FREEPORT-
MCMORAN

FACILITATOR GUIDE

SFT FCX2003C
CONFINED SPACE REFRESHER

October / 2018

VERSION 1.1

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COURSE OVERVIEW

The following is basic information about this course.

COURSE DESCRIPTION

Freeport-McMoRan's Department of Health and Safety states that, after initial training on the Confined Space Policy, an annual review of the policy must occur (FCX-HS05). As such, this course summarizes the original Confined Space course and refreshes employees on the knowledge/skills necessary to safely enter and work in confined spaces. Students review the characteristics, hazards, evaluation techniques, hazard controls, emergency procedures, and safe entry procedures associated with confined spaces. A written exam is used to assess student knowledge.

COURSE OBJECTIVES

Upon completion of this course, students will be able to:

- Module 1: Evaluating a Confined Space
  - Categorize confined spaces based on the three criteria.
  - Analyze the characteristics of a permit-required confined space.
- Module 2: Permit-Required Confined Space Hazards
  - Evaluate hazards associated with permit-required confined spaces.
- Module 3: Controlling Confined Space Hazards
  - Evaluate the hazards and controls in a confined space.
- Module 4: Entering a Confined Space
  - Demonstrate the process for entering a confined space.

COURSE PRE-REQUISITES

Before taking this course, students should have taken the original Confined Space course.

COURSE LENGTH

This course takes approximately 1 hour and 30 minutes to complete.

CLASS SIZE

This course is designed for a maximum of 15 students. Class size may be more or less depending on each site's needs and the students' skills and experience levels.

TARGET AUDIENCE

This training is intended for all Freeport-McMoRan employees who need an annual refresher on entering a confined space, and satisfies the refresher training requirements for the roles of Entrant, Attendant, and Entry Supervisor.

FACILITATOR QUALIFICATIONS

Facilitators should be well versed in Freeport-McMoRan's Confined Space Policy (FCX-HS05).

REGULATIONS/POLICIES/PROCEDURES

This course teaches to Freeport-McMoRan's Confined Space Policy (FCX-HS05).

FACILITATOR PREPARATION

The following information will help the facilitator prepare for the course.

ABOUT THIS GUIDE

This guide is intended to give the facilitator a general outline for the flow of the refresher course. It is designed to assist the facilitator in presenting content, conducting classroom activities, and managing time to meet the learning objectives. This Facilitator Guide (FG) is intended to be used in conjunction with the PowerPoint (PPT). The guide belongs to the facilitator to make notes and write in as much as needed.

This course was designed to be a refresher of previously learned content. As such, the facilitator should review the PPT, FG, and activities within the FG before teaching the course and determine the best approach to refreshing the course content for each specific group of students. The PPT slides provide basic course content that can be elaborated on using the talking points provided in the FG. The content provided in the FG can be adjusted to fit the needs of the students and site.

Five or more activities have been developed for each module and meet the module's stated learning objective(s). The facilitator should not do all of the activities. In most cases, the facilitator presents the PPT slides for one module at a time and reinforces the content by choosing one or two activities developed for that module. Pick the activities that are most appropriate for your students and site. In some cases, an activity may be used in place of the PPT slides for a module. The activities that can replace module slides are indicated at the beginning of the module and as within the activities directions.

SAFETY

Safety is a fundamental component of this course. Students must adhere to safety information presented in the PPT, and the facilitator must focus instruction on safety procedures throughout the training. Equipment may not be operated without facilitator authorization.

ACTIVITIES

Students participate in many hands-on activities designed to give students time to practice the knowledge learned throughout the course. Activities also provide opportunities for the facilitator to give immediate feedback on what each student does/does not do well. Facilitators should review each activity's directions in the FG before instructing students.

GENERAL MATERIALS

The following is a list of materials consistently needed for courses. Gather and/or order the necessary materials prior to the start of class and verify that everything functions properly.

- Attendance sign-in sheets
- Name cards – 1 per student
- Pens and/or pencils
- Push pins and/or tape such as painter's tape
- Sticky notes
- Easel
- Flipchart
- Markers of various colors
- Projector and sound system for PPT and/or videos (available on MTI SharePoint)
- Laptop with access to the internet
- Assessments (available on MTI SharePoint)
- Course Evaluations (Found in the FG)
- Appropriate Personal Protective Equipment (PPE)

ACTIVITY MATERIALS

The following materials are needed for activities in each module:

Module	Materials
Introduction	• Activity 1: Icebreaker o Gather the appropriate materials depending on the icebreaker chosen

Module 1: Evaluating a Confined Space	• Activity 2: Guess the Space
	  o 3x5 cards (at least 1 per group)
	  o Pen (at least 1 per group)
	• Activity 3: On the Fence
	  o Tape to affix signs to the wall
	  o Confined Space and Not a Confined Space signs, FG pp.113-115 (1 of each)
	• Activity 4: Flash Cards
	  o Flash Cards, pp.117-119 (1 copy of all cards for each group)
	• Activity 5: Twenty Questions
	  o None
	• Activity 6: PRCS vs NPRCS
	  o PRCS vs NPRCS worksheet, FG p.121 (1 per student)
	  o Pen (1 per student)
	• Activity 7: Face-Off
	  o Markers (3)
	  o Flipchart paper (3 pieces)

Module 2: Permit-Required Confined Space Hazards	• Activity 8: PRCS Poster
	  o A variety of markers for each group
	  o Flipchart paper (1 per group)
	• Activity 9: PRCS Summaries
	  o Writing paper (1 per group)
	  o Pen
	• Activity 10: Hazard Detective
	  o Hazard Detective Worksheet, FG pp.123-124 (1 per student)
	  o Pen (1 per student)
	• Activity 11: Around the Room
	  o Flipchart paper (4)
	  o Markers (4)
	• Activity 12: PRCS Categories
	  o PRCS Categories worksheet, FG p.125 (1 per student)
	  o Pen (1 per student)

Module 3: Controlling Confined Space Hazards	• Activity 13: Team Quiz
	  o Flipchart paper (1 per group)
	  o Marker (1 per group)
	• Activity 14: Test the Space
	  o Test the Space worksheet, FG pp.127-130 (1 per student)
	  o Pen (1 per student)
	• Activity 15: Find Your Match
	  o Find Your Match Questions and Answers cards, pp.131-137 (1 copy of each page cut apart before class)
	• Activity 16: Reflection
	  o Reflection worksheet, FG p.139 (1 per student)
	  o Pen (1 per student)
	• Activity 17: Secure the Scene
	  o Secure the Scene worksheet, FG pp.141-142 (1 per student)
	• **Air monitor(s) used at your site (Either 1 for the facilitator to demonstrate OR 1 for the facilitator to demonstrate and 1 per group so students can follow along and practice)**

Module 4: Entering a Confined Space	• Activity 18: Confined Space Entry
	  o Confined Space Entry worksheet, FG p.111-112 (1 per student)
	  o Pen (1 per student)
	  o **Confined Space Entry Permit and Policy FCX-HS05**
	  o **Facilitator created confined space scenario**

Conclusion	• None

In addition, the following will be needed during each module:

- **Confined Space Policy FCX-HS05, Technical Supplement and Confined Space Entry Permit copies, FG pp.107-112.**

FACILITATOR GUIDE CUES

Throughout the FG, cues are used to help the facilitator quickly identify slides that have unusual but important features. The purpose of each symbol is explained below.

Description	Symbol	Purpose
Audio Link		The speaker icon indicates when audio files are linked on a PPT slide.
Video Link		The director's clapboard is indicates when video files are linked on a PPT slide.
Animated Slide		The star indicates when a PPT slide has an animation and requires more than one click to view all of the content.
Note		The paper and pencil indicate that an important note relating to the slide is included on the PPT slide or in the FG.
Incidents		The first aid symbol indicates when a PFE, testimonial, or other safety related incident is addressed on a PPT slide or in the FG.
Flipchart		The marker indicates when the facilitator needs to write down responses given to them by the students. This is generally done with a flipchart or a whiteboard.
Discussion		The question mark indicates when students are expected to participate in a discussion either as a class or in small groups.
Example		The hand indicates when the instructor will hold up an item or pass an example around the class.

USING THE PPT PRESENTATION

When preparing to facilitate the course, there are several ways to integrate the PPT with the FG.

1. The facilitator can project the PPT and carry the paper copy of the FG as he/she walks around the room.
2. The facilitator can begin the PPT in presentation mode on his/her computer. This displays only the current slide to the class on the projection screen, but shows the facilitator a different view on his/her computer. The facilitator's screen shows a notes screen that has the same information for the slide that is included in the FG. This view also shows the next slide and lets the facilitator see the marker tools to write on the slides and emphasize teaching points.
3. The facilitator can also choose to do both. This is the preferred method for facilitating this course. Moving around the room helps the facilitator engage more participants and keeps the students' brains stimulated, thus promoting learning.

Note: The FG follows the PPT presentation slide by slide. Each page is designed with the information the facilitator needs and an image of the slide. The FG should be used as a roadmap to guide the facilitator through the course.

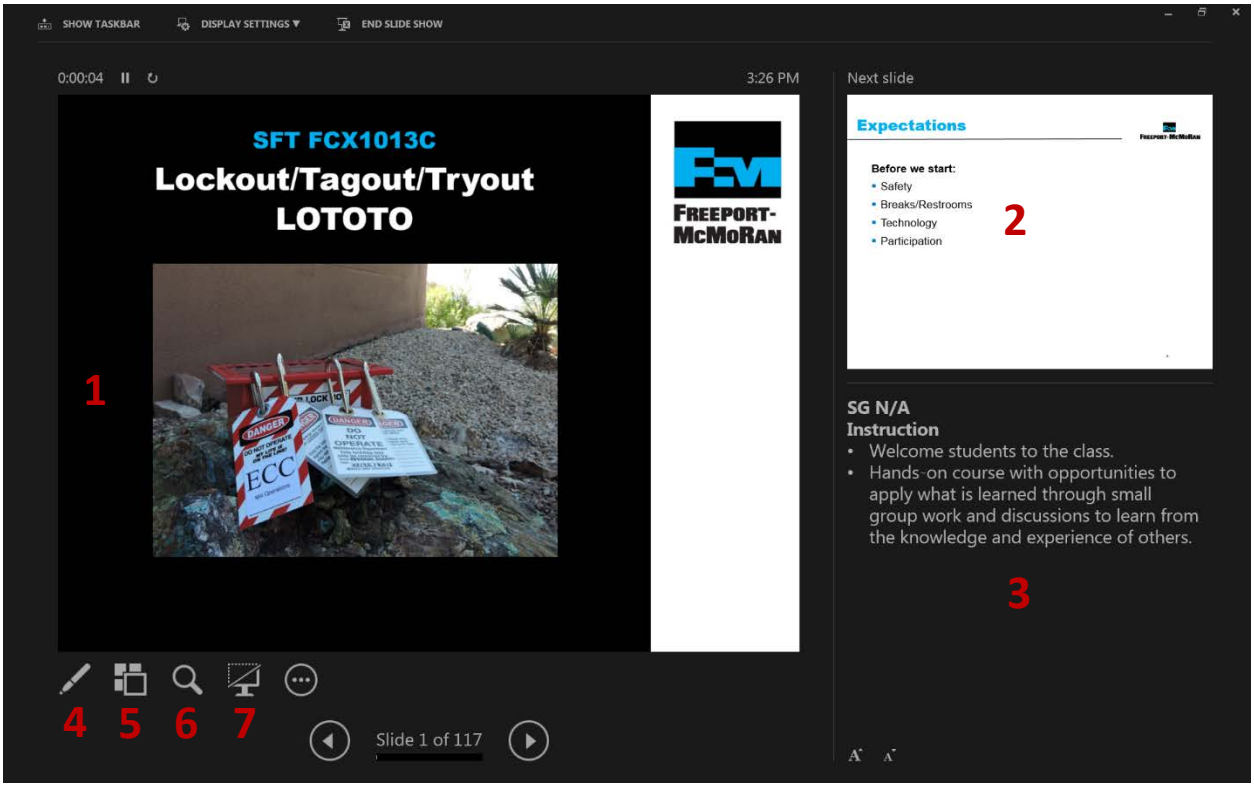
SETTING THE PRESENTATION MODE

To initiate the presentation mode, do the following:

Step	Action
1	Open the PPT presentation.
2	At the bottom pf the screen is a colored bar (The look or color may vary depending on the version of PPT used).
3	Select the icon that is noted in the image below. 

PRESENTATION MODE FEATURES

Once you are in presentation mode, the students will only see the slide displayed but the facilitator will see the layout below. Some of the commonly used features available from this view are numbered in red and identified in the image.



1. **Current slide** – This is the same slide that students see on the projection screen.
2. **Next slide** – A visual preview for the next slide is shown.
3. **Notes** – These notes are the same as the talking points available in the FG. The notes correspond with the current slide projected to the students.
4. **Pens** – This icon gives the user access to a laser pointer, pen, highlighter, and arrow options. Whichever tool is used on the facilitator's screen will show on the projection screen for the students and allows for specific points on the PPT to be emphasized. This helps the facilitator customize the PPT presentation to better suit the needs of the site and students.
5. **All slides** – This will show small images of all of the slides together on the facilitator's screen.
6. **Zoom** – This icon lets the facilitator zoom in on specific aspects of the PPT.
7. **Black screen** – If the facilitator would like to explain content further but feels the PPT slide shown on the screen may distract from the learning, the screen can be blacked out to help focus the students.

INTRODUCTION

The introduction contains information about Confined Spaces and Freeport-McMoRan's Confined Space Policy (FCX-HS05).

ACTIVITIES

- Activity 1: Icebreaker

TOTAL TEACHING TIME

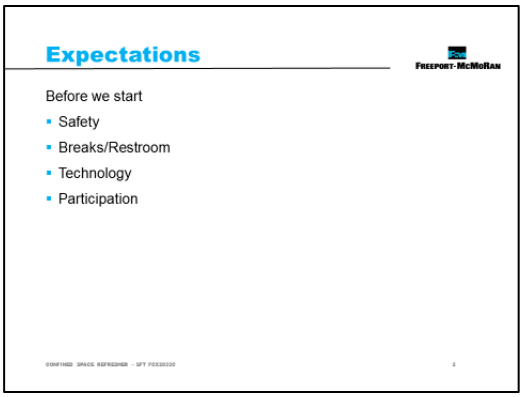
The introduction takes approximately 10 minutes to complete.

PPT slide 1

Instruction

- Welcome students to class.
- Remind students to sign the attendance sheet.
- Facilitator introduces self by stating:
  - position at FMI
  - length of service with the company, and
  - length of service in mining industry.
- Tell students this is a hands-on course with opportunities to apply what is learned. Group work and discussions help them learn from the knowledge and experience of others.

PPT slide 2

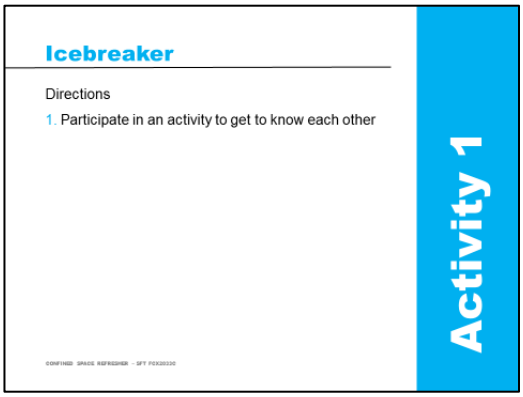


Instruction

- Administrative/Classroom policies
  - Safety
    - Identify the appropriate evacuation procedures, gathering areas, and emergency exits and fire extinguisher locations, etc.
  - Breaks and Restrooms
    - Establish a break schedule and announce it to the class. Suggested break times are included throughout the FG and occur approximately every hour and often occur at the end of each module. Breaks should last 5-10 minutes to give students time to rest and relax before beginning the next learning session.
    - Identify the location of restrooms and smoking areas.
  - Technology policy
    - Review your expectations on cell phone and laptop use during the training.
  - Participation
    - This course requires significant participation. Students should be prepared for discussions and small group activities.
  - Set the class ground rules by verbalizing your expectations. Some suggestions are provided below.
    - Be on time.
    - Stay on task.
    - Listen when others talk.
    - Respect the opinions and attitudes of others.

ACTIVITY 1: ICEBREAKER

PPT slide 3



Time
Approximately 10 minutes

Materials

- Choose an icebreaker and gather appropriate materials

Purpose

- Successful icebreakers encourage students to contribute their ideas and experiences thus increasing motivation and engagement in the class.
- Below is an assortment of icebreakers that the facilitator can incorporate at the beginning of the course as well as after breaks.

Icebreaker	Instructions
What would you do if you had a million dollars? *(5-10 minutes)*	1. The facilitator will begin by answering this question themselves, such as "I will buy a tiny island in the Bahamas and live there the rest of my life selling coconuts and bananas", "I will sell my house and live in an RV touring the U.S and Canada", or "I plan on paying off all my debt and giving $xxx to ABC charity." 2. The facilitator will then ask each student to respond to the question. There may be some similarities or common themes.
Two Truths and a Lie *(15 minutes)*	1. The facilitator will begin this icebreaker by explaining the activity. Each student will think of two true statements about themselves and one false statement. Allow a few minutes for students to come up with their examples. The facilitator will then proceed telling the class two truths and a lie about him or herself. 2. The class will come to a common vote on what they believe is the lie. The facilitator will reveal the correct answer. After the lie has been detected, the facilitator can elaborate on one or two of the statements that they made. 3. Continue the exercise with the students as you have each one present their statements.

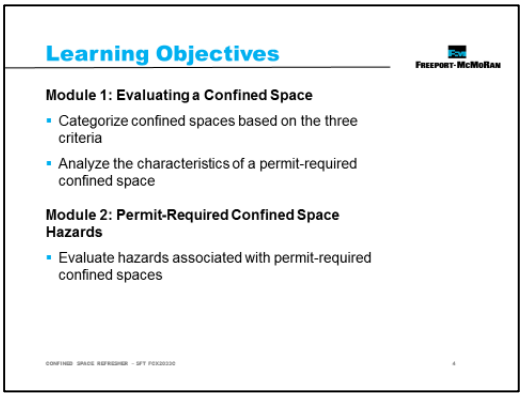
Icebreaker	Instructions
Ten Things in Common *(15 minutes)* *http://humanresources.about.com/od/icebreakers/a/icebreaker_com.htm*	1. Divide class into groups of about four people by either having them work with the people near them or numbering them and having them move to be with others of the same number. This gives individuals the chance to meet new people. Give each group a paper and pen. 2. Tell class their assignment is to find ten things they all have in common that have nothing to do with work, body parts, or clothes. 3. One person should list the things that everyone has in common on paper. 4. After about seven minutes of brainstorming stop the groups so there will be time to share. Tell the groups that if they didn't get ten things, it is okay. 5. Have one person from each group share their list with the class.
Would You Rather *(10-15 minutes)*	1. Divide class into groups of about four people by either having them work with the people near them or numbering them and having them move to be with others of the same number (this gives individuals the chance to meet new people). 2. Ask each statement below one at a time and give the groups about two minutes to discuss and explain their answers. Each individual should be given a chance to share. Would you rather . . . . . . be a farmer or a politician? . . . ride a roller coaster or a mechanical bull? . . . have the power to fly or disappear? . . . live in the city or the country? . . . drive a Ford or a Chevy? . . . be known for your looks or your personality? . . . go for a month without the internet or your car? . . . lose your wallet or your keys? . . . spend every minute of the rest of your life indoors or outdoors? . . . live in a home without electricity or running water?

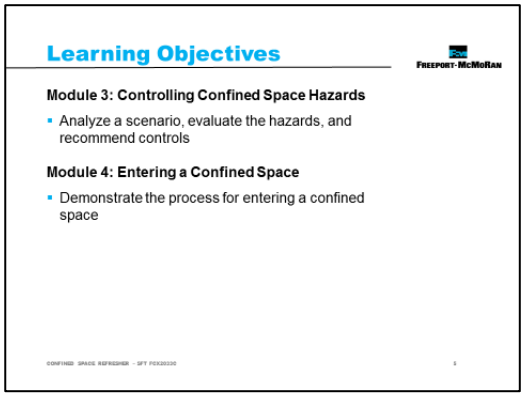
Icebreaker	Instructions
A Little Known Fact *(10-15 minutes)*	1. The facilitator will begin by stating their name, title, organization (if different than students), length of time in position and one little known fact about themselves. 2. Continue this exercise by asking each student to share the same information about themselves.
One Question One Answer *(5-10 minutes)* *http://humanresources.about.com/od/icebreakers/a/Ice-Breakers-For-Meetings.htm*	1. Divide class into groups of about four people by either having them work with the people near them or numbering them and having them move to be with others of the same number. This gives individuals the chance to meet new people. 2. Assign a question to each group from the list below. Have individuals share with their groups. • What are you most worried about at work this month? • What characteristic do you value the most in your coworkers? • What is the most important personal attribute that you bring to your job? • What are you most excited about in relation to your job this year? • What coworker characteristic do you find most irritating? • What's the one word that you'd like to hear from your boss? • What's the single most important factor that you would change about your job?

PPT slide 4-5

Instruction

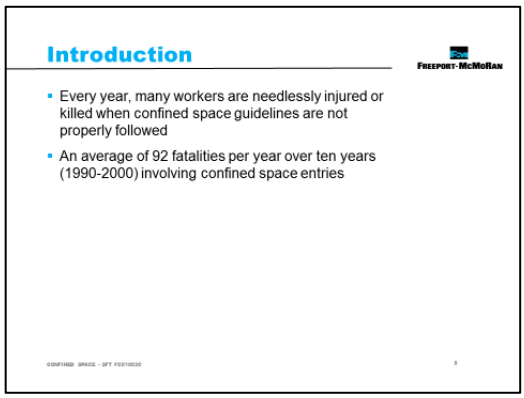
- Before beginning the next slide:
  - **Ask students what they would like to get out of this course and record their responses on a flip chart.**
  - This gives the facilitator insight into what the students would like out of the course and helps guide the facilitators focus while teaching.
- Show the objectives for each module.
  - Tie each recorded response to the course objectives (even if it is a vague connection).
  - This shows students their ideas help direct the course.





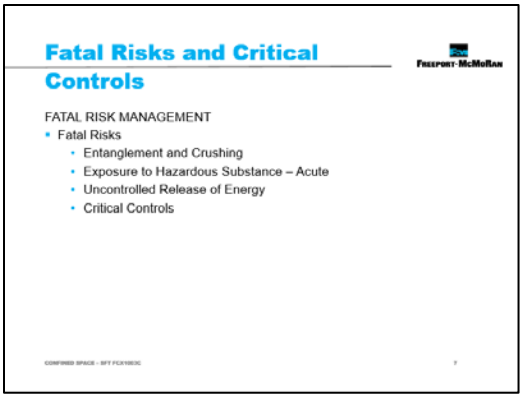
PPT slide 6, SG page vii

Instruction



- Read the statistic with the class.
- Many workplaces contain areas which are defined as “confined” due to the constraints that limit the employee’s ability to enter, exit, or perform their job.
- In addition, confined spaces may be more difficult to evacuate in an emergency, or they can make access to life-saving equipment more difficult.
- The words “confined space” should trigger a concern for added caution whenever any activity or task is performed.
- We should all have the necessary knowledge and skills to recognize the hazards and select the safe work practices necessary to deal with these hazards.

PPT slide 7, SG pages viii-ix



Instruction

- Discuss Fatal Risk Management.
- While all risks have a degree of danger, Fatal Risks are those risks that, when left uncontrolled, will kill you.
- After identifying a Fatal Risk, Critical Control(s) are implemented to prevent death or mitigate the consequences of the Fatal Risk. In short, Critical Controls help keep you from being killed.
- The Fatal Risk(s) and Critical Controls relevant to this course are provided below.
    - Entanglement and Crushing
    - Exposure to Hazardous Substances-Acute
    - Uncontrolled Release of Energy
    - Follow your site's procedures for identifying and controlling risks involved with the specific task you are performing.
    - Discuss site specific Fatal Risk Management and Critical Controls.

MODULE 1: EVALUATING A CONFINED SPACE

This module contains introductory information about the criteria needed to categorize a space as a confined space, the difference between a permit-required confined space and a non-permit required confined space, and the basic roles of an entry team.

LEARNING OBJECTIVES

Upon completion of this module, students will be able to:

- Categorize confined spaces, based on the criteria.
- Analyze the characteristics of a permit-required confined space.

ACTIVITIES

The facilitator should not do all of the activities. This module has two learning objectives and three activities have been developed for each learning objective. The facilitator presents all of the PPT slides for this module and reinforces the content by choosing two activities (one activity for each learning objective). Pick the activities that are most appropriate for your students and site.

Note: Activity 2: Guess the Space, Activity 3: On the Fence, or Activity 4: Flash Cards may be used as activities after presenting the module's PPT slides or used in place of slide 11. If an activity is replacing the slide, make sure all talking points on slide 11 are discussed according to the level needed by the students/site while completing the activity.

Activity 5: Twenty Questions, Activity 6: PRCS vs NPRCS, Activity 7: Face-off can be used after presenting the module's PPT slides or used in place of slide 8. If an activity is replacing the slide, make sure all talking points on slide 12 are discussed according to the level needed by the students/site while completing the activity.

- First learning objective
  - Activity 2: Guess the Space
  - Activity 3: On the Fence
  - Activity 4: Flash Cards
- Second learning objective
  - Activity 5: Twenty Questions
  - Activity 6: PRCS vs NPRCS
  - Activity 7: Face-Off
- **Confined Space Policy FCX-HS05, Technical Supplement and Confined Space Entry Permit copies, FG pp.109-114. (One per student)**

TOTAL TEACHING TIME

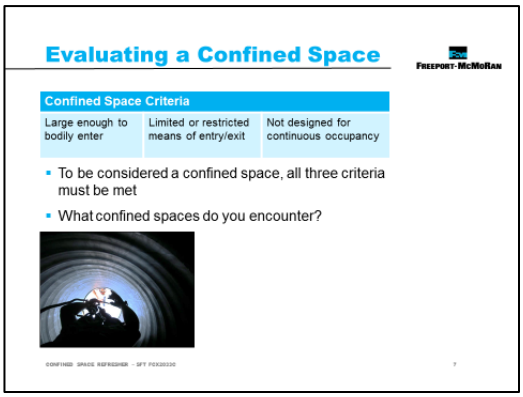
This module takes approximately 15 minutes to complete.

PPT slide 8

Instruction

- Upon completion of this module, the students will be able to:
  - Categorize confined spaces based on the three criteria.
  - Analyze the characteristics of a permit-required confined space.

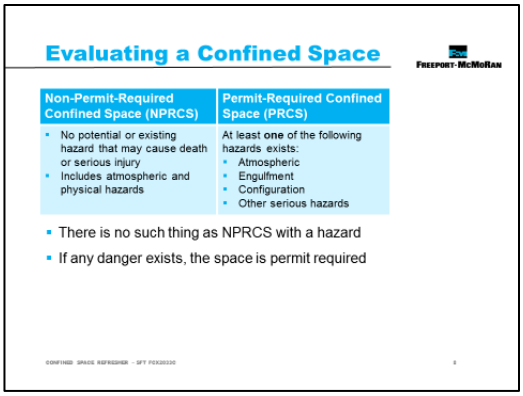
PPT slide 9



Instruction

- All three criteria listed must be met to be considered a confined space.
- **Refer to the Confined Space Policy FCX-HS05 (FG page 21-22) while progressing through this slide.**
- **Ask students to interpret what each criteria means then review the criteria below.**
  - Large enough to enter guideline:
    - Once any portion of the body crosses the plane of the space, entry has occurred.
  - Limited or restricted means of entry/exit includes:
    - When the entrant's ability to escape or be rescued is hindered.
    - When the entrant must bend, stoop, crawl, or climb to access the space.
    - An area with two exits where both are hard to get through or one is blocked by construction/debris.
  - Not designed for continuous occupancy guidelines:
    - The presence of a door does not eliminate the space as a confined space.
    - Spaces designed for continuous occupancy include offices and walkways.
- **Ask students what confined spaces they encounter in their specific work areas.**
- Each site inventories and labels all recognized confined spaces.
- Some confined spaces may not be formally recognized or signs may be damaged, faded, or missing so students need to be able to recognize a confined space.
- Contact a supervisor, management, or a Health and Safety Professional when a confined space is discovered or suspected.

PPT slide 10



Instruction

- Review the conditions that make up a NPRCS.
- Review the conditions that make up a PRCS.
- **Refer to the Confined Space Policy FCX-HS05 (FG page 21-22) while progressing through this slide.**
- Only one of the following is needed to be a PRCS:
    - Contains or has potential to contain a hazardous atmosphere,
    - Contains material with the potential to engulf an entrant, or
    - Has an internal configuration that could trap or asphyxiate an entrant (i.e. inwardly converging walls or floor sloping down that tapers to a smaller area)
    - Contains other serious safety or health hazards.
- Each hazard will be explained in depth in the next module.

FREEPORT-McMoRan

Confined Space Policy

Health and Safety FCX-HS05 |Version 1 | Release 03/2018

POTENTIAL FATAL RISKS

Exposure to Hazardous Substances
Entanglement and Crushing
Uncontrolled Release of Energy

CRITICAL CONTROLS

Atmospheric Monitoring
Ventilation
Energy Isolation
Entry Permit Execution

A Confined Space is a space that meets all three of the below conditions:

1. Is large enough and so configured that a person can enter with their whole body and perform their assigned work
2. Has a limited or restricted means of entering and exiting (a configuration that would impede a person ability to self-rescue)
3. Is not designed for continuous occupancy (i.e. an individual could not occupy the space during normal operating conditions)

TRAINING REQUIREMENTS

Awareness Training for all employees
Initial Training
Annual Refresher Training
Remedial Training as required

POLICY

OVERVIEW

The Confined Space Policy establishes the requirements and performance standards needed to protect employees and contractors from hazards associated with confined space and to safely enter to perform work in confined spaces.

Permit Required Confined Spaces (PRCS) are confined spaces that have one or more of the following characteristics:

1. Contains or has the potential of containing a hazardous atmosphere
2. Contains a material that has the potential for engulfing an entrant
3. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section
4. Contains any other recognized serious safety or health hazard

NOTE: Permits are valid only for as long as it takes to complete the task, but not more than one shift.

ACTIONS TO STAY SAFE

The following requirements must be met when FCX employees or contractors are entering confined spaces on FCX properties:

- Evaluate confined space using the permit to determine if the space is a permit required confined space, retain documentation
- Verify, understand and abide by Confined Space Permit requirements
- Monitor atmospheric condition periodically throughout the entry
- Entrant(s) have the right to observe pre-entry atmospheric test
- Identify and control the hazards within the confined space
- Use proper ventilation
- Understand and abide by assigned roles and responsibilities of confined space entry team
- Establish a communication process with entrant(s)
- Evacuate space immediately at established alarm condition, atmospheric monitor failure, or any uncontrolled/unanticipated change in condition

A confined space entry team is the group of individuals assigned to complete a task within a confined space. A typical entry team consists of three roles: entrant, attendant, and entry supervisor. For any Permit Required Confined Space (PRCS) entry, a minimum of two individuals are necessary. These individuals will be classified as either the:

- Entrant (individual entering the confined space)
- Attendant (the individual staying outside and monitoring the confined space)

A person will also be designated as the entry supervisor (the attendant may serve as the entry supervisor, but the supervisor may never serve as the entrant) and will be responsible for the confined space entry and ensuring that all safety precautions have been met.

Regardless of the role, all entry team members, attendants, entrants and entry supervisors, must:

Responsibilities and Duties of the Entry Supervisor:

- Define all Risks and Controls
- Establish in writing all acceptable entry conditions
- Conduct a pre-entry meeting with all confined space team members
- Ensure that the atmospheric tests is conducted and recorded
  - To classify the space
  - Conducted immediately prior to entry
  - Continued throughout the entry if required
- Ensure all members have been trained in Confined Space entry
- Ensure that rescue services are notified and available, and that the means for summoning them are operable
- Ensure acceptable entry conditions are in place before anyone enters the space and that conditions remain safe throughout the entry
- Maintain the confined space permit:
  - Authorize entry by signing the entry permit after all conditions for safe entry have been met
  - Post the completed, signed permit at the entrance to the space
  - Terminate the entry and cancel the permit when entry operations are complete or when uncontrolled hazards arise in or near the permit space
  - File the original canceled permit with the appropriate department
- If hazardous conditions arise that are Immediately Dangerous to Life and Health (IDLH), immediately evacuate the space

Responsibilities and Duties of the Attendant:

- Control access to the PRCS:
  - Maintain an accurate count of entrants
  - Do not allow unauthorized entry
- Communicate with the authorized entrants
- Monitor entrant(s) activities and conditions
- Maintain retrieval lines/system
- Stop work and evacuate the space if:
  - A non-acceptable entry condition occurs
  - Behavior changes in the entrant(s)
  - Outside conditions arise that may endanger the entry team
  - The air monitor alarms
  - Any new or uncontrolled hazards are introduced
- Manage emergencies
- Attendant may not perform any other duties

Responsibilities and Duties of the Entrant(s):

- Communicate with the Attendant
- Inspect for hazards within the space
- Stop work and evacuate the space if:
  - Air monitor alarms
  - Air monitor stops functioning normally
  - Uncontrolled hazard is suspected or observed
  - Any entrant experiences signs or symptoms of exposure to hazards
  - Communication link between the entrant and attendant is broken
  - Conditions outside the space threaten the entrants or attendant
  - Attendant calls for an evacuation
- Wear designated PPE

Technical Supplement

Confined Space FCX-HS05 | Rev 6 | Release 03/2018

ATMOSPHERIC TESTING & MONITORING

Atmospheric testing is required for two distinct purposes:

1. Evaluation of the hazards of the permit space; and
2. Verification that acceptable entry conditions for entry into that space exist.

Air monitoring equipment will be selected by a qualified individual based on the hazards of the entry. As the monitor's sensors are gas specific, these determinations must be documented with area SOPs/Risk Registers/HIRADC/JSA. Calibration will be performed per the manufacturer's specifications and records will be kept according to the Records Retention Program.

Acceptable Monitoring Levels and Entry Conditions:

- **Oxygen levels**: O_2 levels between 19.5% - 23.5%
  - **Oxygen Deficient** (< 19.5%) is considered hazardous
  - **Oxygen Enriched** (> 23.5%) is considered hazardous
- **Flammable Gases**: Flammable gas concentration less than 10% of the Lower Explosive Limit (LEL) of the flammable gas.
- **Toxicity:** Atmospheric concentration in excess of the occupational exposure limit for any substance that is capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects and which could result in employee exposure in excess of its dose or permissible exposure limit.

Refer to the **FCX IH Field Guide** for more information on exposure limits.

REFERENCES

- 29 CFR 1910.146; Permit-required Confined Spaces
- 29 CFR 1910.146 Appendix B; Procedures for Atmospheric Testing
- 29 CFR 1910.146 Appendix F; Rescue Team or Rescue Service Evaluation Criteria
- 30 CFR 56.16002; Bins, hoppers, silos, tanks, and surge piles
- NSI/ASSE Z117.1-2009; Safety Requirements for Confined Spaces

ADDITIONAL REQUIREMENTS

(1) Evaluation testing. The atmosphere of a confined space should be analyzed using equipment of sufficient sensitivity and specificity to identify and evaluate any hazardous atmospheres that may exist or arise, so that appropriate permit entry procedures can be developed and acceptable entry conditions stipulated for that space. Evaluation and interpretation of these results, and development of the entry procedure, should be performed by, or reviewed by, a technically qualified person based on evaluation of all serious hazards.

(2) Verification testing. The atmosphere of a permit space which may contain a hazardous atmosphere should be tested for residues of all contaminants identified by evaluation testing using permit specified equipment to determine that residual concentrations at the time of testing and entry are within the range of acceptable entry conditions. Results of testing (i.e., actual concentration, etc.) should be recorded on the permit in the space provided adjacent to the stipulated acceptable entry condition.

(3) Duration of testing. Follow manufacturer's recommendations for the duration of time the monitor should remain in place for a complete response, analysis times may vary depending on probe length and flow rate.

(4) Testing stratified atmospheres. When monitoring for entries involving a descent into atmospheres that may be stratified (layered), testing should proceed from the top to the bottom of the space and tested a distance of approximately 4 feet (1.22 m) in the direction of travel and to each side. If a sampling probe is used, the entrant's rate of progress should be reduced to accommodate the sampling speed and detector response.

(5) Order of testing. Test for oxygen first because most combustible gas meters are oxygen dependent and will not provide reliable readings in an oxygen deficient atmosphere. Test for combustible gases next because the threat of fire or explosion is both more immediate and more life threatening, in most cases, than exposure to toxic gases and vapors. If tests for toxic gases and vapors are necessary, they are performed last.

FREEPORT-McMoRan

CONFINED SPACE Entry Permit

DIVISION	**DEPARTMENT**
DATE **TIME**	**SHIFT**
CONFINED SPACE LOCATION	**CONFINED SPACE ID #**
PURPOSE OF ENTRY	**AUTHORIZED DURATION**
ENTRY SUPERVISOR NAME	**SUPERVISOR APPROVAL SIGNATURE**
ENTRY ATTENDANT(S) NAME(S)	
AUTHORIZED ENTRANT(S) NAME(S) (continue over if necessary)	
ROUTINE ☐ **NON-ROUTINE** ☐ **WORKPLACE EXAM COMPLETED** ☐ **SOP/JHS COMPLETE AND REVIEWED** ☐	

STEP 1: HAZARD IDENTIFICATION AND RECOGNITION

EXISTING HAZARDS WITHIN, CONNECTED TO, OR NEAR THE SPACE (hazardous energy, radiation, etc)	**CONTROLS**	**HAZARDS TO BE INTRODUCED TO THE SPACE FROM THE WORK BEING PERFORMED** (welding fumes, noise, dust, hot work, other tasks that require specialized PPE)	**CONTROLS**

STEP 2: ASSESSING THE SPACE

SECTION A: CONFINED SPACE HAZARDS	**YES**	**NO**
Hazardous / Potentially Hazardous Atmosphere		
Sloping or Converging Walls or Floors		
Engulfment / Entrapment		
Any Other Recognized Hazards: (noise, heat, uncontrolled energy source, fall hazards inside the space, radiation, thermal exposure etc) List these hazards and controls in section 2		
If the answer to ALL question above is NO, or can be eliminated: The space may be classified as NON-PERMIT REQUIRED.		
Name:		
Signature:		

SECTION B: INITIAL AIR SAMPLING (around the opening of the space, and at multiple levels within the space)

GAS	**ACCEPTABLE**	**READING**
Oxygen	19.5 – 23.5%	
LEL*	< 10%	
Toxics	< PEL* / TLV* /OEL*	
Other:		
Time of testing		
Date of calibration		
Initials of person taking the sample		
Test instrument and #		

STEP 3: PRE ENTRY PREPARATION AND CONTROLS

EQUIPMENT	**REQUIRED / N/A**	**COMMUNICATION**	**TESTED**
Ventilation Required: YES / NO		Entrant and Attendant Communication Method:	
Type: Duration:			
Retrieval System (Emergency Escape Apparatus)		Supervisor Communication Method:	
Fire Extinguisher			
Intrinsically Safe Equipment		Emergency Response Communication Method:	
LOTOTO			
Flagging and Barricading			

STEP 4: Pre-Entry Air Sampling (Immediately Prior to Entry)				**STEP 5: Pre-Entry Meeting and Review**	
GAS	**ACCEPTABLE**	**READING**		**MEETING/REVIEW**	**INITIALS**
Oxygen	19.5 – 23.5%			Pre Entry Meeting and Review Conducted	
LEL*	< 10%			Acceptable Entry Conditions Have Been Met	
Toxics	< PEL* / TLV* /OEL*				
Other:					
Time of testing		Initials of Tester			

* LEL = Lower Explosive Limit, PEL = Permissible Exposure Limit, TLV = Threshold Limit Value

NOTE: Post completed permit, and any other relevant forms at the entrance to the Confined Space

Post Entry Cancellation of Permit by Confined Space Entry Supervisor: NAME..... SIGN.....

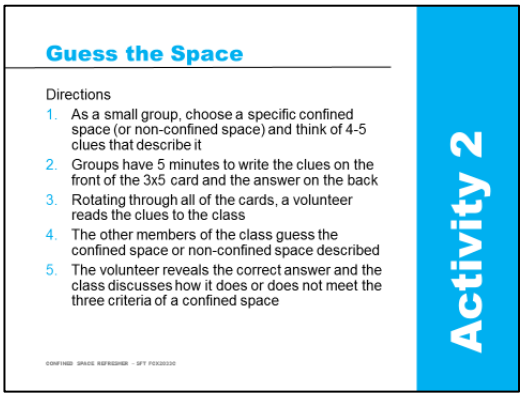
ADDITIONAL MONITORING RECORD										
GAS	**ACCEPTABLE**	**TIME**	**READING**	**INITIALS**	**TIME**	**READING**	**INITIALS**	**TIME**	**READING**	**INITIALS**
Oxygen	19.5 – 23.5%									
LEL*	< 10%									
Toxics	< PEL* / TLV*/OEL*									
Other										

AUTHORIZED ENTRANT(S) NAME(S) (continued from front page)	Time

AUTHORIZED ATTENDANTS (S) NAME(S) (continued from front page)	Time

ACTIVITY 2: GUESS THE SPACE

PPT slide 11



Time

Approximately 15 minutes

Materials

- 3x5 cards (at least 1 per group)
- Pen (at least 1 per group)

Purpose

- This activity gives students the opportunity to classify a space based on the three criteria for a confined space. This is accomplished as students analyze spaces in small groups to choose a confined space (or non-confined space) and then create clues that describe the space. This is further accomplished as students evaluate the clues they hear to identify the confined space described and discuss how each answer meets the three criteria of a confined space.
- **Note: If the facilitator uses this activity in place of the PPT slides rather than as an activity after presenting the module's PPT slides, make sure all talking points provided in the FG are discussed according to the level needed by the students/sites. Talking points are found in the FG alongside the corresponding slides.**

Instruction

1. Break the class into groups of approximately five students.
2. Groups of students choose a specific confined space (or non-confined space) and think of 4-5 clues to describe it.
3. Give the groups 5 minutes to write the clues on the front of a 3x5 card and the answer on the back (If the class is small, have them create a card for more than one confined space or non-confined space).
4. Rotating through all of the cards, have a volunteer read the clues to the entire class.
5. After reading each clue on a card, the other members of the class (except the group who's card is being read) guess the confined space or non-confined space described.
6. The volunteer reveals the correct answer and **the class discusses how it does or does not meet the three criteria of a confined space**.

Examples

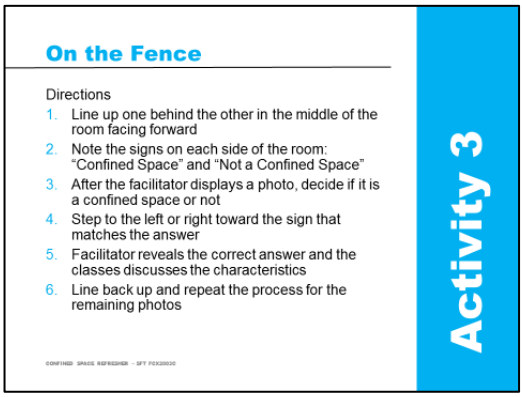
Example	Clues	Answer
1	• Usually kept outside • 10 foot by 10 foot space • Opening is large enough to enter • Used to collect waste	Dumpster (Confined Space)
2	• Used to transport people • Has one entry/exit • Suspended by a cable • Has buttons inside	Elevator (Not a Confined Space)

ACTIVITY 3: ON THE FENCE

PPT slides 12-21

Time

Approximately 10 minutes



Materials

- Confined Space and Not a Confined Space signs, FG p.31-33
- Tape to affix signs to wall

Purpose

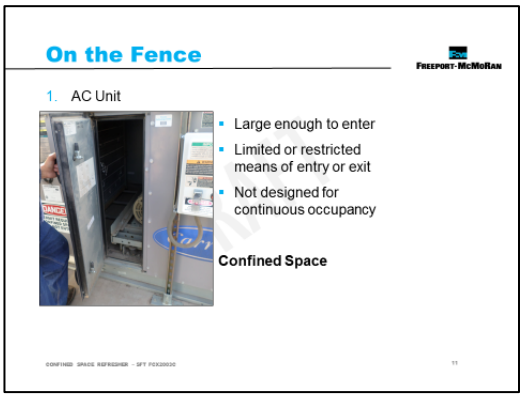
- This activity gives students the opportunity to classify a space based on the three criteria for a confined space. This is accomplished as students decide if the space shown in each photo is a confined space or not a confined space.
- **Note: If the facilitator uses this activity in place of the PPT slides rather than as an activity after presenting the module's PPT slides, make sure all talking points provided in the FG are discussed according to the level needed by the students/sites. Talking points are found in the FG alongside the corresponding slides.**

Instruction

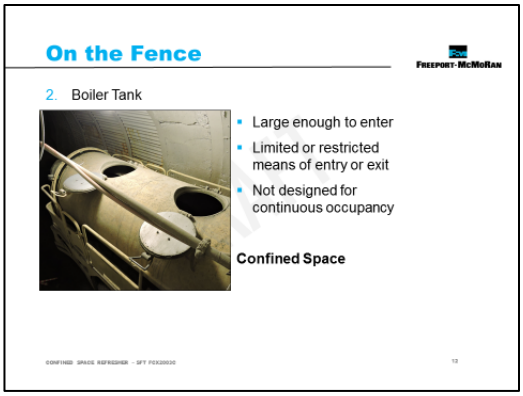
1. Use the two signs on pages 31 and 33 to label one side of the room "Confined Space" and the other "Not a Confined Space".
2. Line students up one behind the other in the middle of the room facing forward.
3. Show students one PPT slide at a time and have them decide if each photo shown is a confined space or not.
4. Tell students to take a step to the left or right toward the sign that matches their answer.
5. Advance through the animations on each slide to **discuss the confined space criteria(s) that is met/not met** and the correct answer.
6. Line students back up and repeat the process for the remaining photos.

Answer Key

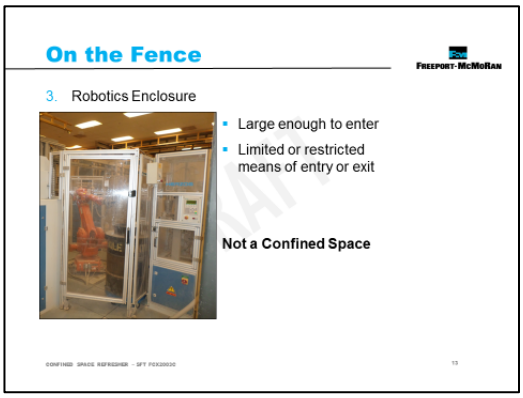
Description	Answer
1. AC Unit	• Confined Space. • Meets all criteria.



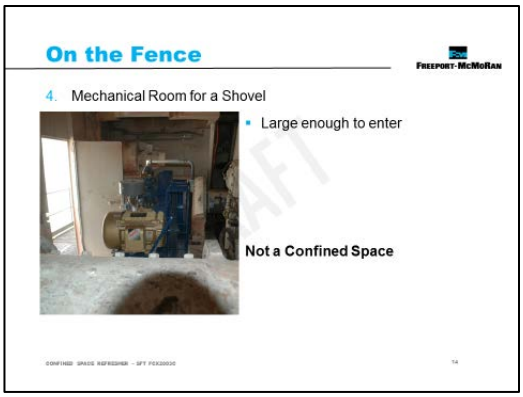
Description	Answer
2. Boiler Tank	• Confined Space. • Meets all criteria.



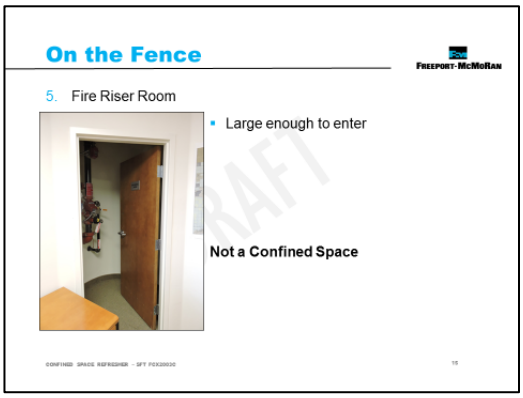
Description	Answer
3. Robotics enclosure	• Not a Confined Space. • The enclosure **is** designed for continuous occupancy. • The enclosure **does not** have limited means of entry or exit.



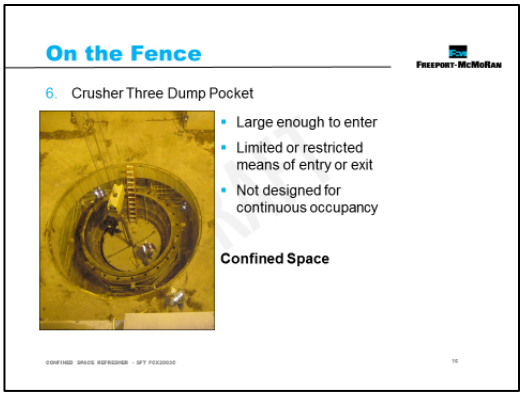
Description	Answer
4. Mechanical room for a shovel	• Not a Confined Space. • Mechanical room **does not** have a limited or restricted means of entry or exit. • Mechanical room **is** designed for continuous human occupancy.



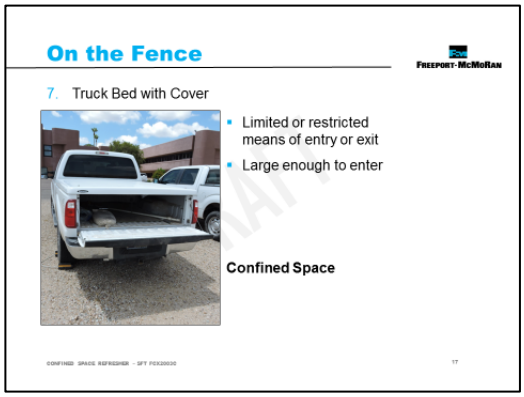
Description	Answer
5. Fire Riser Room	• Not a Confined Space. • This fire riser room **does not** have a limited or restricted means of entry/exit. • This fire riser **is** designed for continuous occupancy.



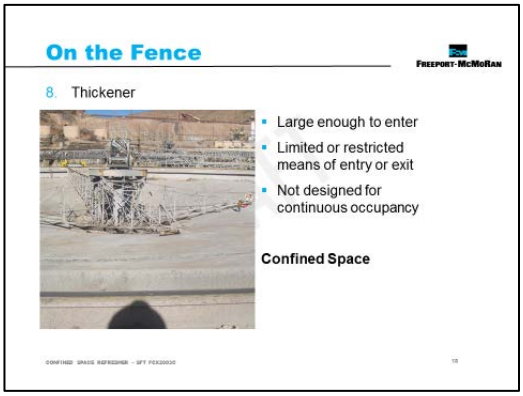
Description	Answer
6. Crusher dump pocket	• Confined Space. • Meets all criteria.



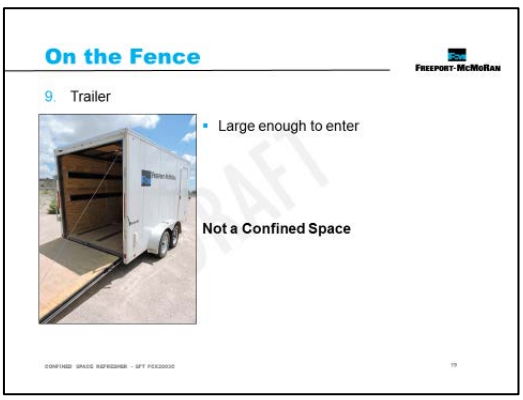
Description	Answer
7. Truck bed with cover	• NPRCS. • Meets all criteria.



Description	Answer
8. Thickener	• Confined Space. • Meets all criteria.



Description	Answer
9. Trailer	• Not a Confined Space • This trailer **does not** have a limited or restricted means entry/exit. • This trailer **is** designed for continuous occupancy.



Confined Space

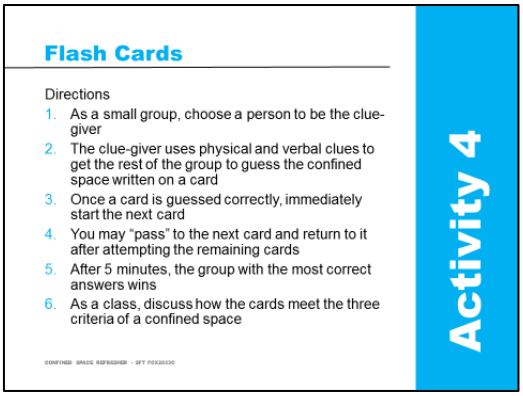
Not a

Confined

Space

ACTIVITY 4: FLASH CARDS

PPT slide 22



Time
Approximately 10 minutes

Materials

- Flash Cards, pp.37-39 (1 copy of all cards for each group, cut cards before class begins)

Purpose

- This activity gives students the opportunity to classify a space based on the three criteria for a confined space. This is accomplished as students evaluate the confined spaces given on the card to create clues to describe the space. The students then discuss how each answer meets the three criteria of a confined space.
- **Note: If the facilitator uses this activity in place of the PPT slides rather than as an activity after presenting the module's PPT slides, make sure all talking points provided in the FG are discussed according to the level needed by the students/sites. Talking points are found in the FG alongside the corresponding slides.**

Instruction

1. Break the class into groups of approximately five students.
2. Give a stack of all the Flash Cards to one person in each group.
3. Each group chooses one person to look at the Flash Cards and be the clue-giver.
4. The clue-giver uses physical and verbal clues to get the rest of the group to guess the confined space written on the card.
5. Once the group guesses correctly, the clue-giver immediately starts the next card.
6. If a group cannot guess the card, they may say "pass" to skip to the next card. Once the remaining cards are attempted, the group may return to any passed cards.
7. Give the group 5 minutes to guess as many of the words as possible.
8. The group with the most correct guesses wins.
9. **As a class, discuss how the cards meet the three criteria of a confined space**.

Note: There are many alternate ways to play this game. Groups can be smaller or larger than the recommended size or the time limit can be longer or shorter. Also, instead of using physical and verbal clues, the clue-giver could draw pictures on a flipchart. Another possibility is to switch the clue-giver after each correct answer. The facilitator should decide what will work best for the students.

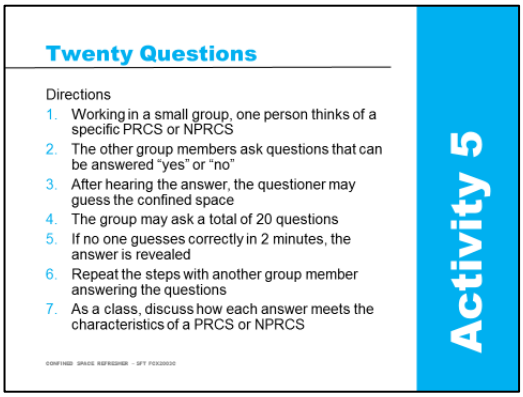
Flash Cards

Sewers	**Furnaces**
Ball mills	**Vaults**
Vats	**Bins**
Ducts	**Boilers**
Manholes	**Dumpsters**
Silos	**SX filters**
Acid tanks	**Ball bins**

Cyclones	**Precipitators**
Thickeners	**Concentrators**
Storage tanks	**Tanker railcar**
Flotation cells	**Open-top tanks**
Crusher chutes	**Dust collectors**
Storage hoppers	**Haul truck tires**

ACTIVITY 5: TWENTY QUESTIONS

PPT slide 23



Time

Approximately 10 minutes

Materials

- None

Purpose

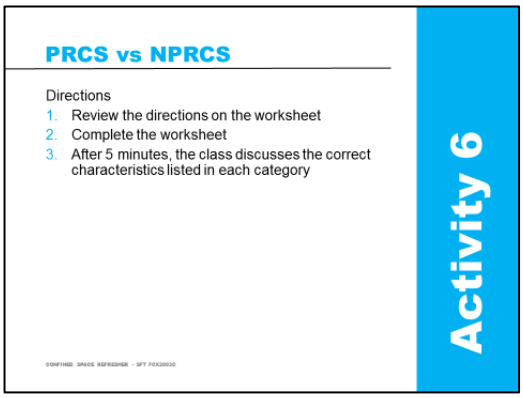
- This activity gives students the opportunity to analyze the characteristics of a PRCS. This is accomplished as students determine an appropriate PRCS or NPRCS for the activity and as they question and evaluate the answers given to identify the correct PRCS or NPRCS.
- **Note: If the facilitator uses this activity in place of the PPT slides rather than as an activity after presenting the module's PPT slides, make sure all talking points provided in the FG are discussed according to the level needed by the students/sites. Talking points are found in the FG alongside the corresponding slides.**

Instruction

1. Break the class into groups of approximately five students.
2. One student in each group thinks of a specific confined space (PRCS or NPRCS)
3. The other students in the group ask questions about the confined space that can be answered with a simple "yes" or "no".
4. After hearing the answer, the questioner is allowed to guess the confined space.
5. If the guess is correct, the questioner now thinks of a new confined space. If the answer is incorrect, the next member of the group asks a yes or no question.
6. The group is allowed to ask a total of twenty questions.
7. If no one guesses correctly in 2 minutes, the student thinking of the confined space reveals the answer.
8. Repeat the steps until all students have had a chance to answer the questions or until time is up.
9. **As a class, discuss the how each answer meets the characteristics of a PRCS or NPRCS**.

ACTIVITY 6: PRCS VS NPRCS

PPT slide 24



Time
Approximately 10 minutes

Materials
- PRCS vs NPRCS worksheet, FG p.43 (1 per student)
- Pen (1 per student)

Purpose
- This activity gives students the opportunity to analyze the characteristics of a PRCS. This is accomplished as students compare and contrast a PRCS and a NPRCS.
- **Note: If the facilitator uses this activity in place of the PPT slides rather than as an activity after presenting the module's PPT slides, make sure all talking points provided in the FG are discussed according to the level needed by the students/sites. Talking points are found in the FG alongside the corresponding slides.**

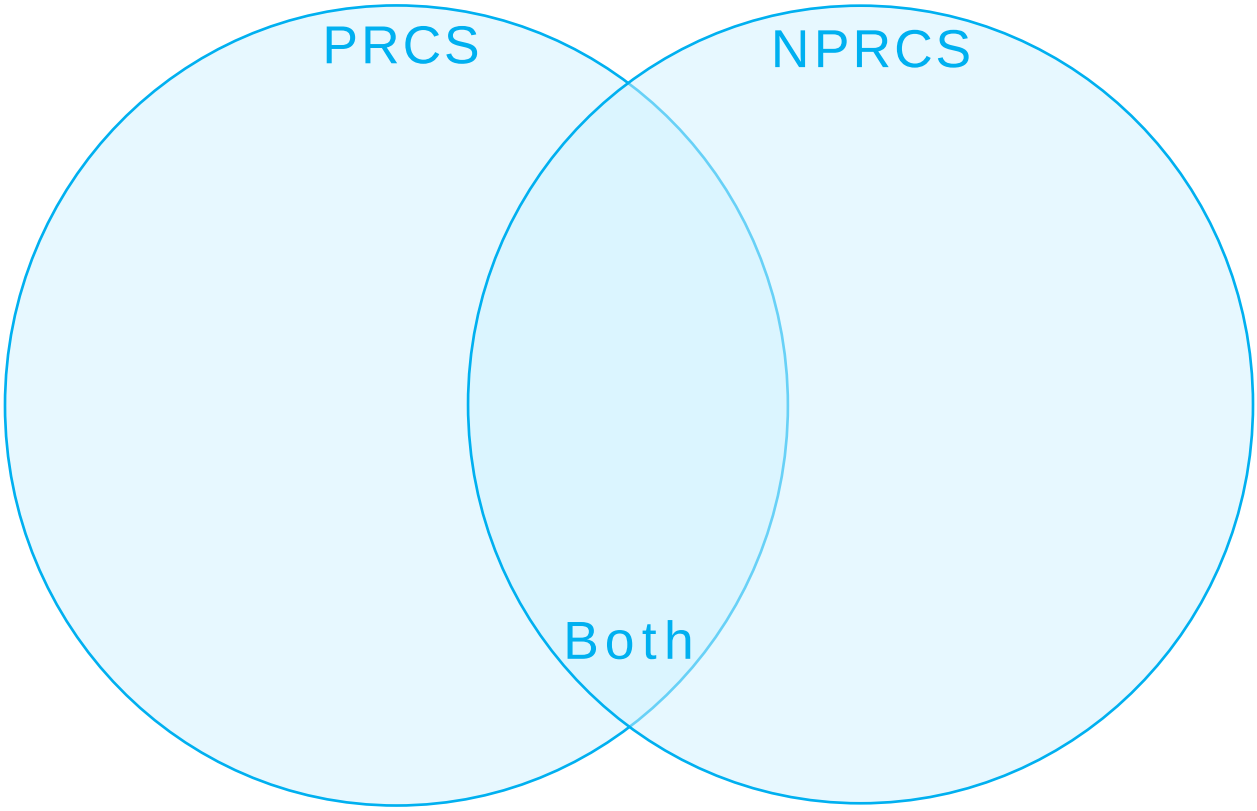
Instruction
1. Give each student a PRCS vs NPRCS worksheet.
2. Review the directions on the worksheet.
    - Use the Venn diagram to chart the similarities/differences between PRCS & NPRCS.
    - Characteristics are assigned a letter in the box at the bottom of the page.
    - Place the letters that describe a PRCS in the circle on the left and those that describe a NPRCS on the right. Letters that describe both belong in the center
3. Give students approximately five minutes to complete individually or as a small group.
4. **As a class, discuss the correct characteristics listed in each category**.

Answer Key

Type	Answers
PRCS	• B – Engulfment hazard • C – Any serious hazard • D – Atmospheric hazard • E – Configuration hazard • J – Hazard that may cause death or serious injury
NPRCS	• A – No physical hazard • F – No atmospheric hazard • K – No potential hazard that may cause death or serious injury • L – No existing hazard that may cause death or serious injury
Both	• G – Large enough to bodily enter • H – Not designed for continuous occupancy • I – Limited or restricted means of entry or exit

PRCS vs NPRCS

Directions:
Use the Venn diagram below to organize the similarities and differences between a PRCS and a NPRCS. Characteristics are assigned a letter in the box at the bottom of the page. Place the letters that describe a PRCS in the circle on the left and those that describe a NPRCS on the right. Letters that describe both belong in the center space.

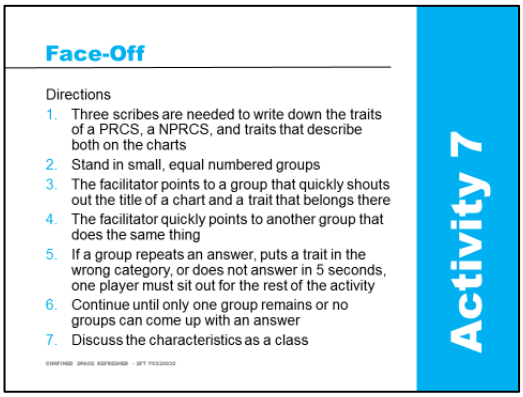


Characteristics

A. No physical hazard
B. Engulfment hazard
C. Any serious hazard
D. Atmospheric hazard
E. Configuration hazard
F. No atmospheric hazard
G. Large enough to bodily enter
H. Not designed for continuous occupancy
I. Limited or restricted means of entry or exit
J. Hazard that may cause death or serious injury
K. No potential hazard capable of causing death or serious injury
L. No existing hazard capable of causing death or serious injury

ACTIVITY 7: FACE-OFF

PPT slide 25

Time
Approximately 10 minutes

Materials

- Markers (3)
- Flipchart paper (3 pieces)

Purpose

- This activity gives students the opportunity to analyze the characteristics of a PRCS. This is accomplished as students work in a group to develop a list of characteristics for a PRCS and a NPRCS.
- **Note: If the facilitator uses this activity in place of the PPT slides rather than as an activity after presenting the module's PPT slides, make sure all talking points provided in the FG are discussed according to the level needed by the students/sites. Talking points are found in the FG alongside the corresponding slides.**

Instruction

1. Write PRCS, NPRCS, and Both each on a separate sheet of flipchart paper and hang the sheets in the front of the room.
2. Have three volunteers act as scribes as the students list identifying traits of a PRCS, identifying traits of a NPRCS, and traits that describe both a PRCS and a NPRCS on the corresponding paper.
3. Break the remaining students into small, equal numbered groups and have each group stand.
4. The facilitator points to a group and the group quickly shouts out the title of any chart and a trait that belongs in that category.
5. The facilitator quickly points to another group that does the same thing
6. If a group fails to shout out an answer within 5 seconds, repeats an answer, or puts an answer in the wrong category, one player must sit down and can no longer help the group.
7. Continue until only one group remains or until no groups can think of additional traits.
8. **Discuss each characteristic listed on the flipcharts pointing out any interesting or vital ideas recorded.**

MODULE 2: PERMIT-REQUIRED CONFINED SPACE HAZARDS

This module contains introductory information about the hazards associated with permit-required confined spaces.

LEARNING OBJECTIVES

Upon completion of this module, students will be able to:

- Evaluate hazards associated with permit-required confined spaces.

ACTIVITIES

The facilitator should not do all of the activities. The facilitator presents all of the PPT slides for this module and reinforces the content by choosing one or two activities. Pick the activities that are most appropriate for your students and site.

Note: Activity 8: PRCS Poster, Activity 10: Hazard Detective, or Activity 12: Around the Room can be used as an activity after presenting the module's PPT slides or to teach the module in place of the PPT slides. If the activity is replacing the module slides, make sure all talking points provided in the FG are discussed according to the level needed by the students/sites. Talking points are found in the FG alongside the slides. Also, the facilitator should demonstrate air monitor use with a site air monitor as appropriate during the activity. If possible, let students practice using air monitors.

- Activity 8: PRCS Poster
- Activity 9: PRCS Summaries
- Activity 10: Hazard Detective
- Activity 11: Around the Room
- Activity 12: PRCS Categories
- **Confined Space Policy FCX-HS05, Technical Supplement and Confined Space Entry Permit copies, FG pp.21-26.**

TOTAL TEACHING TIME

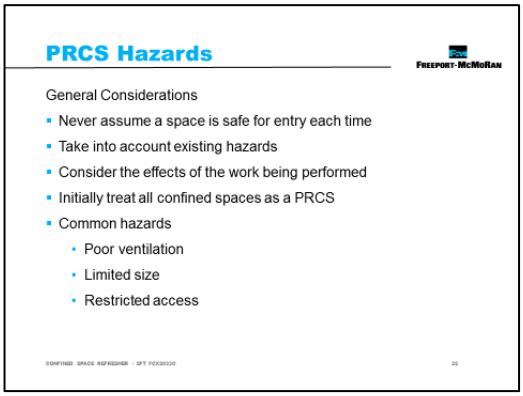
This module takes approximately 20 minutes to complete.

PPT slide 26

Instruction

- Upon completion of this module, the students will be able to:
    - Evaluate hazards associated with permit-required confined spaces.

PPT slide 27



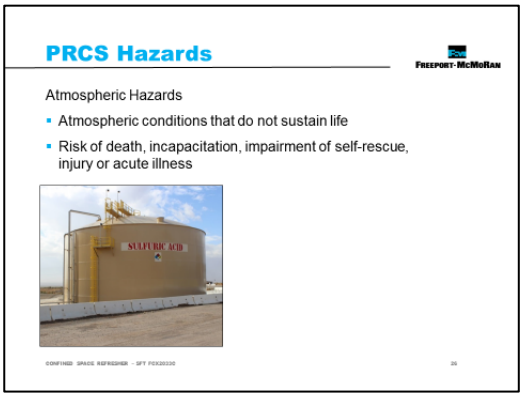
Instruction

- Confined spaces present unique safety challenges because the hazards are not always apparent.
- Review the general considerations on the slide pointing out the following:
    - Poor ventilation
        - Leads to hazardous atmosphere
    - Limited size
        - Closer to hazards
        - Less movement
    - Restricted access
        - Difficult entry and exit
        - Affects timely emergency rescue

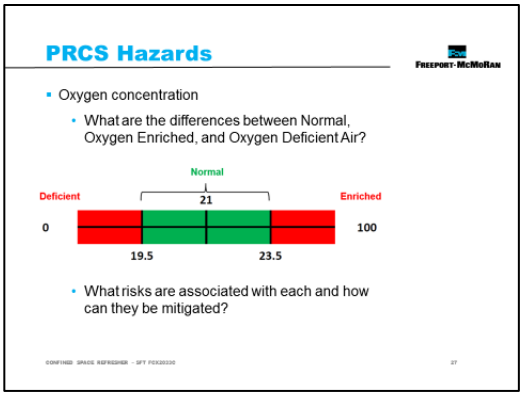
PPT slide 28

Instruction

- Review the slide.
- More specific atmospheric hazards will be discussed on the following slides.
- **Refer to "Step 1 – Hazard Identification and Recognition" on the Confined Space Entry Permit while progressing through this slide.**



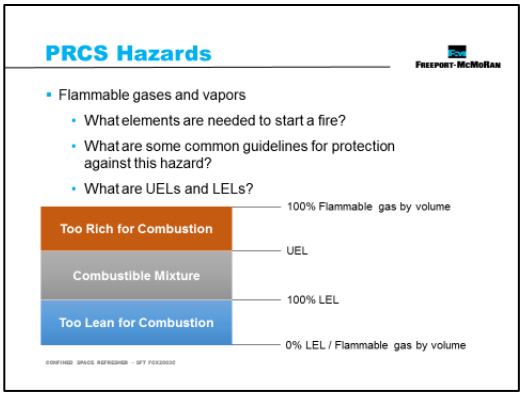
PPT slide 29



Instruction

- **Refer to "Step 1 – Hazard Identification and Recognition" and "Step 2 – Assessing the Space" on the Confined Space Entry Permit while progressing through this slide.**
- **Ask the question and use the chart to discuss the differences between the three types of air.**
    - Normal Air
        - 21% oxygen.
        - 78% nitrogen.
        - 1% other gases including argon, carbon dioxide, and methane.
        - Oxygen levels must stay between 19.5% and 23.5% for a safe atmosphere.
    - Oxygen Enriched Air
        - When oxygen in greater than 23.5%.
        - Not a risk by itself but is prone to accelerated and explosive combustion.
        - Materials not normally a fuel source can become one.
        - Mitigate risk by doing the following:
            - Calmly and carefully evacuate (do not drop metal tools or use electrical equipment).
            - Remove welding lines when taking a break from the space.
            - Never bring compressed gas in a space (except breathing air).
            - Never ventilate with pure oxygen.
    - Oxygen Deficient Air
        - When oxygen is less than 19.5%.
        - Person cannot breathe and suffocates (even without toxic materials present).
        - Consumption – Oxygen is removed from air through usage.
        - Displacement – Oxygen is moved by another gas to a different location.
        - Risks can include accelerated heartbeat, impaired thinking and coordination, convulsive movements, and death.
        - Mitigate risk by leaving the space and notifying supervision.

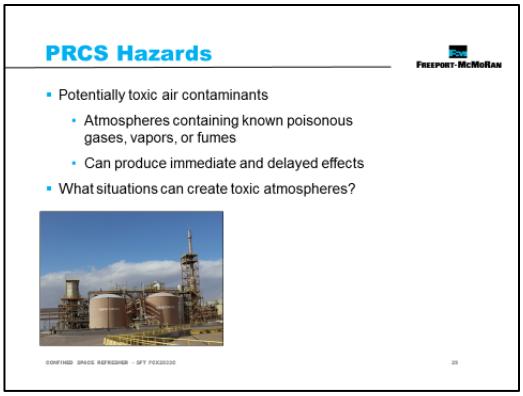
PPT slide 30



Instruction

- **Refer to "Step 1 – Hazard Identification and Recognition" and "Step 2 – Assessing the Space" on the Confined Space Entry Permit while progressing through this slide.**
- **Ask the question and discuss the elements needed to start a fire.**
  - Heat (ignition source)
  - Fuel (combustible gas such as methane or acetylene, or vapors of solvents/fuels such as gasoline, kerosene, or toluene)
  - Oxygen
  - Chemical Reaction
- **Ask the question and discuss common guidelines for protection against this hazard.**
  - Follow appropriate Hot Work procedures and guidelines.
  - Prohibit tanks/cylinders of compressed gases (other than breathing air) in confined spaces.
  - Only use welding leads, cutting torch hoses, hose extensions, etc. when required and remove from the space when not in use.
- **Ask the question and discuss the differences between LELs and UELs.**
  - Lower Explosive Limit (LEL)
    - Lowest concentration (air-fuel mixture) at which a gas ignites.
    - Precautionary standard – remain below 10%.
    - Below this limit, mixtures are too lean to burn.
  - Upper Explosive Limit (UEL)
    - Highest concentration at which a gas ignites.
    - Above this limit, mixtures are too rich to burn.

PPT slide 31



Instruction

- **Refer to "Step 1 – Hazard Identification and Recognition" and "Step 2 – Assessing the Space" on the Confined Space Entry Permit while progressing through this slide.**
- Review the slide.
- **Ask the question and discuss situations that can create toxic atmospheres**. Examples are provided below.
    - Toxic products stored in the space.
        - Absorbed into vessel walls and released when work is performed.
        - Example – removing sludge or crust.
    - Areas adjacent to the space.
        - Toxins produced can enter/accumulate in a confined space
        - Example – engines producing carbon monoxide.
    - Type of work being performed.
        - Vapors can build up to toxic or explosive levels.
        - Examples – welding, cutting, brazing, painting, scraping, sanding, using cleaning solvents

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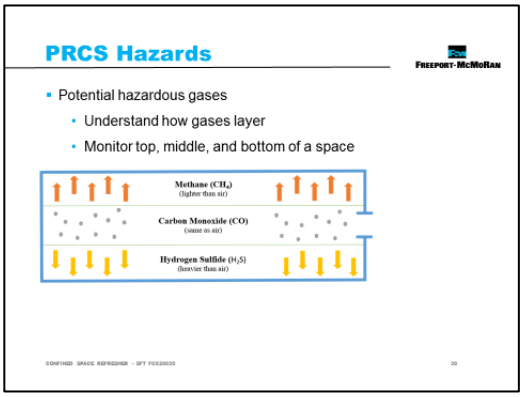
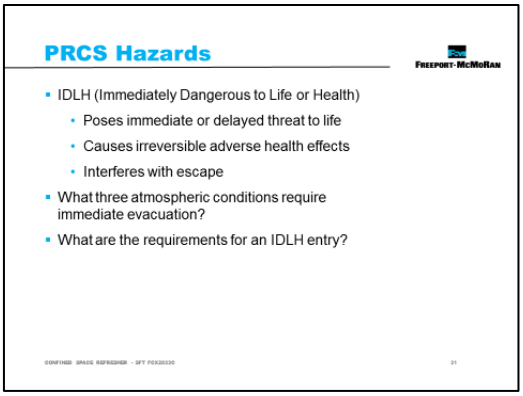
PPT slide 32



Instruction

- These are three examples of hazardous gases found in confined spaces.
- Gas type effects how it mixes with normal air.
- Methane
    - Lighter than air.
    - Can gather at the top of a space.
    - Displaces oxygen resulting in oxygen deficient atmosphere.
    - Causes dizziness, unconsciousness, and asphyxiation.
- Carbon Monoxide
    - Mixes evenly with normal air.
    - Prevents oxygen absorption in the blood stream.
    - Causes dizziness, unconsciousness, asphyxiation, and death.
- Hydrogen Sulfide (H_2S)
    - Heavier then air and settles at the bottom of a space.
    - Byproduct from some Molybdenum and Mill processes.
    - Blocks respiration causing odor fatigue, rapid loss of consciousness, and death.
- Though not necessarily toxic, all other hydrocarbon gases and vapors (exception being methane) are heavier than air. Examples include, propane, butane, acetylene, gasoline vapors)
- Test top, middle, and bottom of spaces.

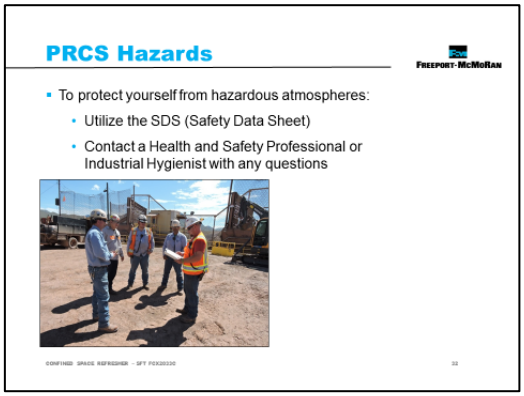
PPT slide 33



Instruction

- IDLH spaces should not be entered except by properly trained and equipped emergency personnel or when entry is specifically required to follow detailed procedures.
- **Ask the first question and discuss the conditions requiring immediate evacuation:**
    - There is an oxygen rich/deficient atmosphere
    - LEL/LFL (Lower explosive or flammable limit) is greater than 10%
    - Toxic gases reach the IDLH limits found in the following locations:
        - Safety Data Sheets (SDS) and Health and Safety (H&S)
        - Regulatory agencies
        - U.S. National Institutes of Occupational Safety (NIOSH) online Pocket Guide to Chemical Hazards
- If IDLH is discovered, immediately evacuate and evaluate.
- Re-entry can occur after the source of the hazard is identified and controlled.
- **Ask the second question and discuss the requirements for IDLH entry:**
    - Use intrinsically safe electrical equipment.
    - Use respiratory protection.
    - Station one or more trained attendants outside the space.
    - Maintain visual, voice, or signal communication between entrants and attendants.
    - Station a rescue team immediately outside the space.

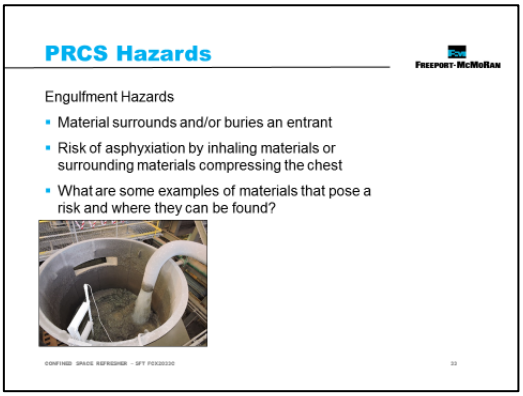
PPT slide 34



Instruction

- Read product labels and use SDSs to:
    - Determine appropriate PPE.
    - Understand the exposure symptoms of the chemicals being used or generated such as carbon monoxide, sulfur dioxide, hydrogen sulfide, and residue remaining in vessels.
    - Know what emits dangerous fumes such as cleaning solvents, epoxies, and paint.

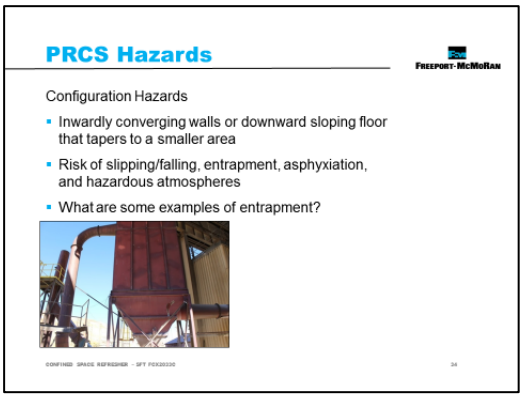
PPT slide 35



Instruction

- **Refer to "Step 1 – Hazard Identification and Recognition" and "Step 2 – Assessing the Space" on the Confined Space Entry Permit while progressing through this slide.**
- One of the leading causes of death from physical hazards.
- Material can move quickly and unexpectedly as it is drawn in a funnel-shaped path down the outlet.
- Compression can lead to strangulation, and constriction/crushing.
- **Ask the question and discuss examples of materials that pose a risk (such as sand, gravel, dust, grain, and water), and where they can be found.**
- Mitigate risk by:
  - Releasing material through lines (Disconnect, blank, or double block and bleed).
  - Build sufficient retaining walls for trenching and excavating.

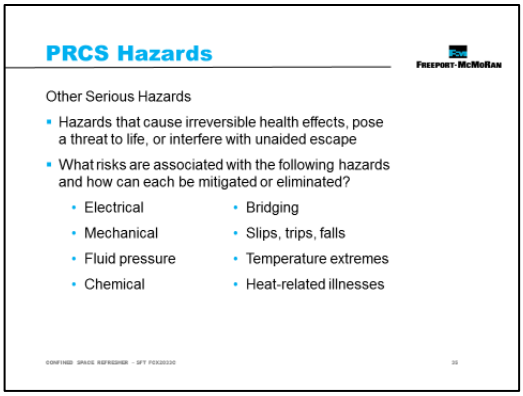
PPT slide 36



Instruction

- **Refer to "Step 1 – Hazard Identification and Recognition" and "Step 2 – Assessing the Space" on the Confined Space Entry Permit while progressing through this slide.**
- Employees could fall and be trapped by the inwardly converging walls resulting in suffocation due to pressure on the upper torso.
- **Ask the question and discuss examples of entrapment hazards.** Usually fall into one of three categories below:
  - Cone trap
    - Found at the bottom of cyclones and precipitators.
  - Cylinder trap
    - A pipe or similar opening big enough to fall in at the bottom of a space.
    - Example – a pipe leading to an elevated water tower.
  - Wedge trap
    - Converging walls that entrap someone who falls in.
    - Example – commonly found in bins, large boilers, and sand hoppers.
- Examples of where other configuration hazards are found – dust collectors, thickeners, flotation cells/tanks, feed chutes, ball bins, sumps large enough to enter.

PPT slide 37



Instruction

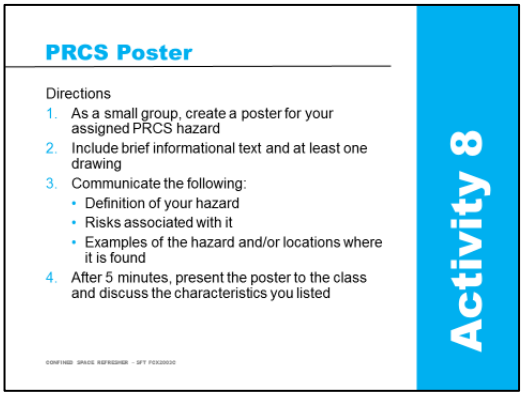
- Review the definition of other serious hazards.
- **Refer to "Step 1 – Hazard Identification and Recognition" and "Step 2 – Assessing the Space" on the Confined Space Entry Permit while progressing through this slide.**
- **Ask the question and discuss risks associated with the hazards and how each can be mitigated.**
- Electrical
  - Electrical vaults and structures (especially areas below ground) with poor air quality.
  - Electric power tools – inadequate grounding system, no GFCI, or low-voltage.
  - Mitigate hazards by following LOTOTO procedures.
- Mechanical
  - Can be struck by moving parts such as agitators, pumps, and conveyors
  - Mitigate hazards by following LOTOTO procedures.
- Fluid pressure
  - Create the potential for drowning and chemical exposure.
  - Mitigate hazards by following LOTOTO procedures.
- Chemical
  - Residual material & cleaning solutions can cause chemical reactions/volatilization
- Bridging
  - Hollow space beneath the surface may collapse.
  - Storage vessel size and amount of moisture contribute to bridging.
  - Mitigate hazards by using safety lines, solving problems remotely, and evaluating/ removing potential hazards before continuing.
- Slips, trips, and falls
  - Injury or death may occur when employees fall or something falls on him/her.
  - Follow FMI's Open Hole, Flagging/Barricading, and Working at Heights policies.
  - Mitigate hazards with adequate lighting, good housekeeping (no wet, oily, or greasy surfaces), and proper inspection of equipment, hoses, and internal structures.
- Temperature extremes
  - Environmental and man-made heat and cold
  - Examples – cold reducing hand mobility and the risk of steam.
- Heat-related illnesses
  - Jobs become more dangerous in the heat and/or humidity of summer.
  - Examples – heat rash, heat cramps, heat exhaustion, or heat stroke
  - Mitigate hazards by staying in the best possible health, acclimatizing, working at a steady pace, replenishing water and electrolytes before feeling thirsty, monitoring self and others, and acting quickly when symptoms appear.

Break

- We recommend taking a 5-10 minute break after the activities for this module are completed. Give students time to stand up, stretch, use the facilities, etc. Clearly communicate what time you expect them to return to start the next module.

ACTIVITY 8: PRCS POSTER

PPT slide 38



Time

Approximately 15 minutes

Materials

- A variety of markers
- Flipchart paper (1 per group)

Purpose

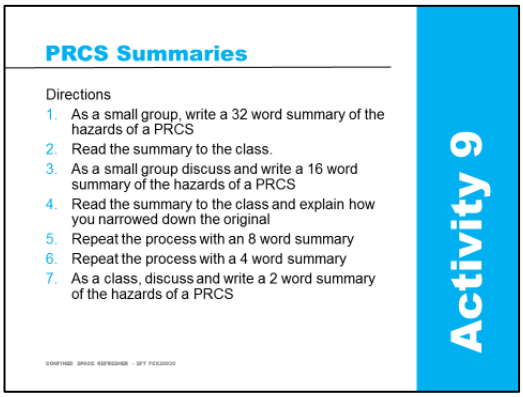
- This activity gives students the opportunity to evaluate hazards associated with permit-required confined spaces. This is accomplished by having students create a poster that communicates the hazards of a PRCS.
- **Note: If the facilitator uses this activity in place of the PPT slides rather than as an activity after presenting the module's PPT slides, make sure all talking points provided in the FG are discussed according to the level needed by the students/sites. Talking points are found in the FG alongside the corresponding slides.**

Instruction

1. Break the class into groups of approximately five students. Create at least four groups.
2. Give each group some markers and a piece of flipchart paper.
3. Assign each group one of the hazards of a PRCS. If there are more than four groups, more than one group may be assigned the same hazard.
    - Atmospheric
    - Engulfment
    - Configuration
    - Other serious hazards
4. **Groups discuss their assigned hazard** and create an informational poster on the hazard that includes at least one drawing with text and communicates the following:
    - Definition of the hazard
    - Risks associated with it
    - Examples of the hazard and/or locations where it is found
5. After 5 minutes, each group presents their poster to the class **discussing the characteristics on the poster.**

ACTIVITY 9: PRCS SUMMARIES

PPT slide 39



Time
Approximately 15 minutes

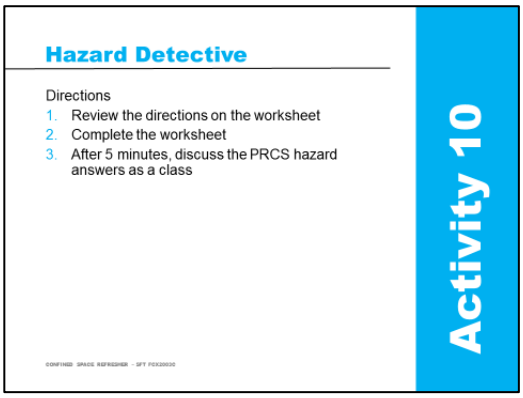
Materials
- Writing paper (1 per group)
- Pen

Purpose
- This activity gives students the opportunity to evaluate hazards associated with permit-required confined spaces. This is accomplished by having students create written summaries of the hazards of a PRCS.

Instruction
1. Break the class into groups of approximately five students.
2. **Groups of students work together to discuss their combined understanding of the hazards of a PRCS and write a 32 word summary of the topic**.
3. After 3 minutes, each group reads their summary to the class.
4. **Working in the small groups, students create a 16 word summary for the same topic by discussing what is most important**.
5. After 2 minutes, each group reads their summary to the class and explains how they narrowed down their original summary.
6. **Working in the small groups, students create an 8 word summary for the same topic by discussing what is most important**.
7. After 1 minute, each group reads their summary to the class and explains how they narrowed down their original summary.
8. **Working in the small groups, students create a 4 word summary for the same topic by discussing what is most important**.
9. After 30 seconds, each group reads their summary to the class and explains how they narrowed down their original summary.
10. **As a class, discuss and come up with a two word summary for the hazards of a PRCS**.

ACTIVITY 10: HAZARD DETECTIVE

PPT slide 40



Time
Approximately 10 minutes

Materials

- Hazard Detective worksheet, FG pp.57-58 (1 per student)
- Pen (1 per student)

Purpose

- This activity gives students the opportunity to evaluate hazards associated with permit-required confined spaces. This is accomplished as students discuss and write about the hazards shown in several photos of PRCSs.
- **Note:** If the facilitator uses this activity in place of the PPT slides rather than as an activity after presenting the module's PPT slides, make sure all talking points provided in the FG are discussed according to the level needed by the students/sites. Talking points are found in the FG alongside the corresponding slides. Also, the facilitator should demonstrate air monitor use with a site air monitor as appropriate during the activity. If possible, let students practice using air monitors.

Instruction

1. Give each student a Hazard Detective worksheet.
2. Review the directions on the worksheet.
    - Evaluate each photo for potential and existing confined space hazards.
    - Record the hazards you find in the appropriate column.
3. Give students approximately five minutes to complete individually or as a small group.
4. **Discuss the PRCS hazard answers as a class.**

Answer Key

Picture	Hazards
1	• Engulfment • Configuration (Inwardly converging walls) • Other serious hazards – Falls, rescue would be difficult
2	• Atmospheric • Engulfment • Other serious hazards – Limited entry and exit, electrical, chemical
3	• Atmospheric • Engulfment • Other serious hazard – Electrical
4	• Engulfment • Configuration (Inwardly converging walls) • Other serious hazards – Electrical, mechanical, rescue would be difficult

Hazard Detective

Directions:
Evaluate each photo for potential and existing confined space hazards. Record the hazards you find in the appropriate column.

1. 

Hazards

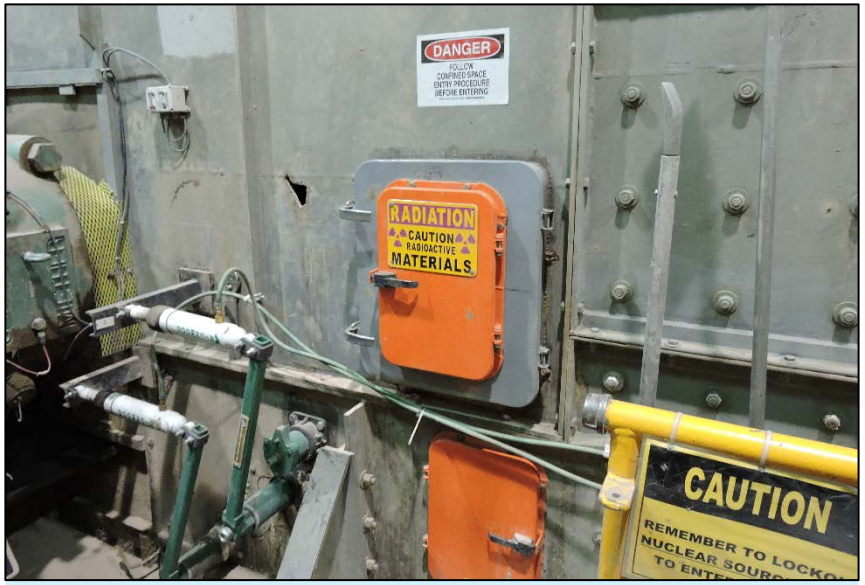
2. 

Hazards

Directions:
Evaluate each photo for potential and existing confined space hazards. Record the hazards you find in the appropriate column.

3. 

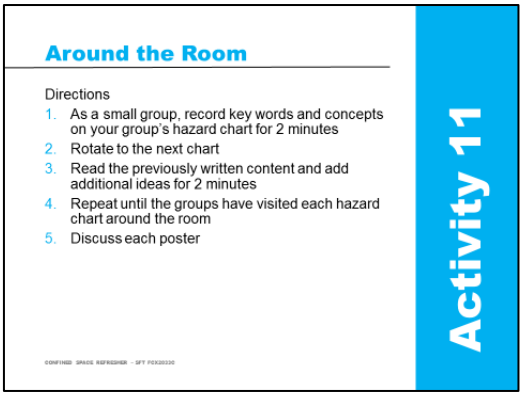
Hazards

4. 

Hazards

ACTIVITY 11: AROUND THE ROOM

PPT slide 41



Time

Approximately 15 minutes

Materials

- Flipchart paper (4 sheets)
- Markers (4)

Purpose

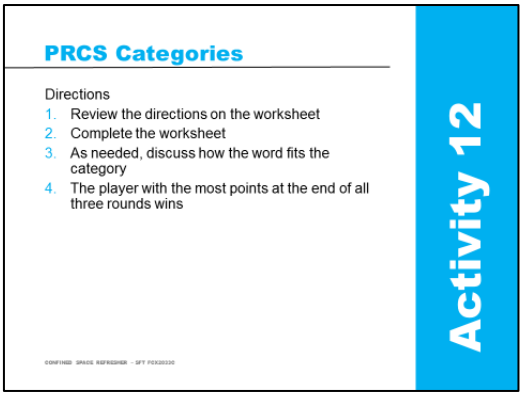
- This activity gives students the opportunity to evaluate hazards associated with permit-required confined spaces. This is accomplished by having students work in groups to discuss and record key words and concepts for each PRCS hazard category.
- **Note: If the facilitator uses this activity in place of the PPT slides rather than as an activity after presenting the module's PPT slides, make sure all talking points provided in the FG are discussed according to the level needed by the students/sites. Talking points are found in the FG alongside the corresponding slides. Also, the facilitator should demonstrate air monitor use with a site air monitor as appropriate during the activity. If possible, let students practice using air monitors.**

Instruction

1. Write each PRCS hazard category (Atmospheric, Engulfment, Configuration, and Other Serious Hazards) on a separate sheet of flipchart paper and hang the sheets in different areas around the room.
2. Break the class into four groups.
3. Station each group at a different hazard flipchart paper with a marker.
4. **Groups have two minutes at each station to discuss and record key words and concepts associated with the hazard at which they are stationed.**
5. Rotate the groups through each station every two minutes. Have them read the previously written content and add additional information.
6. **After visiting all of the stations, discuss each poster as a class pointing out any interesting or vital ideas recorded.**

ACTIVITY 12: PRCS CATEGORIES

PPT slide 42



Time
Approximately 15 minutes

Materials
- PRCS Categories worksheet, FG p.63 (1 per student)
- Pen (1 per student)

Purpose
- This activity gives students the opportunity to evaluate hazards associated with permit-required confined spaces. This is accomplished by having students identify key terms associated with the hazards of a PRCS.

Instruction
1. Break the class into groups of approximately five students.
2. Give each student a PRCS Categories worksheet.
3. Review the directions on the worksheet.
4. Choose and announce a letter before each round of play.
5. Tell players to write one word that begins with that letter and is associated with the appropriate PRCS hazard/category listed.
6. Give students three minutes to write down one word for each category. Tell them to stop writing as soon as the time is up.
7. Have the players take turns reading their answers to their group, crossing out any answers that match another player's.
    - **If necessary, have students explain/discuss how the word fits the category.**
    - Creative answers are allowed but can be challenged. If the answer is challenged, all players vote and the majority rules.
8. Players score one point for each answer not crossed out.
9. Repeat the process with a new letter for each round.
10. The player in each group with the most points at the end of all three rounds wins. It is up to the facilitator if a prize is awarded.

PRCS Categories

Directions:

1. Use the table below that lists several PRCS-related hazard categories.
2. Before each round of play, the facilitator chooses a letter and players write one word that begins with that letter for each category listed.
3. After three minutes, the players take turns reading their answers, crossing out any answers that match another player's.
4. Players score one point for each answer not crossed out.
5. Repeat the process with a new letter for each round.
6. Creative answers are allowed but can be challenged. If the answer is challenged, all players vote and the majority rules.
7. The player with the most points wins.

Category	Round 1	Round 2	Round 3
Atmospheric Hazard			
Normal/Enriched/Deficient Air			
Flammable Gases & Vapors			
IDLH			
Engulfment Hazards			
Configuration Hazards			
Other Serious Hazards			
Electrical Hazards			
Mechanical Hazards			
Chemical Hazards			
Heat-Related Illness Hazards			
PRCS PPE			

MODULE 3: CONTROLLING CONFINED SPACE HAZARDS

This module contains introductory information about the ways confined spaces can be controlled.

LEARNING OBJECTIVES

Upon completion of this module, students will be able to:

- Evaluate the hazards and controls in a confined space.

ACTIVITIES

The facilitator should not do all of the activities. The facilitator presents all of the PPT slides for this module and reinforces the content by choosing one or two activities. Pick the activities that are most appropriate for your students and site.

Note: Activity 15: Find Your Match can be used as an activity after presenting the module's PPT slides or to teach the module in place of the PPT slides. If the activity is replacing the module slides, make sure all talking points provided in the FG are discussed according to the level needed by the students/sites. Talking points are found in the FG alongside the slides. Also, the facilitator should demonstrate air monitor use with a site air monitor as appropriate during the activity. If possible, let students practice using air monitors.

- Activity 13: Team Quiz
- Activity 14: Test the Space
- Activity 15: Find Your Match
- Activity 16: Reflection
- Activity 17: Secure the Scene
- **Confined Space Policy FCX-HS05, Technical Supplement and Confined Space Entry Permit copies, FG pp.21-26.**
- **An air monitor used at your site (Either 1 for the facilitator to demonstrate use OR 1 for the facilitator and 1 per group so students can follow along as facilitator demonstrates use)**

TOTAL TEACHING TIME

This module takes approximately 20 minutes to complete.

PPT slide 43

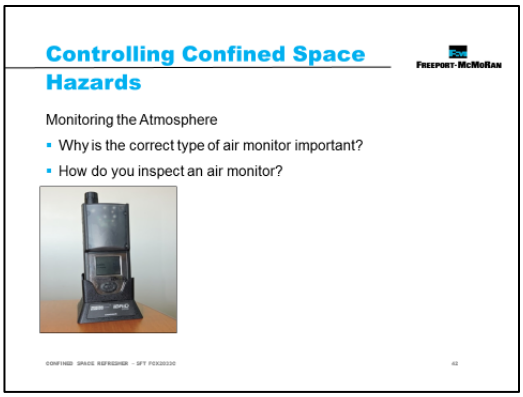
Instruction

- Upon completion of this module, the students will be able to:
  - Evaluate the hazards and controls in a confined space.

PPT slide 44

Materials

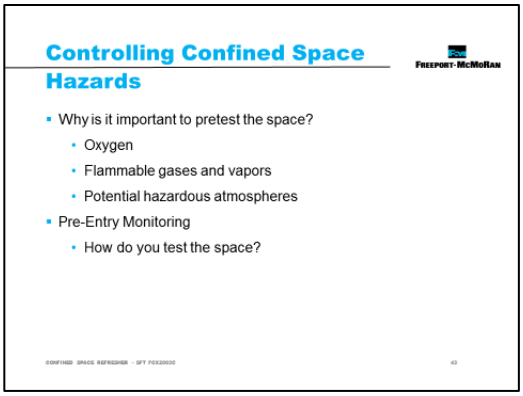
- **Air monitor(s) used at your site (Either 1 for the facilitator to demonstrate OR 1 for the facilitator to demonstrate and 1 per group so students can follow along and practice).**



Instruction

- **Ask the first question and discuss why the correct type of air monitor is important.**
  - Air monitors are designed to detect one or more specific gases.
  - Choose air monitor based on the gases most likely to occur in your workplace.
- **Ask the second question. As each step to the inspection is discussed, use a site air monitor to demonstrate how it is done. If groups have their own air monitors, demonstrate the step then have them practice on their air monitor.**
  - Calibration – Calibrate the monitor monthly and record completion on a sticker.
  - Battery check – Ensure the monitor turns on and the battery is charged.
  - Zero – Confirm all sensors operate at normal levels in non-polluted air.
  - Clear the peaks – Erase history of the previous use to avoid false readings.
  - Bump test – Verify the monitor responds correctly by exposing it to a gas.
- If an air monitor does not function properly or you are not trained/signed-off on a specific air monitor, do not proceed with the work.
- Monitors sound an alarm when a small amount of an atmospheric hazard is detected.
- Speak with a Health and Safety professional if you have questions about the type of air monitor to use, how to use it, or acceptable entry conditions.

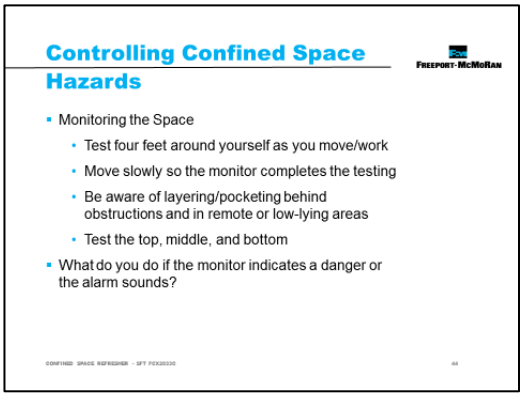
PPT slide 45



Instruction

- **Ask the first question and discuss why it is important to pretest the space.**
  - Oxygen – Most air monitors are oxygen-dependent and do not work correctly in oxygen deficient air.
  - Flammable gases and vapors – Fire and explosion are often more immediate than exposure to toxic vapors/gases
  - Potential hazardous gases – Exercise caution in the environment by knowing the potential materials in the air and their hazards.
- **Refer to "Step 4 – Pre-entry Air Sampling" on the Confined Space Entry Permit while progressing through this slide.**
- **Ask the second question and discuss how you test a space.**
  - Test around the opening then slowly open the access-way while testing.
  - Put a probe in the small cover openings or by cracking open the cover to test several feet in front of you without entering.
  - Gases can also mix very rapidly with slight movement.
  - Test the top, middle, and bottom since gases layer based on their properties.

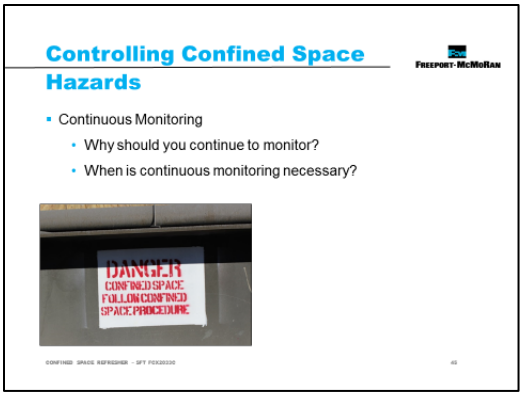
PPT slide 46



Instruction

- Review the guidelines for monitoring a space.
- If work stops for any amount of time, repeat air monitoring procedures before resuming work.
- Re-entry and pre-entry testing are performed the same way.
- **Ask the question and discuss what to do if the monitor indicates a danger or the alarm sounds.**
  - Do not enter the space or evacuate immediately.

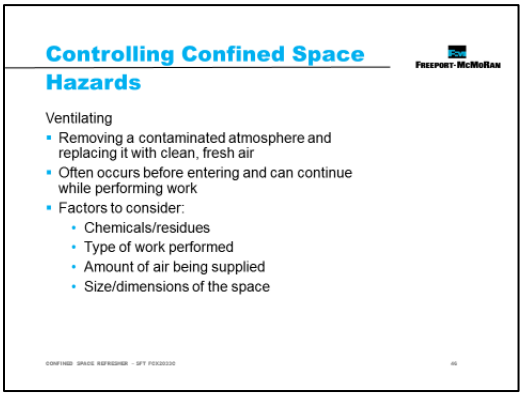
PPT slide 47



Instruction

- **Ask the question and discuss why continuous monitoring is needed.**
  - Atmospheres can change rapidly.
- **Refer to "Step 4 – Pre-entry Air Sampling" on the Confined Space Entry Permit while progressing through this slide.**
- **Ask the question and discuss that continuous monitoring is necessary when atmospheric hazards might:**
  - Not be completely eliminated.
  - Result from the task being performed.
  - Move to the space from nearby activities or processes.
  - Be greater than 10% of the LEL/LFL.
  - Include oxygen rich, oxygen deficient, or toxic air.

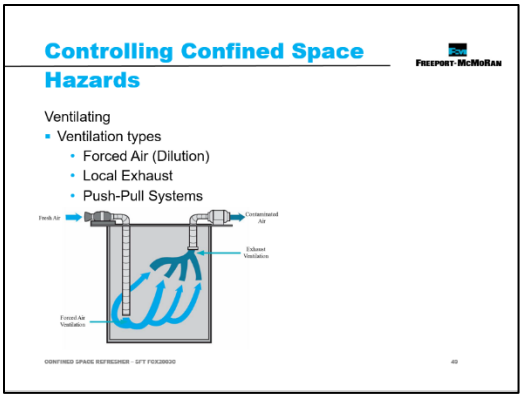
PPT slide 48



Instruction

- Lack of adequate ventilation is a primary reason why confined spaces are hazardous.
- Removing the harmful atmosphere through ventilation is an engineering control.
- New contaminants can enter through a change in conditions or work being performed so ventilation needs to be continuous.
- **Refer to "Step 3 pre-entry Preparation" on the Confined Space Entry Permit while progressing through this slide.**

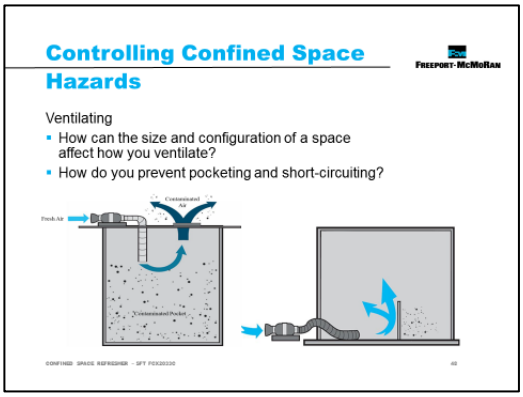
PPT slide 49



Instruction

- Forced Air (Dilution) Ventilation
  - Pushes fresh air into the space using blowers and flexible ducts.
  - Turbulence dislodges pockets of contaminants.
- Local Exhaust Ventilation
  - Pulls air out of the space which removes the contaminants.
  - Intake port must be close to the contaminant and discharged outside of the confined space.
  - Fans that blow air (forced air) 30 feet only pull air (local exhaust) within 1 foot.
- Push-Pull Systems
  - Pushes fresh air into the space and pulls contaminants out.
  - More efficient than using any one system.

PPT slide 50



Instruction

- **Ask the question and discuss how the size and configuration can effect ventilation.**
  - Blow fresh air into one end (top, bottom, sides) of long or deep spaces
  - Allow contaminated air to exhaust out of the other side.
- **Ask the question and discuss how to prevent pocketing and short-circuiting.**
  - Pocketing – Ventilate the space thoroughly so no pockets will be left, and then test the space
  - Short-circuiting – Use a powerful blower to blow clean air into the entire space or a long duct to reach the bottom of the space

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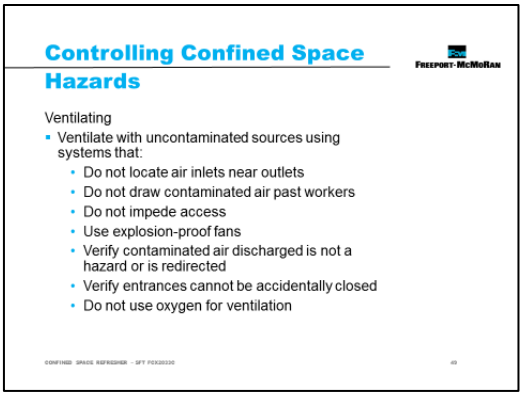
PPT slide 51



Instruction

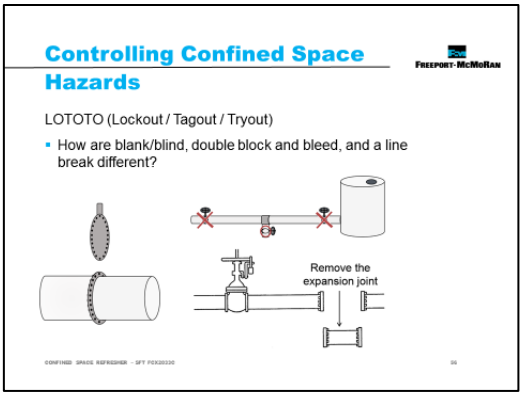
- Review the guidelines for ventilation systems.

PPT slide 52

Instruction

- **Refer to "Step 3 – Pre-Entry Preparation and Controls" on the Confined Space Entry Permit while progressing through this slide.**
- **Ask the question and briefly discuss what LOTOTO is and why it is performed.**
    - Isolate or eliminate all energy sources that can enter a space.
    - De-energize all equipment before performing work
    - Follow Freeport-McMoRan's LOTOTO policy (FCX-04).

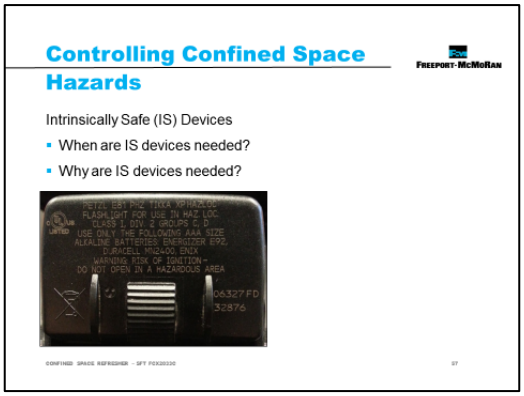
PPT slide 53



Instruction

- **Refer to "Step 3 – Pre-Entry Preparation and Controls" on the Confined Space Entry Permit while progressing through this slide.**
- **Ask the question and discuss how blank/bleed, double block and bleed, and a line break are different.**
  - Each stops material from flowing into the confined space.
  - Blank/bleed (image on left) – Bleeding a pipeline, removing the flange bolts, and putting a block into the line or pipe at the joint.
  - Double block and bleed (image on top right) – Locking closed and draining two in-line valves, locking open a third valve (between the first two).
  - Line break (image on bottom right) – Removing a spool section (expansion joint) of a pipe/duct after LOTOTO has been performed.

PPT slide 54



Instruction

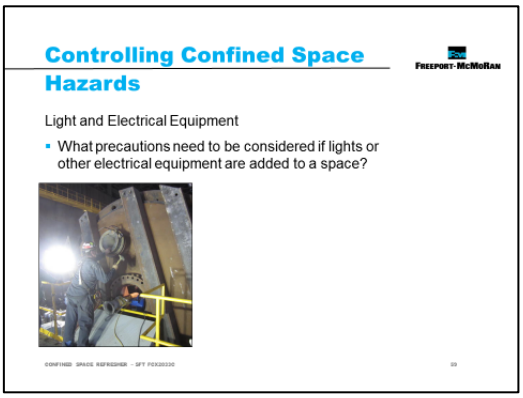
- **Refer to "Step 3 – Pre-Entry Preparation and Controls" on the Confined Space Entry Permit while progressing through this slide.**
- **Ask the question and discuss when IS devices are needed.**
  - When working with electrical equipment in areas with flammable chemicals or vapors (Ignition source cannot be present).
- **Ask the question and discuss why an IS is needed.**
  - When working with electrical equipment where a flammable atmosphere could exist, IS rated equipment decreases the hazard and must be used.
  - IS rated equipment is designed to not introduce an ignition source.

PPT slide 55

Instruction

- **Refer to "Step 3 – Pre-Entry Preparation and Controls" on the Confined Space Entry Permit while progressing through this slide.**
- **Ask the question and discuss controls that help secure a space.**
  - Barriers separating workers & hazards.
  - Examples include barricades, warning signs, temporary railings, and cones.
  - Follow Freeport-McMoRan's Flagging and Barricading Policy (FCX-HS19).
- **Ask the question and discuss who controls access to the space and why.**
  - Attendants control access to prevent unauthorized entry, notably in emergencies.

PPT slide 56

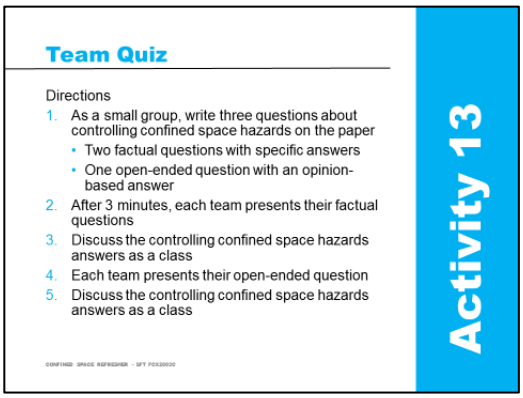


Instruction

- **Refer to "Step 2 – Assessing the Space – Any other recognized hazards" on the Confined Space Entry Permit while progressing through this slide.**
- **Ask the question and discuss the precautions needed when lights or other electrical equipment are added to a space.**
  - Enough light to safely perform the job.
  - Low-voltage lighting.
  - IS classified and rated equipment if a potential explosive atmosphere exists.
  - GFCI protected and tested equipment if wet or damp conditions exist.

ACTIVITY 13: TEAM QUIZ

PPT slide 57



Time
Approximately 10 minutes

Materials

- Flipchart paper (1 per group)
- Marker (1 per group)

Purpose

- This activity gives students the opportunity to evaluate the hazards and controls in a confined space. This is accomplished by having students work in groups to develop factual and open-ended questions to ask and discuss with the class.

Instruction

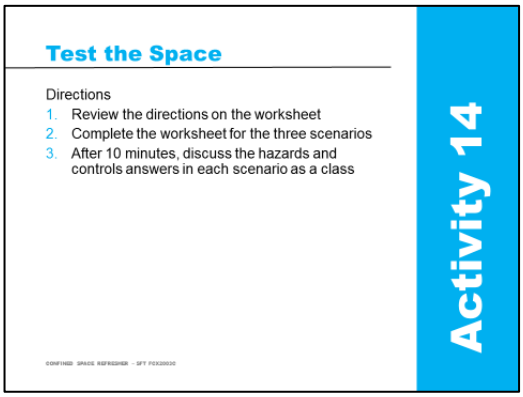
1. Break the class into teams of approximately five students.
2. Each team writes three questions about controlling confined space hazards on the flipchart paper.
    - Two questions are factual with a specific correct answer.
    - One question is open-ended and intended to lead to a discussion. These questions are generally answered with opinions and do not have right and wrong answers.
3. After 3 minutes, each team presents their factual questions to the class.
4. **Discuss the controlling the confined space hazards answers as a class**.
5. Each team presents their open-ended question to the class.
6. **Discuss the controlling confined space hazards answers as a class**.

Examples

Question Type	Question Examples
Factual	• What ventilation type pulls air out of the space to remove contaminants? Local exhaust ventilation • True or False. Air monitors take a few moments to analyze the atmosphere. True
Open-ended	• What do you think is the most important control when in a confined space? Why? • What hazards are most difficult to control? What makes them difficult? • Was there a time when you felt unsafe before entering a confined space? Why did you feel unsafe?

ACTIVITY 14: TEST THE SPACE

PPT slide 58



Time
Approximately 15 minutes

Materials

- Test the Space worksheet, FG pp.73-76 (1 per student)
- Pen (1 per student)

Purpose

- This activity gives students the opportunity to evaluate the hazards and controls in a confined space. This is accomplished by having the students evaluate several scenarios to identify and record potential atmospheric hazards, monitoring techniques, and possible controls.

Instruction

1. Three scenarios and worksheets have been written for class use. A blank scenarios template has been provided so the facilitator can fill in a site-specific scenario/topic, if desired.
2. Give each student a Test the Space worksheet.
3. Review the directions on the worksheet.
    - Evaluate each of the three scenarios as if you were expected to complete the job described.
    - Use the scenario and list of chemical properties to answer the questions provided.
4. Give students approximately ten minutes to complete individually or as a small group.
5. **Discuss the hazards and controls answers in each scenario as a class.**

Test the Space

Directions:
Evaluate each of the scenarios as if you were expected to complete the job described. Use the scenarios and list of chemical properties to answer the questions provided.

SCENARIO 1: EXPOSURE TO ARGON GAS

You have been asked to enter a confined space to perform repair work that will require TIG welding using Argon gas as the inert shielding.

Properties of Argon Gas

- 38% more dense than air
- Inert and classified as a simple asphyxiate
- Evaporates very quickly causing super saturation of the air with serious risk of suffocation
- Death may occur from errors in judgement, confusion, or loss of consciousness that prevents self-rescue
- Used as an inert shield in arc welding
- Colorless, odorless, non-flammable, and non-toxic
- At low oxygen concentrations, unconsciousness and death may occur within seconds and without warning
- Inhalation in excessive concentrations can result in dizziness, nausea, vomiting, rapid breathing, muscular incoordination, diminished mental alertness, loss of consciousness, and death

Questions

What are the potential hazards that will be introduced when the task is performed?

What part of the confined space would you test to detect the presence of Argon?

How would you monitor test for this hazard?

How would you control the hazard?

SCENARIO 2: EXPOSURE TO HYDROGEN SULFIDE

You have been asked to enter and clean a digestion tank that is used to treat organic waste.

Properties of Hydrogen Sulfide (H_2S)

- Slightly heavier than air
- Short-term, high-level exposure can induce immediate collapse, with loss of breathing and a high probability of death
- Exposure to lower concentrations can result in eye irritation, a sore throat and cough, nausea, shortness of breath, and fluid in the lungs
- Considered a broad-spectrum poison, (i.e. it can poison several body systems)
- Highly flammable and toxic (A mixture of H_2S and air can create an explosive atmosphere)
- Results from the breakdown of organic matter in the absence of oxygen and from places where elemental sulfur comes in contact with organic material, especially at high temperatures

Questions

What are the potential hazards that will be introduced when the task is performed?

What part of the confined space would you test to detect the presence of Hydrogen Sulfide?

How would you monitor test for this hazard?

How would you control the hazard?

SCENARIO 3: EXPOSURE TO ACETYLENE

You have been asked to enter a confined space to remove obsolete equipment. The job requires cutting out material using an oxy/acetylene torch.

Properties of Acetylene

- Colorless and generally has a garlic-like odor
- A hydrocarbon gas commonly used for torch cutting
- Lighter than air and considered a simple asphyxiant
- Highly flammable and unstable under pressure
- Mixed with air it is highly explosive and easily ignited
- Packaged and transported within a compressed gas cylinder where it is dissolved (pure acetylene is explosive above 30 psi)

Questions

What are the potential hazards that will be introduced when the task is performed?

What part of the confined space would you test to detect the presence of Acetylene?

How would you monitor test for this hazard?

How would you control the hazard?

SCENARIO #____: _____ (Create a title)

You have been asked to enter a confined space to _____
(Explain the job). The job requires you to_____
(Explain how a chemical is used when performing the job)

Properties of _____ (pick a chemical and add several of its properties)

-
-
-
-
-
-

Questions

What are the potential hazards that will be introduced when the task is performed?

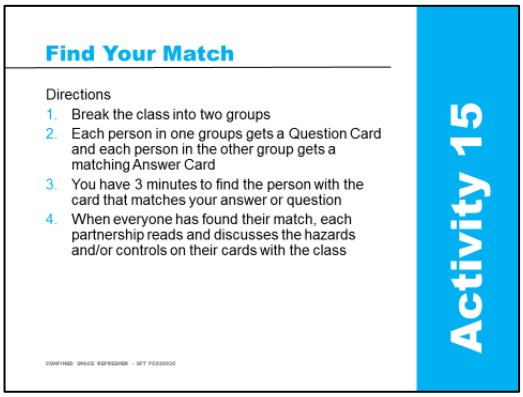
What part of the confined space would you test to detect the presence of the chemical?

How would you monitor test for this hazard?

How would you control the hazard?

ACTIVITY 15: FIND YOUR MATCH

PPT slide 59



Time
Approximately 10 minutes

Materials

- Find Your Match Questions and Answers Cards, pp. 79-85 (1 copy of each page cut before class)
- **If used in place of the PPT – Air monitor(s) used at your site (Either 1 for the facilitator to demonstrate OR 1 for the facilitator to demonstrate and 1 per group so students can follow along and practice).**

Purpose

- This activity gives students the opportunity to evaluate the hazards and controls in a confined space. This is accomplished by reading questions related to evaluating hazards and controls in a confined space and figuring out the answers.
- **Note: If the facilitator uses this activity in place of the PPT slides rather than as an activity after presenting the module's PPT slides, make sure all talking points provided in the FG are discussed according to the level needed by the students/sites. Talking points are found in the FG alongside the corresponding slides. Also, the facilitator should demonstrate air monitor use with a site air monitor as appropriate during the activity. If possible, let students practice using air monitors.**

Instruction

1. Break the class into two groups.
2. Give everyone in one of the groups a Question Card and everyone in the other group a matching Answer Card. If there is an odd number of students, give one student two cards or the facilitator may also participate.
3. Give students 3 minutes to find the person with the answer/question that matches their card.
4. After all matches have been made, have each partnership read their question and answer to the class **and discuss the hazards and/or controls on the cards.**
5. If time permits, repeat the process.

Answer Key

Question	Answer
1. Why is the correct type of air monitor important?	Air monitors are designed to detect one or more specific gases and must be chosen based on the gases most likely to occur in your workplace
2. What steps are involved in an air monitor inspection?	Calibration, battery check, zero, clear the peaks, and bump test
3. What does it mean to "clear the peaks" on an air monitor?	Erasing the history of the previous use to avoid false readings
4. Why do you need to bump test your air monitor before use?	Verifies the monitor responds correctly by exposing it to the gas.

Question	Answer
5. In what order is the atmosphere pre-tested?	Oxygen, flammable gases and vapor, potential air contaminants
6. Why is the oxygen in a space tested first?	Most air monitors are oxygen dependent and do not work properly in oxygen deficient air
7. What areas in the space do you test during pre-entry?	Around the opening, several feet in front of you, the top, middle, and bottom
8. What should be done if work stops for any amount of time?	Repeat the air monitoring procedures before resuming work
9. What do you do if the monitor indicates a danger or the alarm sounds?	Do not enter or evacuate the space immediately
10. Why is continuous monitoring needed?	Atmospheres can change rapidly
11. When is continuous monitoring needed?	When atmospheric hazards might not be completely eliminated, result from the task being performed, move to the space from nearby activities, be greater than 10% of the LEL/LFL, or include oxygen rich, deficient, or toxic air
12. What factors should be considered when ventilating?	Chemicals/residues, type of work to be performed, amount of air being supplied, and size/ dimensions of the space
13. What is the difference between Forced Air (Dilution) Ventilation and Local Exhaust Ventilation	Forced Air pushes fresh air into the space and the turbulence dislodges pockets of contaminants. Local exhaust pulls air out of the space and discharges contaminants outside of the space.
14. How does a Push-Pull Ventilation system work?	It pushes fresh air into the space and pulls contaminants out.
15. How do you prevent pocketing?	Ventilate the space thoroughly so no pockets will be left, and then test the space
16. How do you prevent short-circuiting?	Use a powerful blower to blow clean air into the entire space or a long duct to reach the bottom of the space
17. What are some guidelines when using ventilation systems?	Don't locate air inlets near outlets, Don't draw contaminated air past workers, don't impede access, don't use oxygen for ventilation, verify entrances can't be closed, use explosion proof fans
18. Why is LOTOTO performed?	De-energize all equipment before work is performed to isolate/eliminate all energy sources
19. What can be used to stop material from flowing into a confined space?	Blank/bleed, double block and bleed, line break
20. Why are IS devices needed?	Eliminates an ignition source and decreases the hazard when working with electrical equipment where a flammable atmosphere could exist
21. What controls help secure a space?	Barriers, barricades, warning signs, temporary railings, cones, Attendants
22. What precautions need to be considered if lights or other electrical equipment are added to a space?	Enough light to safely perform the job, low-voltage lighting, IS classified and rated equipment used when needed, GFCI protected and tested equipment in wet conditions

Find Your Match Questions and Answers

1. Why is the correct type of air monitor important?	Air monitors are designed to detect one or more specific gases and must be chosen based on the gases most likely to occur in your work area
2. What steps are involved in an air monitor inspection?	Calibration, battery check, zero, clear the peaks, and bump test
3. What does it mean to “clear the peaks” on an air monitor?	Erasing the history of the previous use to avoid false readings
4. Why do you need to bump test your air monitor before use?	Verifies the monitor responds correctly by exposing it to a gas.
5. In what order is the atmosphere pre-tested?	Oxygen, flammable gases and vapor, potential air contaminants
6. Why is the oxygen in a space tested first?	Most air monitors are oxygen dependent and do not work properly in oxygen deficient air

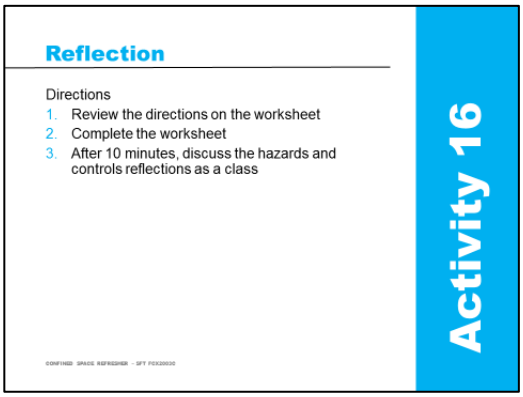
7. What areas in the space do you test during pre-entry?	Around the opening, several feet in front of you, the top, middle, and bottom
8. What should be done if work stops for any amount of time?	Repeat the air monitoring procedures before resuming work
9. What do you do if the monitor indicates a danger or the alarm sounds?	Do not enter the space or evacuate immediately
10. Why is continuous monitoring necessary?	Atmospheres can change rapidly
11. When is continuous monitoring necessary?	When atmospheric hazards might not be completely eliminated, result from the task being performed, move to the space from nearby activities, be greater than 10% of the LEL/LFL, or include oxygen rich, deficient, or toxic air
12. What factors should be considered when ventilating?	Chemicals/residues, type of work to be performed, amount of air being supplied, and size/ dimensions of the space

13. What is the difference between Forced Air (Dilution) Ventilation and Local Exhaust Ventilation?	Forced Air pushes fresh air into the space and the turbulence dislodges pockets of contaminants. Local exhaust pulls air out of the space and discharges contaminants outside of the space.
14. How does a Push-Pull Ventilation system work?	Pushes fresh air into the space and pulls contaminants out.
15. How do you prevent pocketing?	Ventilate the space thoroughly so no pockets will be left, and then test the space
16. How do you prevent short-circuiting?	Use a powerful blower to blow clean air into the entire space or a long duct to reach the bottom of the space
17. What are some guidelines when using ventilation systems?	Don't locate air inlets near outlets, Don't draw contaminated air past workers, don't impede access, don't use oxygen for ventilation, verify entrances can't be closed, use explosion proof fans

18. Why is LOTOTO performed?	De-energize all equipment before work is performed to isolate/eliminate all energy sources
19. What can be used to stop material from flowing into a confined space?	Blank/bleed, double block and bleed, line break
20. Why are IS devices needed?	Eliminates an ignition source and decreases the hazard when working with electrical equipment where a flammable atmosphere could exist
21. What controls are put around a space to help secure it?	Barriers, barricades, warning signs, temporary railings, cones, Attendants
22. What precautions need to be considered if lights or other electrical equipment are added to a space?	Enough light to safely perform the job, low-voltage lighting, IS classified and rated equipment used when needed, GFCI protected and tested equipment in wet conditions

ACTIVITY 16: REFLECTION

PPT slide 60



Time
Approximately 10 minutes

Materials
- Reflection worksheet, FG p.89 (1 per student)
- Pen (1 per student)

Purpose
- This activity gives students the opportunity to evaluate the hazards and controls in a confined space. This is accomplished by reflecting on a real-life confined space entry and answering questions about the hazards and controls encountered.

Instruction
1. Give each student a Reflection worksheet.
2. Review the directions on the worksheet.
    - Reflect on a confined space entry you experienced or know of that could have been performed more safely.
    - Answer the questions provided.
3. Give students approximately ten minutes to complete individually.
4. **Ask for volunteers to discuss their hazards and controls reflections with the class.**

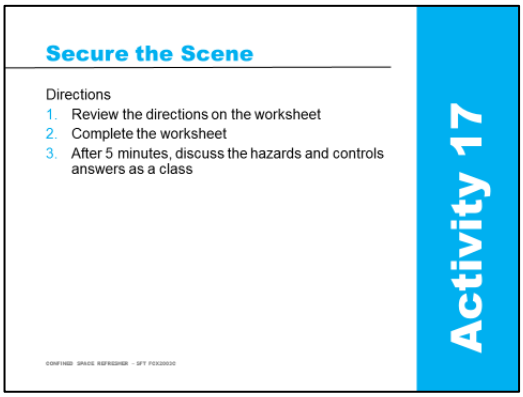
Reflection

Directions:
Reflect on a confined space entry you experienced or know of that could have been performed more safely. Answer the questions below.

Questions
What consequences did result/could have resulted in the incident?
What hazards could have been identified before entering the space?
How could the hazards have been identified before entering the space?
How could the hazards have been controlled before entering the space? What air monitoring, ventilation, PPE, electrical equipment, lighting, etc. could have been used?
How could hazards have been controlled while in the space?
Why didn't those involved follow proper procedures?
How can this incident be avoided in the future?

ACTIVITY 17: SECURE THE SCENE

PPT slide 61



Time
Approximately 10 minutes

Materials
- Secure the Scene worksheet, FG pp.93-94 (1 per student)
- Pen (1 per student)

Purpose
- This activity gives students the opportunity to evaluate the hazards and controls in a confined space. This is accomplished as students discuss and write about the hazards shown in several photos of PRCSs and determine the controls that mitigate the hazards.

Instruction
1. Give each student a Secure the Scene worksheet.
2. Review the directions on the worksheet.
    - Evaluate each photo for potential and existing confined space hazards.
    - Record the hazards you find in the appropriate column.
    - Determine the controls that will mitigate the hazard.
    - Record the controls in the appropriate column.
3. Give students approximately five minutes to complete individually or as a small group.
4. **Discuss the hazards and controls answers as a class.**

Answer Key

Picture	Hazards	Controls
1. Open-top tank	• Engulfment • Configuration • Atmospheric	• Energy control/LOTOTO • Air monitoring • Access
2. Crusher discharge screen	• Atmospheric • Engulfment • Configuration	• Energy control/LOTOTO • Air monitoring
3. Dumpster (NPRCS)	• Atmospheric (possible)	• Dispose products properly
4. Sewer	• Atmospheric • Engulfment • Configuration	• Air monitoring • Energy control • Fall protection

Secure the Scene

Directions:
Evaluate each photo for potential and existing confined space hazards. Record the hazards you find in the appropriate column. Then determine the controls that will mitigate the hazard and record them in the appropriate column.

1. Open-top tank

Hazards	Controls

2. Crusher discharge screen

Hazards	Controls

Directions:
Evaluate each photo for potential and existing confined space hazards. Record the hazards you find in the appropriate column. Then determine the controls that will mitigate the hazard and record them in the appropriate column.

3. Dumpster

Hazards	Controls

4. Sewer

Hazards	Controls

MODULE 4: ENTERING A CONFINED SPACE

This module contains information about the process for entering a confined space.

LEARNING OBJECTIVES

Upon completion of this module, students will be able to:

- Demonstrate the process for entering a confined space.

ACTIVITIES

- Activity 18: Confined Space Entry
- **Confined Space Policy FCX-HS05, Technical Supplement and Confined Space Entry Permit copies, FG pp.21-26.**

TOTAL TEACHING TIME

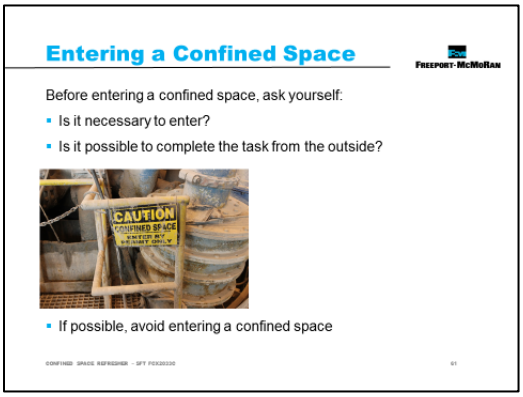
This module takes approximately 20 minutes to complete.

PPT slide 62

Instruction

- Upon completion of this module, the students will be able to:
  - Demonstrate the process for entering a confined space.
- **Refer to the appropriate sections of the Confined Space Policy FCX-HS05, Technical Supplement and Confined Space Entry Permit copies, FG pp.21-26. while reviewing slides 63-68.**

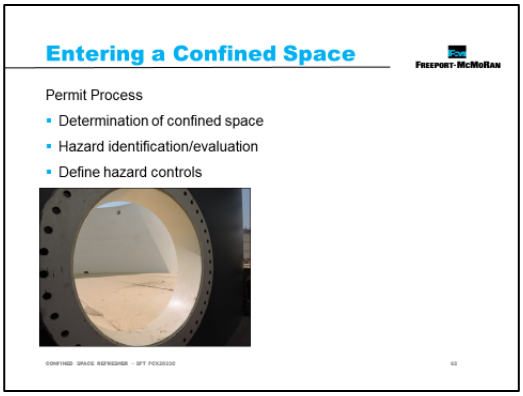
PPT slide 63



Instruction

- **Ask the first question and discuss the necessity of entering a space.**
  - Every consideration should be given to completing the task from the outside.
- **Ask the second question and discuss the possibility of completing a task without entering.**
  - Consider using other methods to do the job without entering.
- Entry is a last resort.

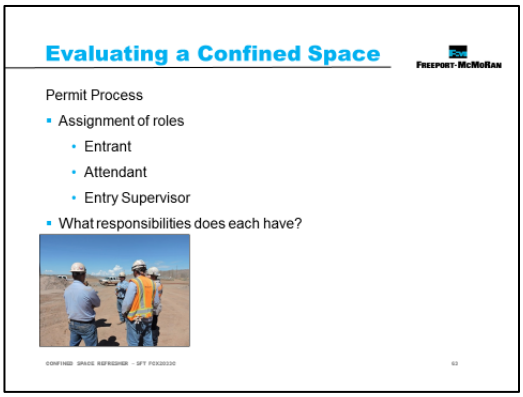
PPT slide 64



Instruction

- All members of the confined space entry team must be trained on confined spaces.
- Treat all confined spaces as permit-required until it has been determined otherwise.
- Determination of confined space
    - Review SOPs, HIRADC (Risk Register), and tasks to perform while in the space.
- Hazard identification/evaluation
    - Identifies existing hazards and documents that hazards have been eliminated (NPRCS) or controlled to a suitable level (PRCS).
- Define hazard controls
    - Isolate or eliminate all energy sources that could enter the space.
    - Mark off the area placing temporary railing, cones, or other devices around the space to help prevent unauthorized entry.
    - If the space is determined to be NPRCS, you can begin entry.
    - If conditions change, evacuate and re-evaluate.

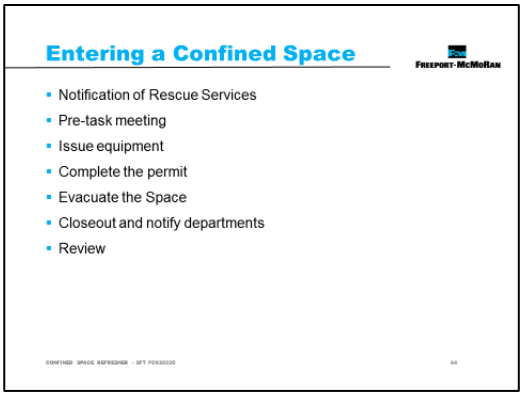
PPT slide 65



Instruction

- **Ask the question and discuss the responsibilities of each role**
- Confined space entry cannot be done alone.
- **Review the three roles using the Confined Space Policy FCX-HS05 (Policy page 2) found in FG p. 23**

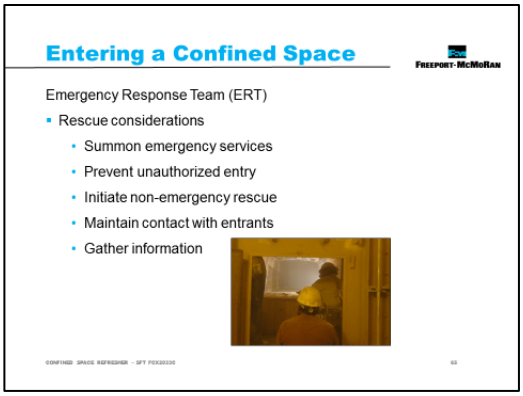
PPT slide 66



Instruction

- Notification of rescue services
  - Ensure their availability prior to entry.
  - Tell them the locations and hazards.
- Pre-task meeting
  - Involve Attendants, Entrants, and all other affected employees.
  - Explain the hazards (signs/symptoms and routes of exposure), acceptable entry conditions, required PPE, testing, and all communication procedures.
- Issue equipment
  - Provide all necessary PPE.
  - Make sure all equipment functions properly (including communication systems).
- Complete the permit
  - Lasts one shift.
  - Posted at entrance.
  - Updated, if conditions change.
- Evacuate the space
  - Attendant activates emergency response process and may attempt non-entry rescue using the retrieval system.
  - All personnel must remain outside the space.
  - Only properly trained and equipped responders may enter the space.
- Closeout and notify departments
  - Notify appropriate departments and rescue services of completion.
- Review
  - Determine if entry measures were adequate to protect employees.
  - If evacuations were necessary, communicate the issues with management and a health and safety professional immediately.

PPT slide 67

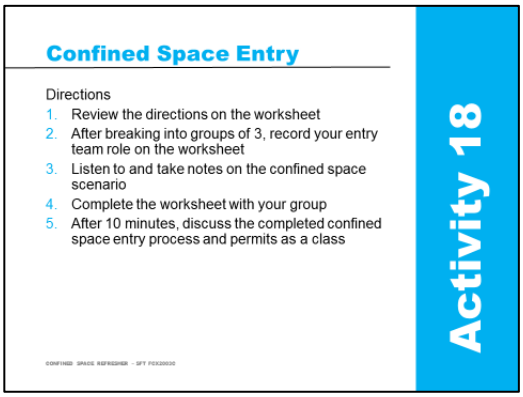


Instruction

- In an emergency, the attendant implements the rescue plan but does not personally rescue the victim(s).
- Review the rescue considerations.
    - Summon emergency services – Attendant calls for help as soon as the potential emergency is discovered.
    - Prevent unauthorized entry – Stop others from entering the space.
    - Initiate non-emergency rescue - When possible, perform a non-entry rescue using tripods, davit arms, rope, pulley systems, rescue harnesses, or wristlets.
    - Maintain contact with entrants – Keep them calm. Tell them help is on the way.
    - Gather information – Know the hazards in the space, number and condition of entrants, and any related mechanical/system information.

ACTIVITY 18: CONFINED SPACE ENTRY

PPT slide 68



Time
Approximately 15 minutes

Materials

- Confined Space Entry worksheet, FG p.101 (1 per student)
- Pen (1 per student)
- **Confined Space Entry Permit (1 per student)**
- **Facilitator created confined space scenario**

Purpose

- This activity gives students the opportunity to demonstrate the process for entering a confined space. This is accomplished as the students use a scenario to simulate a confined space entry as part of an entry team.

Instruction

1. Give each student a Confined Space Entry worksheet.
2. Review the directions on the worksheet.
    - After breaking the class into groups of three, the facilitator assigns each group member an entry team role (Entrant, Attendant, and Entry Supervisor).
    - Write your role on the appropriate line below then listen to the scenario given to you by the facilitator. Take notes in the space provided.
    - The facilitator provides additional air monitor readings throughout the activity.
    - With your assigned confined space entry team, complete all of the tasks listed in the table below.
3. Break the class into groups of three and assign each group member an entry team role (Entrant, Attendant, and Entry Supervisor). If there are groups with two students, assign two roles to one of the group members.
4. Describe a brief confined space scenario as the students take notes. Make sure pre-entry air monitoring readings are included.
5. Give students approximately ten minutes to complete the worksheet/entry permit. As students complete the permit, occasionally provide air monitor readings for them to record for their continuous atmospheric readings.
6. **Discuss the completed confined space entry process and permits as a class.**

Confined Space Entry

Directions:
After breaking the class into groups of three, the facilitator assigns each group member an entry team role (Entrant, Attendant, and Entry Supervisor). Write your role on the appropriate line below then listen to the scenario given to you by the facilitator. Take notes in the space provided. The facilitator provides additional air monitor readings throughout the activity. With your assigned confined space entry team, complete all of the tasks listed in the table below.

YOUR ROLE:

SCENARIO NOTES:

STEP	TASK
1	Discuss each team member's role and responsibilities.
2	Discuss site specific entry steps such as: • Reviewing JSAs, SOPs, HIRDAC • Gathering and inspecting required equipment • Verifying installation of flagging, tagging, and barricading • Conducting a pre-task meeting • Notifying rescue services
3	Complete your site-specific entry permit.
4	"Enter" the space. • Explain the step-by-step process you follow when entering a space (Pre-entry monitoring, donning PPE, etc.)
5	"Perform" the work. • Monitor the space continuously. • React properly when conditions change (such as a shift change), or the air monitor malfunctions/alerts
6	Discuss how to close out the job • Explain the step-by-step process you follow when exiting a space (Parties to notify of completed work, termination of permit, permit retention, etc.)

CONCLUSION

The conclusion summarizes the information presented in this course and Confined Spaces and gives students the opportunity to ask any lingering questions, comments, or concerns regarding Freeport-McMoRan's Confined Space Policy (FCX-HS05).

ACTIVITIES

- None

TOTAL TEACHING TIME

The conclusion takes approximately 5 minutes to complete.

PPT slide 69

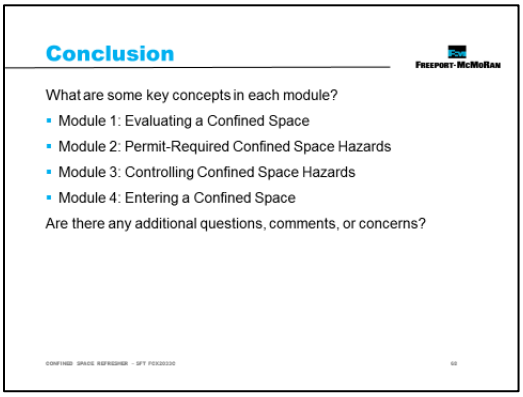
Instruction

- The conclusion covers:
  - Review

PPT slide 70

Instruction

- **Ask for and discuss any lingering questions, comments, or concerns.**



RESOURCES

This section consolidates all of the handouts presented throughout the FG both as part of the regular course and for each of the activities. For additional details about how to use these handouts within the course, see the specific directions within each module of the FG.

Confined Space Policy

Health and Safety FCX-HS05 |Version 1 | Release 03/2018

POTENTIAL FATAL RISKS

Exposure to Hazardous Substances
Entanglement and Crushing
Uncontrolled Release of Energy

CRITICAL CONTROLS

Atmospheric Monitoring
Ventilation
Energy Isolation
Entry Permit Execution

A Confined Space is a space that meets all three of the below conditions:

1. Is large enough and so configured that a person can enter with their whole body and perform their assigned work
2. Has a limited or restricted means of entering and exiting (a configuration that would impede a person ability to self-rescue)
3. Is not designed for continuous occupancy (i.e. an individual could not occupy the space during normal operating conditions)

TRAINING REQUIREMENTS

Awareness Training for all employees
Initial Training
Annual Refresher Training
Remedial Training as required

POLICY

OVERVIEW

The Confined Space Policy establishes the requirements and performance standards needed to protect employees and contractors from hazards associated with confined space and to safely enter to perform work in confined spaces.

Permit Required Confined Spaces (PRCS) are confined spaces that have one or more of the following characteristics:

1. Contains or has the potential of containing a hazardous atmosphere
2. Contains a material that has the potential for engulfing an entrant
3. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section
4. Contains any other recognized serious safety or health hazard

NOTE: Permits are valid only for as long as it takes to complete the task, but not more than one shift.

ACTIONS TO STAY SAFE

The following requirements must be met when FCX employees or contractors are entering confined spaces on FCX properties:

- Evaluate confined space using the permit to determine if the space is a permit required confined space, retain documentation
- Verify, understand and abide by Confined Space Permit requirements
- Monitor atmospheric condition periodically throughout the entry
- Entrant(s) have the right to observe pre-entry atmospheric test
- Identify and control the hazards within the confined space
- Use proper ventilation
- Understand and abide by assigned roles and responsibilities of confined space entry team
- Establish a communication process with entrant(s)
- Evacuate space immediately at established alarm condition, atmospheric monitor failure, or any uncontrolled/unanticipated change in condition

A confined space entry team is the group of individuals assigned to complete a task within a confined space. A typical entry team consists of three roles: entrant, attendant, and entry supervisor. For any Permit Required Confined Space (PRCS) entry, a minimum of two individuals are necessary. These individuals will be classified as either the:

- Entrant (individual entering the confined space)
- Attendant (the individual staying outside and monitoring the confined space)

A person will also be designated as the entry supervisor (the attendant may serve as the entry supervisor, but the supervisor may never serve as the entrant) and will be responsible for the confined space entry and ensuring that all safety precautions have been met.

Regardless of the role, all entry team members, attendants, entrants and entry supervisors, must:

Responsibilities and Duties of the Entry Supervisor:

- Define all Risks and Controls
- Establish in writing all acceptable entry conditions
- Conduct a pre-entry meeting with all confined space team members
- Ensure that the atmospheric tests is conducted and recorded
  - To classify the space
  - Conducted immediately prior to entry
  - Continued throughout the entry if required
- Ensure all members have been trained in Confined Space entry
- Ensure that rescue services are notified and available, and that the means for summoning them are operable
- Ensure acceptable entry conditions are in place before anyone enters the space and that conditions remain safe throughout the entry
- Maintain the confined space permit:
  - Authorize entry by signing the entry permit after all conditions for safe entry have been met
  - Post the completed, signed permit at the entrance to the space
  - Terminate the entry and cancel the permit when entry operations are complete or when uncontrolled hazards arise in or near the permit space
  - File the original canceled permit with the appropriate department
- If hazardous conditions arise that are Immediately Dangerous to Life and Health (IDLH), immediately evacuate the space

Responsibilities and Duties of the Attendant:

- Control access to the PRCS:
  - Maintain an accurate count of entrants
  - Do not allow unauthorized entry
- Communicate with the authorized entrants
- Monitor entrant(s) activities and conditions
- Maintain retrieval lines/system
- Stop work and evacuate the space if:
  - A non-acceptable entry condition occurs
  - Behavior changes in the entrant(s)
  - Outside conditions arise that may endanger the entry team
  - The air monitor alarms
  - Any new or uncontrolled hazards are introduced
- Manage emergencies
- Attendant may not perform any other duties

Responsibilities and Duties of the Entrant(s):

- Communicate with the Attendant
- Inspect for hazards within the space
- Stop work and evacuate the space if:
  - Air monitor alarms
  - Air monitor stops functioning normally
  - Uncontrolled hazard is suspected or observed
  - Any entrant experiences signs or symptoms of exposure to hazards
  - Communication link between the entrant and attendant is broken
  - Conditions outside the space threaten the entrants or attendant
  - Attendant calls for an evacuation
- Wear designated PPE

Technical Supplement

Confined Space FCX-HS05 | Rev 6 | Release 03/2018

ATMOSPHERIC TESTING & MONITORING

Atmospheric testing is required for two distinct purposes:

1. Evaluation of the hazards of the permit space; and
2. Verification that acceptable entry conditions for entry into that space exist.

Air monitoring equipment will be selected by a qualified individual based on the hazards of the entry. As the monitor's sensors are gas specific, these determinations must be documented with area SOPs/Risk Registers/HIRADC/JSA. Calibration will be performed per the manufacturer's specifications and records will be kept according to the Records Retention Program.

Acceptable Monitoring Levels and Entry Conditions:

- **Oxygen levels**: O_2 levels between 19.5% - 23.5%
  - **Oxygen Deficient** (< 19.5%) is considered hazardous
  - **Oxygen Enriched** (> 23.5%) is considered hazardous
- **Flammable Gases**: Flammable gas concentration less than 10% of the Lower Explosive Limit (LEL) of the flammable gas.
- **Toxicity:** Atmospheric concentration in excess of the occupational exposure limit for any substance that is capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects and which could result in employee exposure in excess of its dose or permissible exposure limit.

Refer to the **FCX IH Field Guide** for more information on exposure limits.

REFERENCES

- 29 CFR 1910.146; Permit-required Confined Spaces
- 29 CFR 1910.146 Appendix B; Procedures for Atmospheric Testing
- 29 CFR 1910.146 Appendix F; Rescue Team or Rescue Service Evaluation Criteria
- 30 CFR 56.16002; Bins, hoppers, silos, tanks, and surge piles
- NSI/ASSE Z117.1-2009; Safety Requirements for Confined Spaces

ADDITIONAL REQUIREMENTS

(1) Evaluation testing. The atmosphere of a confined space should be analyzed using equipment of sufficient sensitivity and specificity to identify and evaluate any hazardous atmospheres that may exist or arise, so that appropriate permit entry procedures can be developed and acceptable entry conditions stipulated for that space. Evaluation and interpretation of these results, and development of the entry procedure, should be performed by, or reviewed by, a technically qualified person based on evaluation of all serious hazards.

(2) Verification testing. The atmosphere of a permit space which may contain a hazardous atmosphere should be tested for residues of all contaminants identified by evaluation testing using permit specified equipment to determine that residual concentrations at the time of testing and entry are within the range of acceptable entry conditions. Results of testing (i.e., actual concentration, etc.) should be recorded on the permit in the space provided adjacent to the stipulated acceptable entry condition.

(3) Duration of testing. Follow manufacturer's recommendations for the duration of time the monitor should remain in place for a complete response, analysis times may vary depending on probe length and flow rate.

(4) Testing stratified atmospheres. When monitoring for entries involving a descent into atmospheres that may be stratified (layered), testing should proceed from the top to the bottom of the space and tested a distance of approximately 4 feet (1.22 m) in the direction of travel and to each side. If a sampling probe is used, the entrant's rate of progress should be reduced to accommodate the sampling speed and detector response.

(5) Order of testing. Test for oxygen first because most combustible gas meters are oxygen dependent and will not provide reliable readings in an oxygen deficient atmosphere. Test for combustible gases next because the threat of fire or explosion is both more immediate and more life threatening, in most cases, than exposure to toxic gases and vapors. If tests for toxic gases and vapors are necessary, they are performed last.

FREEPORT-McMoRan

CONFINED SPACE Entry Permit

DIVISION	**DEPARTMENT**
DATE **TIME**	**SHIFT**
CONFINED SPACE LOCATION	**CONFINED SPACE ID #**
PURPOSE OF ENTRY	**AUTHORIZED DURATION**
ENTRY SUPERVISOR NAME	**SUPERVISOR APPROVAL SIGNATURE**
ENTRY ATTENDANT(S) NAME(S)	
AUTHORIZED ENTRANT(S) NAME(S) (continue over if necessary)	
ROUTINE ☐ **NON-ROUTINE** ☐ **WORKPLACE EXAM COMPLETED** ☐ **SOP/JHS COMPLETE AND REVIEWED** ☐	

STEP 1: HAZARD IDENTIFICATION AND RECOGNITION

EXISTING HAZARDS WITHIN, CONNECTED TO, OR NEAR THE SPACE (hazardous energy, radiation, etc)	**CONTROLS**	**HAZARDS TO BE INTRODUCED TO THE SPACE FROM THE WORK BEING PERFORMED** (welding fumes, noise, dust, hot work, other tasks that require specialized PPE)	**CONTROLS**

STEP 2: ASSESSING THE SPACE

SECTION A: CONFINED SPACE HAZARDS	**YES**	**NO**
Hazardous / Potentially Hazardous Atmosphere		
Sloping or Converging Walls or Floors		
Engulfment / Entrapment		
Any Other Recognized Hazards: (noise, heat, uncontrolled energy source, fall hazards inside the space, radiation, thermal exposure etc) List these hazards and controls in section 2		
If the answer to ALL question above is NO, or can be eliminated: The space may be classified as NON-PERMIT REQUIRED.		
Name:		
Signature:		

SECTION B: INITIAL AIR SAMPLING (around the opening of the space, and at multiple levels within the space)

GAS	**ACCEPTABLE**	**READING**
Oxygen	19.5 – 23.5%	
LEL*	< 10%	
Toxics	< PEL* / TLV* /OEL*	
Other:		
Time of testing		
Date of calibration		
Initials of person taking the sample		
Test instrument and #		

STEP 3: PRE ENTRY PREPARATION AND CONTROLS

EQUIPMENT	**REQUIRED / N/A**	**COMMUNICATION**	**TESTED**
Ventilation Required: YES / NO		Entrant and Attendant Communication Method:	
Type: Duration:			
Retrieval System (Emergency Escape Apparatus)		Supervisor Communication Method:	
Fire Extinguisher			
Intrinsically Safe Equipment		Emergency Response Communication Method:	
LOTOTO			
Flagging and Barricading			

STEP 4: Pre-Entry Air Sampling (Immediately Prior to Entry)

GAS	**ACCEPTABLE**	**READING**
Oxygen	19.5 – 23.5%	
LEL*	< 10%	
Toxics	< PEL* / TLV* /OEL*	
Other:		
Time of testing		Initials of Tester

STEP 5: Pre-Entry Meeting and Review

MEETING/REVIEW	**INITIALS**
Pre Entry Meeting and Review Conducted	
Acceptable Entry Conditions Have Been Met	

* LEL = Lower Explosive Limit, PEL = Permissible Exposure Limit, TLV = Threshold Limit Value

NOTE: Post completed permit, and any other relevant forms at the entrance to the Confined Space

Post Entry Cancellation of Permit by Confined Space Entry Supervisor: NAME..... SIGN.....

ADDITIONAL MONITORING RECORD										
GAS	**ACCEPTABLE**	**TIME**	**READING**	**INITIALS**	**TIME**	**READING**	**INITIALS**	**TIME**	**READING**	**INITIALS**
Oxygen	19.5 – 23.5%									
LEL*	< 10%									
Toxics	< PEL* / TLV*/OEL*									
Other										

AUTHORIZED ENTRANT(S) NAME(S) (continued from front page)	Time

AUTHORIZED ATTENDANTS (S) NAME(S) (continued from front page)	Time

Confined

Space

Not a

Confined

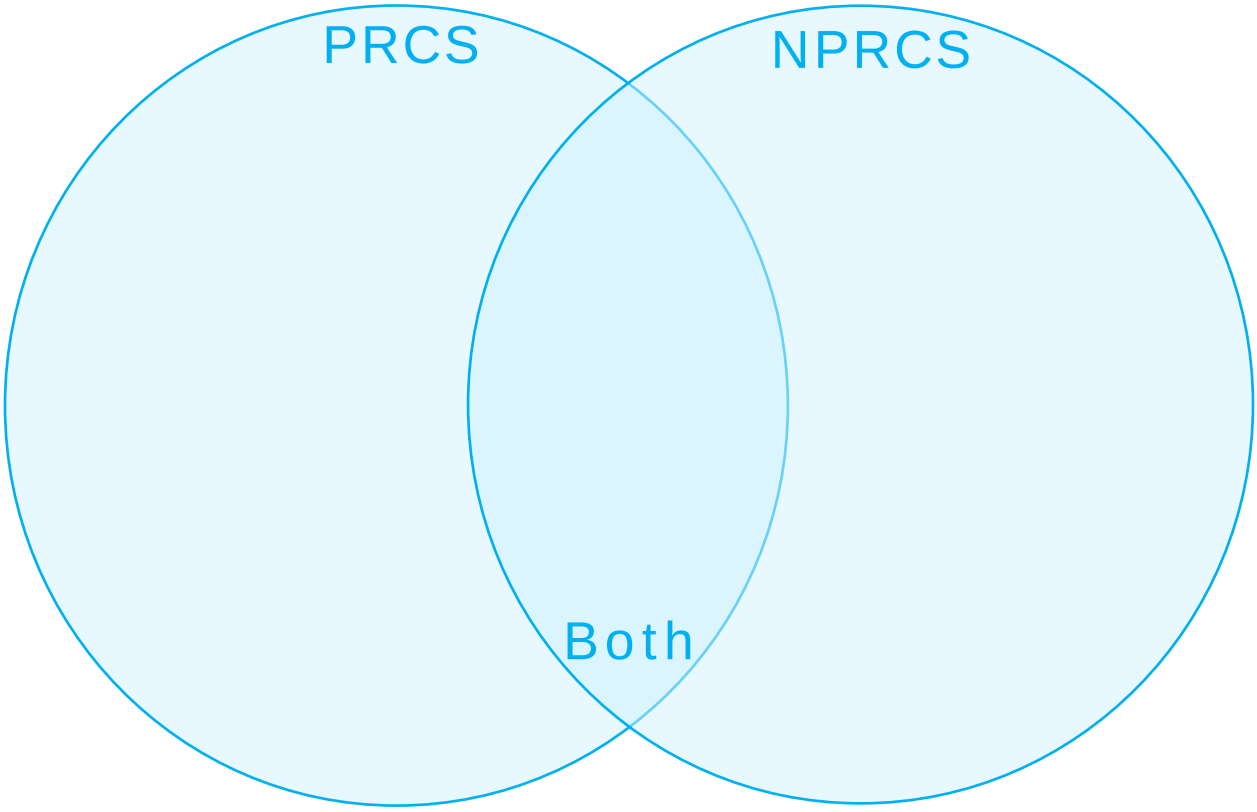
Space

Sewers	**Furnaces**
Ball mills	**Vaults**
Vats	**Bins**
Ducts	**Boilers**
Manholes	**Dumpsters**
Silos	**SX filters**
Acid tanks	**Ball bins**

Cyclones	**Precipitators**
Thickeners	**Concentrators**
Storage tanks	**Tanker railcar**
Flotation cells	**Open-top tanks**
Crusher chutes	**Dust collectors**
Storage hoppers	**Haul truck tires**

PRCS vs NPRCS

Directions:
Use the Venn diagram below to organize the similarities and differences between a PRCS and a NPRCS. Characteristics are assigned a letter in the box at the bottom of the page. Place the letters that describe a PRCS in the circle on the left and those that describe a NPRCS on the right. Letters that



Characteristics

A. No physical hazard
B. Engulfment hazard
C. Any serious hazard
D. Atmospheric hazard
E. Configuration hazard
F. No atmospheric hazard
G. Large enough to bodily enter
H. Not designed for continuous occupancy
I. Limited or restricted means of entry or exit
J. Hazard that may cause death or serious injury
K. No potential hazard capable of causing death or serious injury
L. No existing hazard capable of causing death or serious injury

Hazard Detective

Directions:
Evaluate each photo for potential and existing confined space hazards. Record the hazards you find in the appropriate column. If there are no hazards present, write “none”.

2.

Hazards

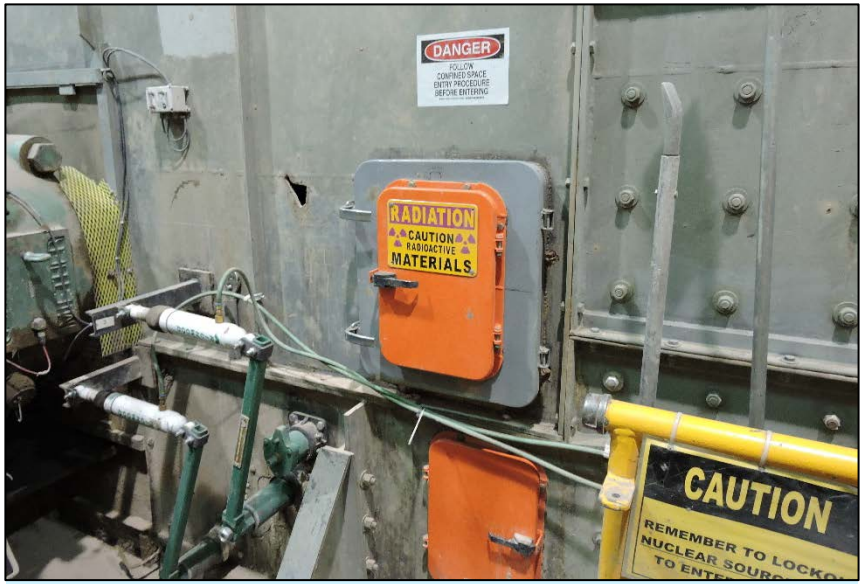
2.

Hazards

Directions:
Evaluate each photo for potential and existing confined space hazards. Record the hazards you find in the appropriate column.

3. 

Hazards

4. 

Hazards

PRCS Categories

Directions:

1. Use the table below that lists several PRCS-related hazard categories.
2. Before each round of play, the facilitator chooses a letter and players write one word that begins with that letter for each category listed.
3. After three minutes, the players take turns reading their answers, crossing out any answers that match another player's.
4. Players score one point for each answer not crossed out.
5. Repeat the process with a new letter for each round.
6. Creative answers are allowed but can be challenged. If the answer is challenged, all players vote and the majority rules.
7. The player with the most points wins.

Category	Round 1	Round 2	Round 3
Atmospheric Hazard			
Normal/Enriched/Deficient Air			
Flammable Gases & Vapors			
IDLH			
Engulfment Hazards			
Configuration Hazards			
Other Serious Hazards			
Electrical Hazards			
Mechanical Hazards			
Chemical Hazards			
Heat-Related Illness Hazards			
PRCS PPE			

Test the Space

Directions:
Evaluate each of the scenarios as if you were expected to complete the job described. Use the scenarios and list of chemical properties to answer the questions provided.

SCENARIO 1: EXPOSURE TO ARGON GAS

You have been asked to enter a confined space to perform repair work that will require TIG welding using Argon gas as the inert shielding.

Properties of Argon Gas

- 38% more dense than air
- Inert and classified as a simple asphyxiate
- Evaporates very quickly causing super saturation of the air with serious risk of suffocation
- Death may occur from errors in judgement, confusion, or loss of consciousness that prevents self-rescue
- Used as an inert shield in arc welding
- Colorless, odorless, non-flammable, and non-toxic
- At low oxygen concentrations, unconsciousness and death may occur within seconds and without warning
- Inhalation in excessive concentrations can result in dizziness, nausea, vomiting, rapid breathing, muscular incoordination, diminished mental alertness, loss of consciousness, and death

Questions

What are the potential hazards that will be introduced when the task is performed?

What part of the confined space would you test to detect the presence of Argon?

How would you monitor test for this hazard?

How would you control the hazard?

SCENARIO 2: EXPOSURE TO HYDROGEN SULFIDE

You have been asked to enter and clean a digestion tank that is used to treat organic waste.

Properties of Hydrogen Sulfide (H_2S)

- Slightly heavier than air
- Short-term, high-level exposure can induce immediate collapse, with loss of breathing and a high probability of death
- Exposure to lower concentrations can result in eye irritation, a sore throat and cough, nausea, shortness of breath, and fluid in the lungs
- Considered a broad-spectrum poison, (i.e. it can poison several body systems)
- Highly flammable and toxic (A mixture of H_2S and air can create an explosive atmosphere)
- Results from the breakdown of organic matter in the absence of oxygen and from places where elemental sulfur comes in contact with organic material, especially at high temperatures

Questions

What are the potential hazards that will be introduced when the task is performed?

What part of the confined space would you test to detect the presence of Hydrogen Sulfide?

How would you monitor test for this hazard?

How would you control the hazard?

SCENARIO 3: EXPOSURE TO ACETYLENE

You have been asked to enter a confined space to remove obsolete equipment. The job requires cutting out material using an oxy/acetylene torch.

Properties of Acetylene

- Colorless and generally has a garlic-like odor
- A hydrocarbon gas commonly used for torch cutting
- Heavier than air and considered a simple asphyxiant
- Highly flammable and unstable under pressure
- Mixed with air it is highly explosive and easily ignited
- Packaged and transported within a compressed gas cylinder where it is dissolved (pure acetylene is explosive above 30 psi)

Questions

What are the potential hazards that will be introduced when the task is performed?

What part of the confined space would you test to detect the presence of Acetylene?

How would you monitor test for this hazard?

How would you control the hazard?

SCENARIO #____: _____ (Create a title)

You have been asked to enter a confined space to _____
(Explain the job). The job requires you to_____
(Explain how a chemical is used when performing the job)

Properties of _____ (pick a chemical and add several of its properties)

-
-
-
-
-
-

Questions

What are the potential hazards that will be introduced when the task is performed?

What part of the confined space would you test to detect the presence of the chemical?

How would you monitor test for this hazard?

How would you control the hazard?

Find Your Match Questions and Answers

1. Why is the correct type of air monitor important?	Air monitors are designed to detect one or more specific gases and must be chosen based on the gases most likely to occur in your work area
2. What steps are involved in an air monitor inspection?	Calibration, battery check, zero, clear the peaks, and bump test
3. What does it mean to “clear the peaks” on an air monitor?	Erasing the history of the previous use to avoid false readings
4. Why do you need to bump test your air monitor before use?	Verifies the monitor responds correctly by exposing it to a gas.
5. In what order is the atmosphere pre-tested?	Oxygen, flammable gases and vapor, potential air contaminants
6. Why is the oxygen in a space tested first?	Most air monitors are oxygen dependent and do not work properly in oxygen deficient air

7. What areas in the space do you test during pre-entry?	Around the opening, several feet in front of you, the top, middle, and bottom
8. What should be done if work stops for any amount of time?	Repeat the air monitoring procedures before resuming work
9. What do you do if the monitor indicates a danger or the alarm sounds?	Do not enter the space or evacuate immediately
10. Why is continuous monitoring necessary?	Atmospheres can change rapidly
11. When is continuous monitoring necessary?	When atmospheric hazards might not be completely eliminated, result from the task being performed, move to the space from nearby activities, be greater than 10% of the LEL/LFL, or include oxygen rich, deficient, or toxic air
12. What factors should be considered when ventilating?	Chemicals/residues, type of work to be performed, amount of air being supplied, and size/ dimensions of the space

13. What is the difference between Forced Air (Dilution) Ventilation and Local Exhaust Ventilation?	Forced Air pushes fresh air into the space and the turbulence dislodges pockets of contaminants. Local exhaust pulls air out of the space and discharges contaminants outside of the space.
14. How does a Push-Pull Ventilation system work?	Pushes fresh air into the space and pulls contaminants out.
15. How do you prevent pocketing?	Ventilate the space thoroughly so no pockets will be left, and then test the space
16. How do you prevent short-circuiting?	Use a powerful blower to blow clean air into the entire space or a long duct to reach the bottom of the space
17. What are some guidelines when using ventilation systems?	Don't locate air inlets near outlets, Don't draw contaminated air past workers, don't impede access, don't use oxygen for ventilation, verify entrances can't be closed, use explosion proof fans

18. Why is LOTOTO performed?	De-energize all equipment before work is performed to isolate/eliminate all energy sources
19. What can be used to stop material from flowing into a confined space?	Blank/bleed, double block and bleed, line break
20. Why are IS devices needed?	Eliminates an ignition source and decreases the hazard when working with electrical equipment where a flammable atmosphere could exist
21. What controls are put around a space to help secure it?	Barriers, barricades, warning signs, temporary railings, cones, Attendants
22. What precautions need to be considered if lights or other electrical equipment are added to a space?	Enough light to safely perform the job, low-voltage lighting, IS classified and rated equipment used when needed, GFCI protected and tested equipment in wet conditions

Reflection

Directions:
Reflect on a confined space entry you experienced or know of that could have been performed more safely. Answer the questions below.

Questions
What consequences did result/could have resulted in the incident?
What hazards could have been identified before entering the space?
How could the hazards have been identified before entering the space?
How could the hazards have been controlled before entering the space? What air monitoring, ventilation, PPE, electrical equipment, lighting, etc. could have been used?
How could hazards have been controlled while in the space?
Why didn't those involved follow proper procedures?
How can this incident be avoided in the future?

Secure the Scene

Directions:
Evaluate each photo for potential and existing confined space hazards. Record the hazards you find in the appropriate column. Then determine the controls that will mitigate the hazard and record them in the appropriate column.

3. Open-top tank

Hazards	Controls

2. Crusher discharge screen

Hazards	Controls

Directions:
Evaluate each photo for potential and existing confined space hazards. Record the hazards you find in the appropriate column. Then determine the controls that will mitigate the hazard and record them in the appropriate column.

3. Dumpster

Hazards	Controls

4. Sewer

Hazards	Controls

Confined Space Entry

Directions:
After breaking the class into groups of three, the facilitator assigns each group member an entry team role (Entrant, Attendant, and Entry Supervisor). Write your role on the appropriate line below then listen to the scenario given to you by the facilitator. Take notes in the space provided. The facilitator provides additional air monitor readings throughout the activity. With your assigned confined space entry team, complete all of the tasks listed in the table below.

ENTRY TEAM ROLE:

SCENARIO NOTES:

STEP	TASK
1	Discuss each team member's role and responsibilities.
2	Discuss site specific entry steps such as: • Reviewing JSAs, SOPs, HIRDAC • Gathering and inspecting required equipment • Verifying installation of flagging, tagging, and barricading • Conducting a pre-task meeting • Notifying rescue services
3	Complete your site-specific entry permit.
4	"Enter" the space. • Explain the step-by-step process you follow when entering a space (Pre-entry monitoring, donning PPE, etc.)
5	"Perform" the work. • Monitor the space continuously. • React properly when conditions change (such as a shift change), or the air monitor malfunctions/alerts
6	Discuss how to close out the job • Explain the step-by-step process you follow when exiting a space (Parties to notify of completed work, termination of permit, permit retention, etc.)