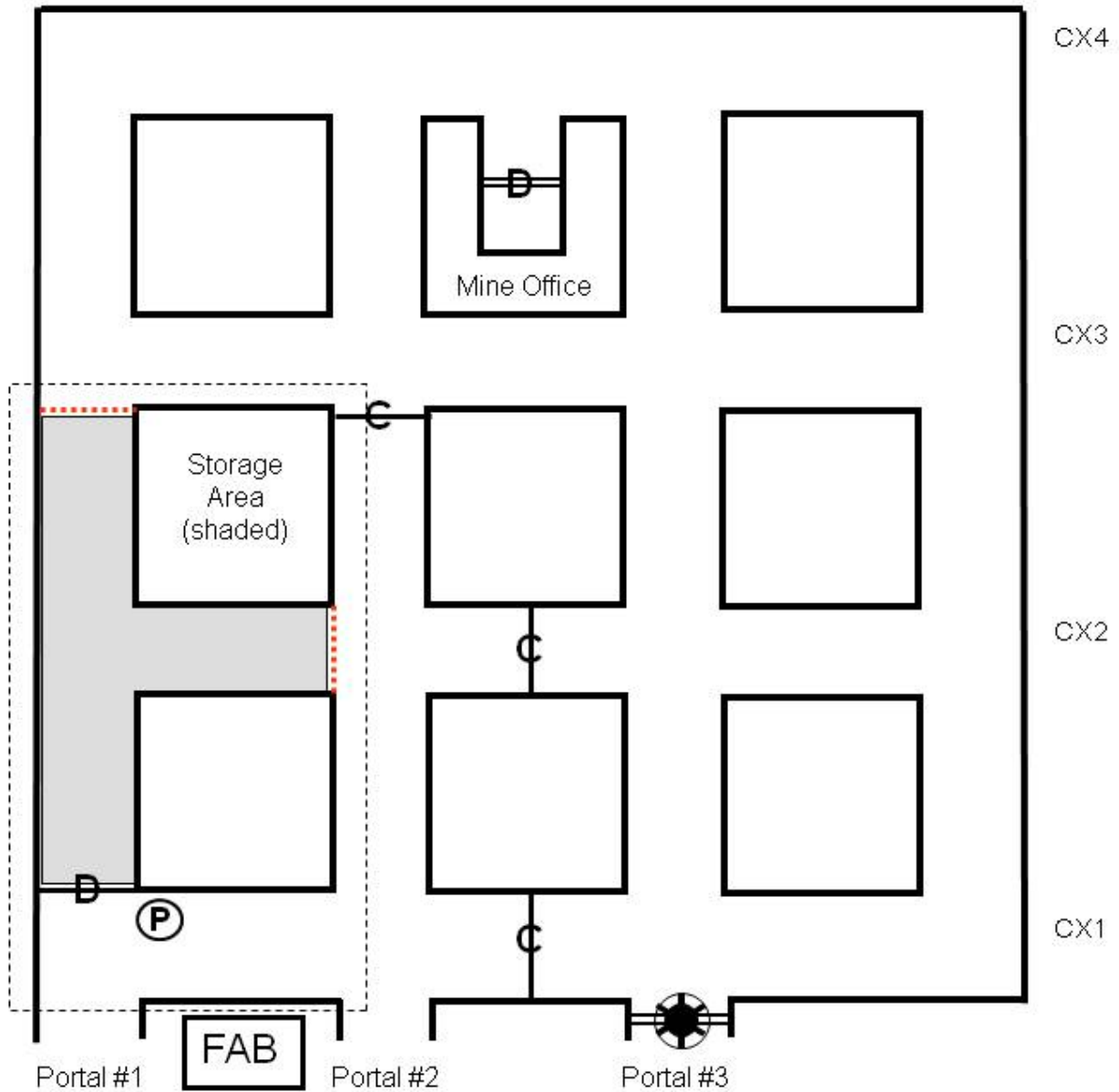


Entry 1

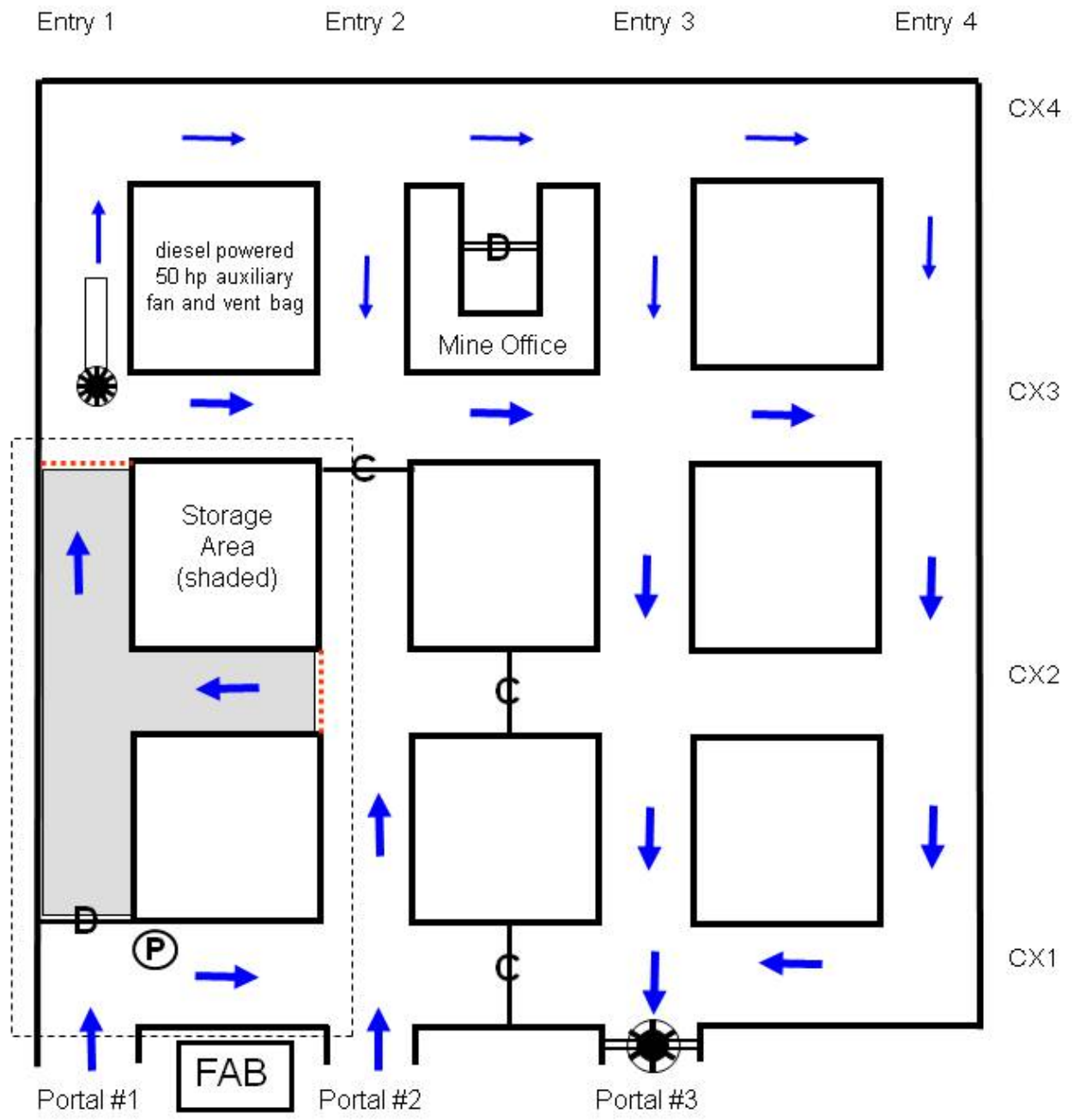
Entry 2

Entry 3

Entry 4



# Typical Ventilation



# Problem Map

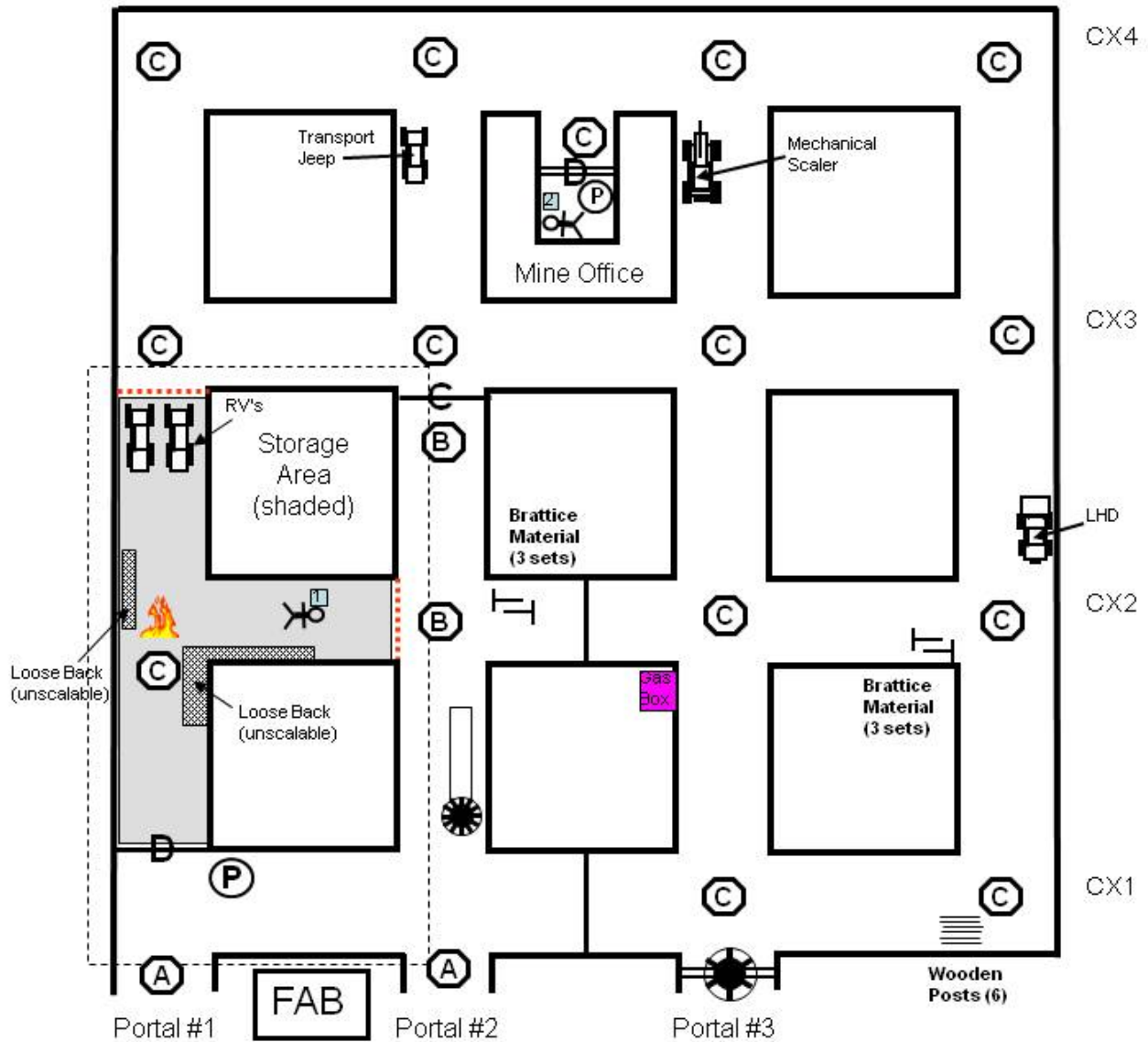


Entry 1

Entry 2

Entry 3

Entry 4



**Missing Miners:**

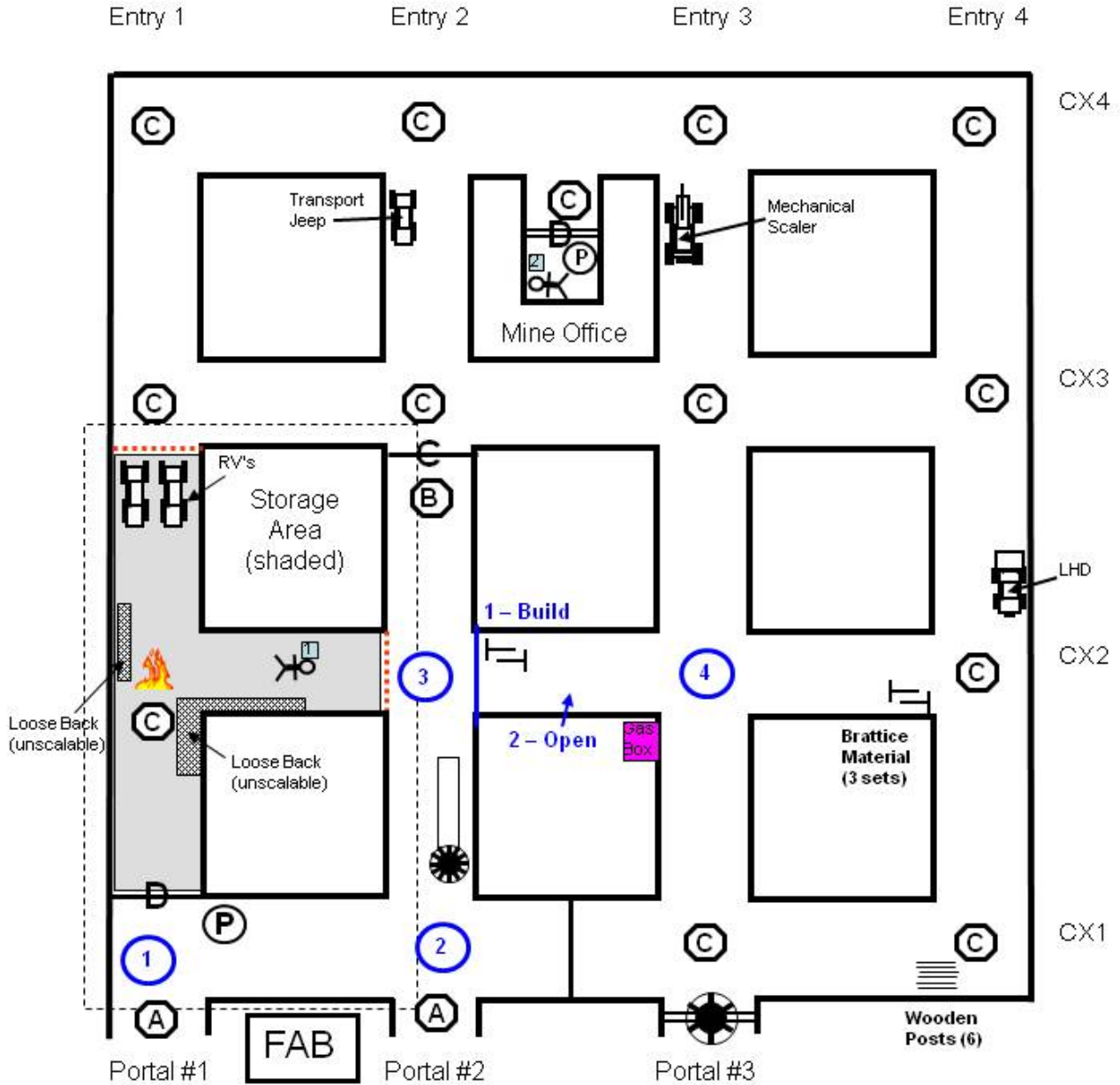
- 1 Miner #1
- 2 Miner #2

**Gas Placards:**

<b>(A)</b>	<b>(B)</b>	<b>(C)</b>
Clear Air	Light Smoke CO = 1,400 ppm O <sub>2</sub> = 16.0 %	Heavy Smoke CO = 6,000 ppm O <sub>2</sub> = 13.0 %



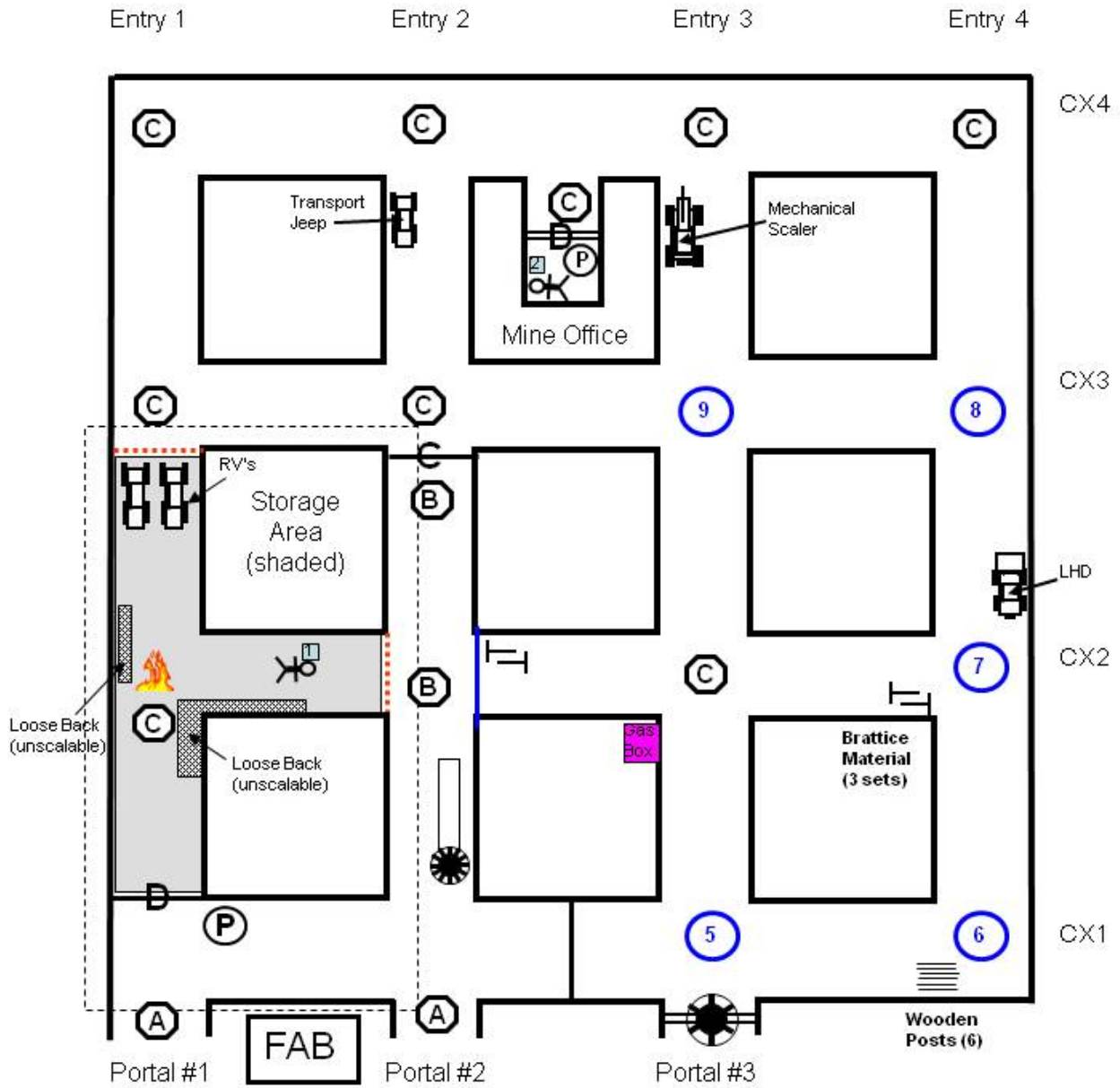
# Solution Map - 1



1 = Team Stop

Gas Placards:		
(A)	(B)	(C)
Clear Air	Light Smoke CO = 1,400 ppm O <sub>2</sub> = 16.0 %	Heavy Smoke CO = 6,000 ppm O <sub>2</sub> = 13.0 %

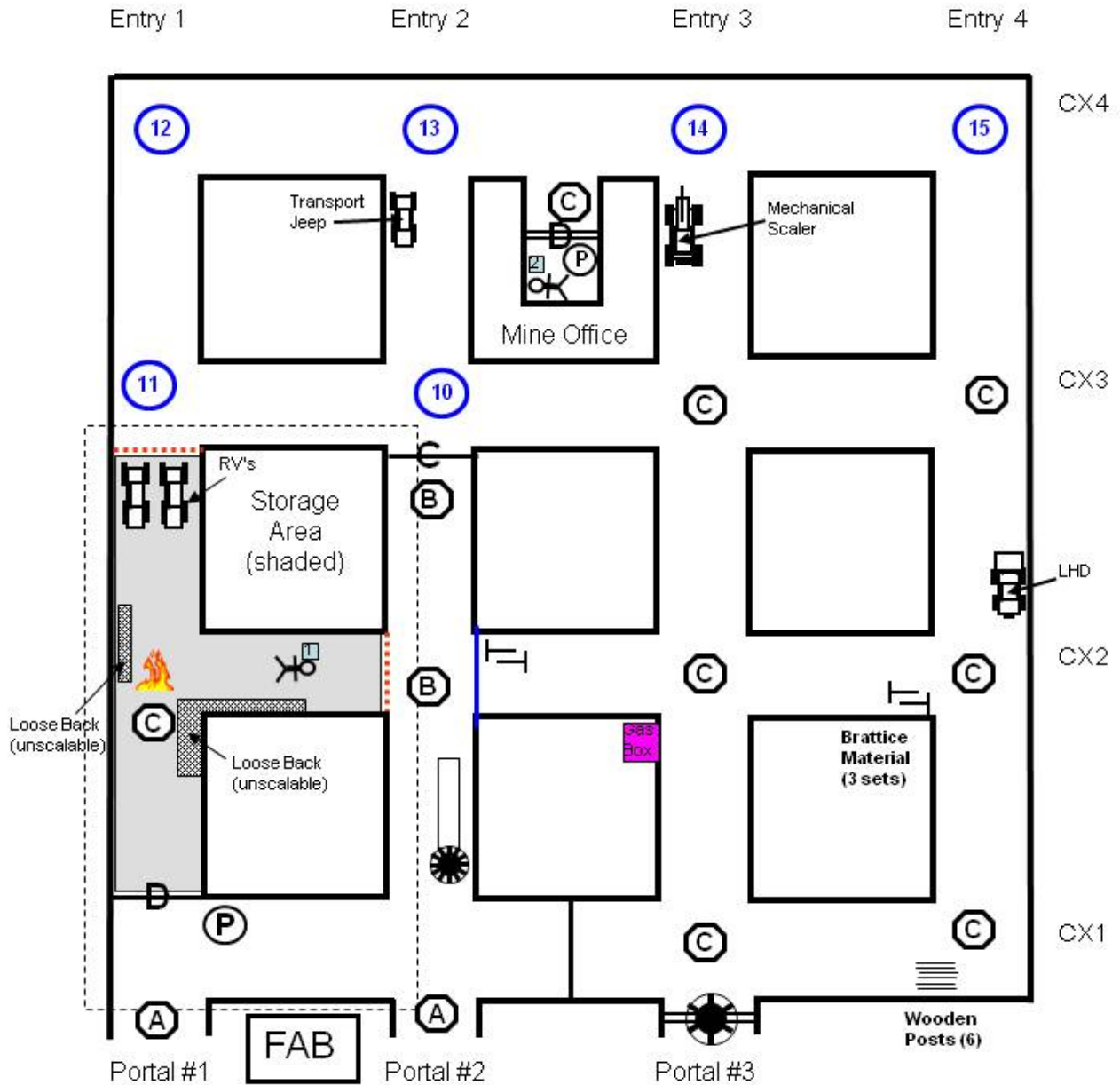
# Solution Map - 2



1 = Team Stop

Gas Placards:		
<b>(A)</b>	<b>(B)</b>	<b>(C)</b>
Clear Air	Light Smoke CO = 1,400 ppm O <sub>2</sub> = 16.0 %	Heavy Smoke CO = 6,000 ppm O <sub>2</sub> = 13.0 %

# Solution Map - 3



**1** = Team Stop

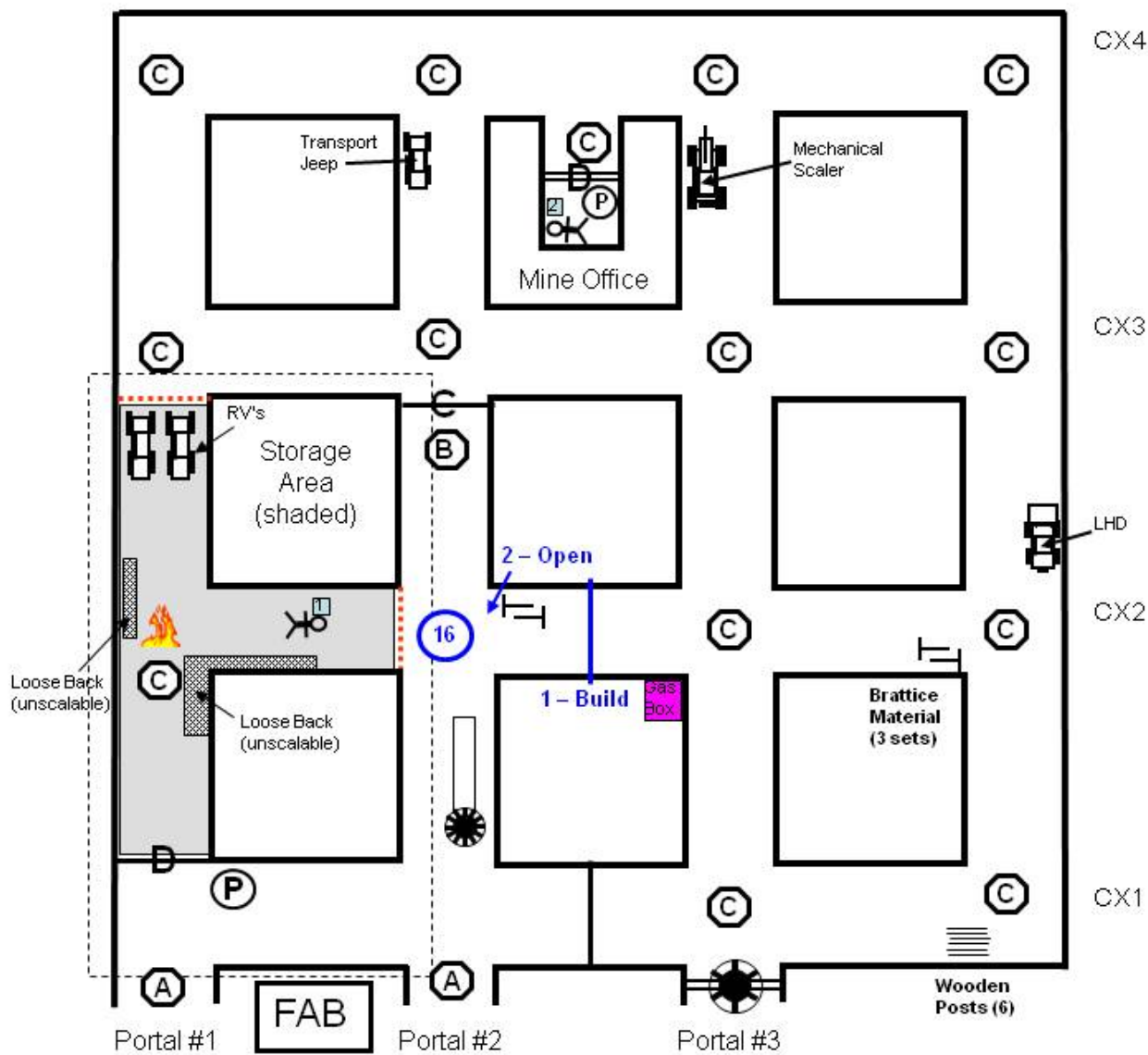
**Gas Placards:**

<b>A</b> Clear Air	<b>B</b> Light Smoke CO = 1,400 ppm O <sub>2</sub> = 16.0 %	<b>C</b> Heavy Smoke CO = 6,000 ppm O <sub>2</sub> = 13.0 %
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# Solution Map - 4



Entry 1                      Entry 2                      Entry 3                      Entry 4

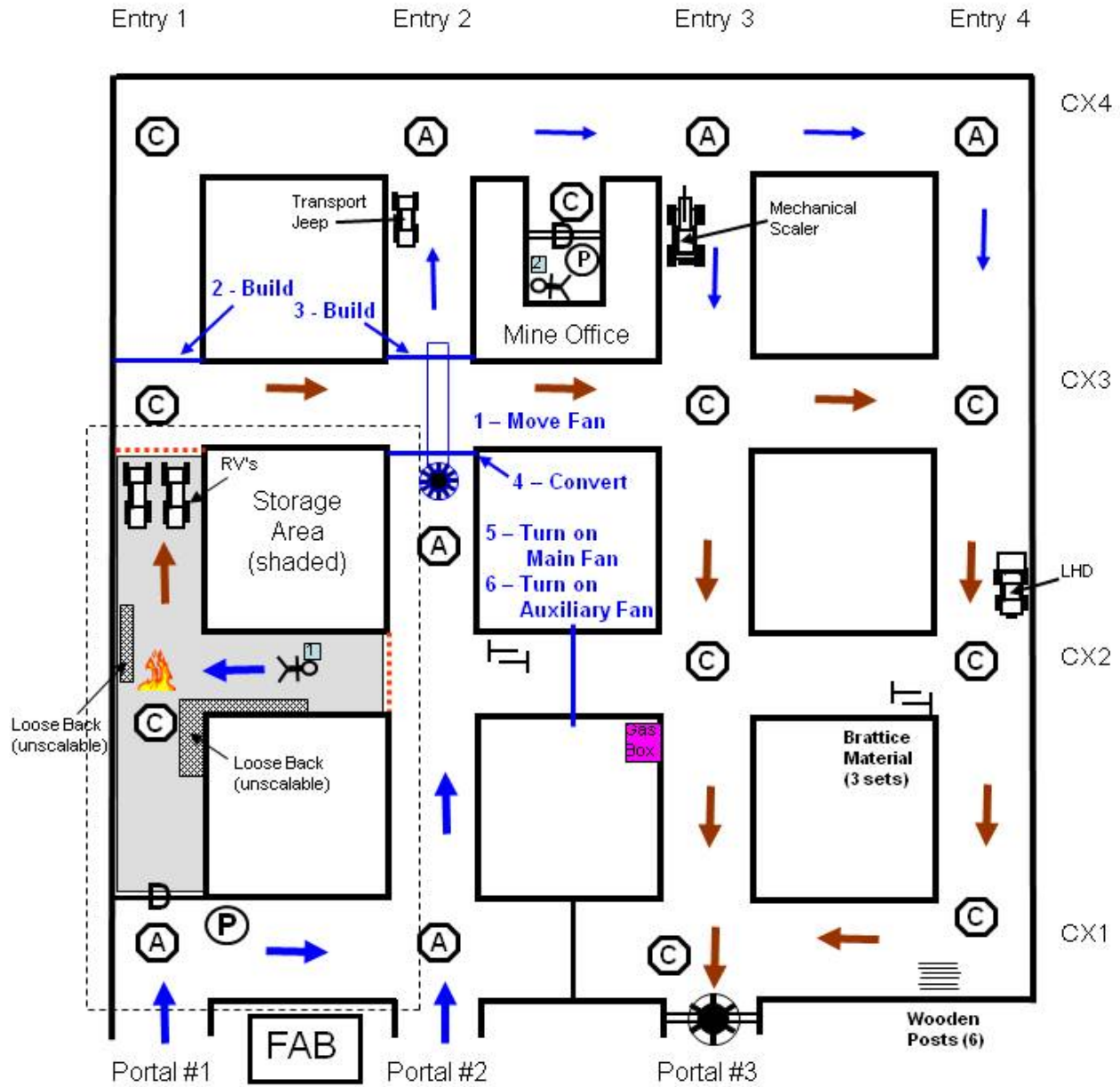


**1** = Team Stop

**Gas Placards:**

<b>A</b> Clear Air	<b>B</b> Light Smoke CO = 1,400 ppm O <sub>2</sub> = 16.0 %	<b>C</b> Heavy Smoke CO = 6,000 ppm O <sub>2</sub> = 13.0 %
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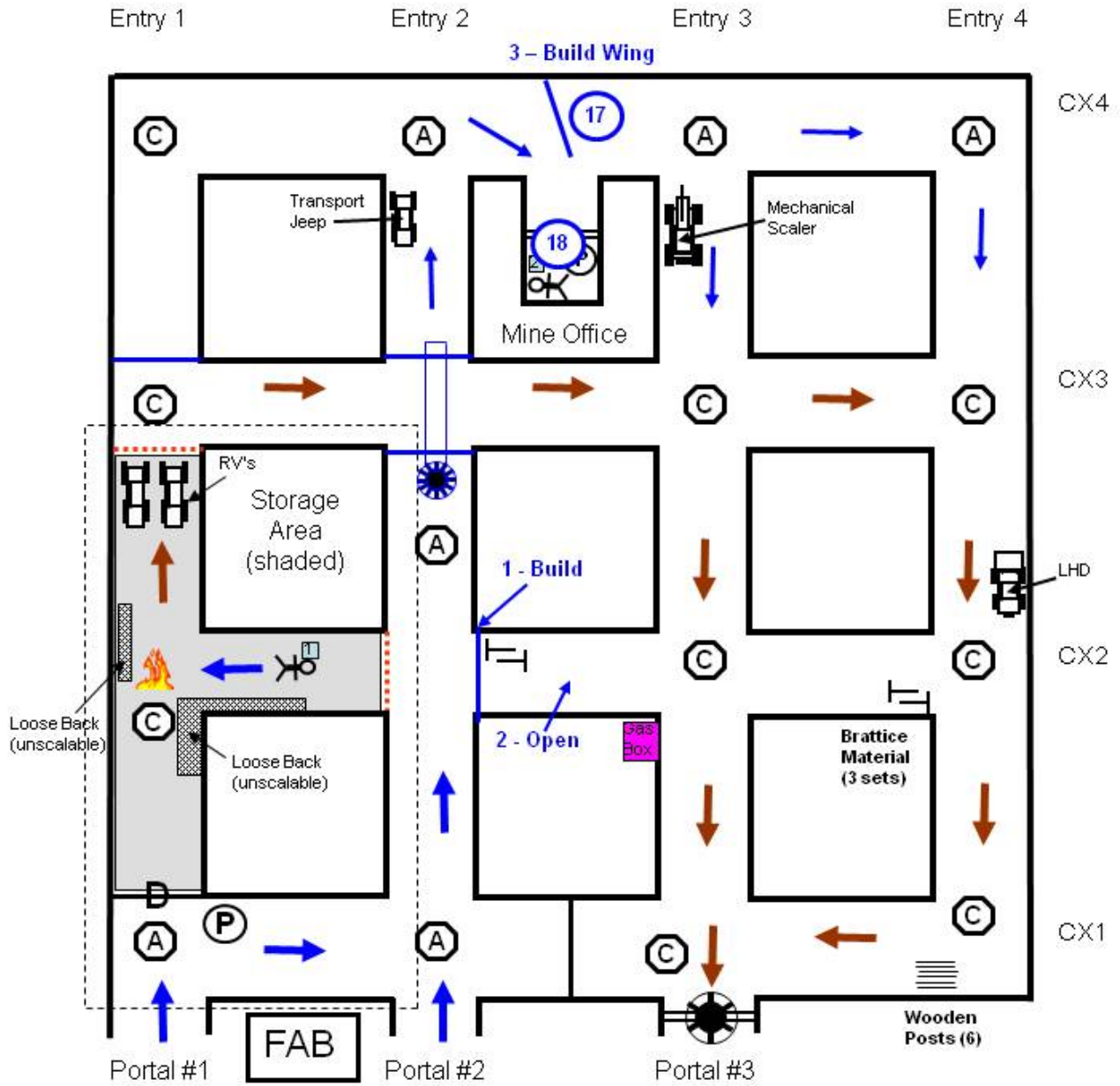
# Solution Map – 5 (Ventilation Change)



1 = Team Stop

Gas Placards:		
<b>A</b>	<b>B</b>	<b>C</b>
Clear Air	Light Smoke CO = 1,400 ppm O <sub>2</sub> = 16.0 %	Heavy Smoke CO = 6,000 ppm O <sub>2</sub> = 13.0 %

# Solution Map – 6



**1** = Team Stop

Gas Placards:		
<b>A</b>	<b>B</b>	<b>C</b>
Clear Air	Light Smoke CO = 1,400 ppm O <sub>2</sub> = 16.0 %	Heavy Smoke CO = 6,000 ppm O <sub>2</sub> = 13.0 %



# Solution Map – 8

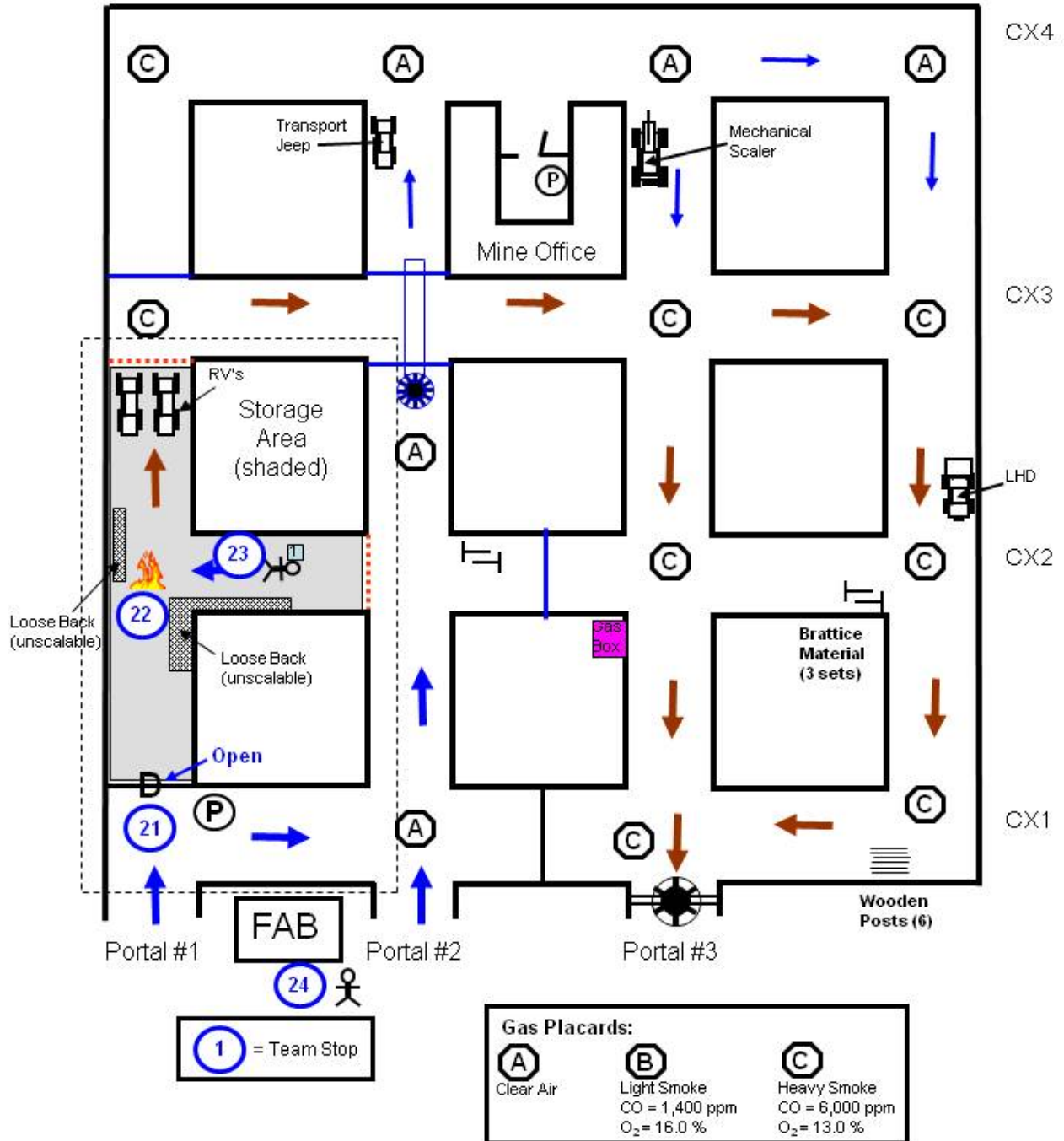


Entry 1

Entry 2

Entry 3

Entry 4





# Day 2 - Placard Map

