



**FREEPORT-
McMORAN**

STUDENT GUIDE



SFT FCX2022C Hot Work Refresher

January/ 2020
VERSION 1

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LEARNING OBJECTIVES

The provided learning objectives establish guidance and focus throughout the course.

MODULE 1: INTRODUCTION TO HOT WORK

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

- Define Hot Work and fire safe areas and the associated safety concerns
- Identify and differentiate between flammable and combustible materials

MODULE 2: CRITICAL CONTROLS

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

- Identify the use of applicable controls

MODULE 3: ROLES AND RESPONSIBILITIES

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

- Describe the roles and responsibilities of persons involved in Hot Work

MODULE 4: EQUIPMENT

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

- Summarize the various equipment and hazards for different types of Hot Work

MODULE 5: HEALTH HAZARDS

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

- Describe the health hazards associated with Hot Work

MODULE 6: HIGH HAZARD AREAS

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

- Evaluate scenarios and categorize the associated hazards

INTRODUCTION

Hot Work is working with ignition sources near flammable materials. Hot Work is any temporary maintenance, construction, or activity that uses gas or electrically powered equipment, which produces flames, sparks, or heat that is sufficient to start a fire or ignite flammable/combustible materials.

The Freeport-McMoRan Hot Work Policy (FCX-HS06) provides guidelines and monitors compliance for all Hot Work activities performed in locations not normally identified as fire safe areas. Common Hot Work processes include welding, soldering, cutting, grinding, and brazing.

A Hot Work Permit is required for Hot Work operations unless working in a designated fire safe area (e.g., welding shop), which is documented by management. Hot Work Permits are valid for one work shift and one task. Operational areas will have signage indicating fire hazards that may not be clear to personnel (e.g., machinery containing rubber liners, conveyor galleries, oil containment/storage, etc.).

This course provides guidelines for Hot Work activities executed in settings not normally identified as fire safe areas. Each module outlines the various hazards, controls, and procedures to conduct Hot Work safely and efficiently. The course discusses when and where the policy allows Hot Work as well as the process to ensure the completion of work safely.

FATAL RISKS AND CRITICAL CONTROLS

Fatal Risk Management is a continuation of the Fatality Prevention Program. Focus is placed on identifying Fatal Risks and Critical Controls in an attempt to safeguard all employees within the Company. The Fatal Risk Management Program standardizes communication for twenty-three Fatal Risks by implementing icons, definitions, and Critical Controls.

Fatal Risks are based on safety issues that have resulted in catastrophic events such as severe injury or death. While all risks have a degree of danger, Fatal Risks are those risks that, when left uncontrolled, will kill you.

For each identified Fatal Risk, a list of necessary Critical Controls was developed to prevent or mitigate the most serious consequences of these risks. Once the Fatal Risk is identified, applying the most effective Critical Control is crucial. A Critical Control is a device, system, or process implemented to eliminate or reduce the risk for a task/job, and if missing or overlooked has the potential to lead to catastrophic outcomes such as serious injury or death. These Critical Controls are considered the most impactful on preventing a fatality or injury and have been previously established based on data. The absence or failure of a Critical Control significantly increases the risk of severe injury or death despite the existence of other controls. The Fatal Risk(s) and Critical Controls relevant to this course are provided below.

FIRE



The Fire Fatal Risk is defined as exposure to thermal, particulate, gas, or vapor hazards from a fire.

CRITICAL CONTROLS

- Alarm Systems
- Evacuation Plan
- Fire Suppression Systems
- Hot Work Permit Execution
- Rescue Systems
- Segregation and Storage

EXPOSURE TO HAZARDOUS SUBSTANCES - CHRONIC



The Exposure to Hazardous Substances Chronic Fatal Risk is defined as workplace exposure to substances that can cause lethal disease over time (e.g., silica, arsenic, lead, welding fumes, asbestos, acid mist, etc.)

CRITICAL CONTROLS

- Access Control
- Engineered Controls
- Handling Requirements
- PPE

Introduction to Hot Work



MODULE 1

MODULE 1: INTRODUCTION TO HOT WORK

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MODULE 1 LEARNING OBJECTIVES

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

- Define Hot Work and fire safe areas and the associated safety concerns
- Identify and differentiate between flammable and combustible materials

INTRODUCTION

This module introduces what constitutes Hot Work and discusses the difference between areas safe for Hot Work and the requirements to make an area safe. The module then describes flammables and combustibles and how ignition sources play a role with those materials is critical to the safety of employees. Freeport-McMoRan processes are full of combustible areas; this module focuses on how to identify those areas.

WHAT CONSTITUTES HOT WORK?

Hot Work is any process that can be a source of ignition when flammable or combustible materials are present or can be a fire hazard regardless of the presence of flammable/combustible materials in the workplace. Common Hot Work processes are welding, soldering, cutting, grinding, and brazing.¹ The equipment used in the process can produce flames, sparks, or heat that is sufficient to start a fire or ignite flammable/combustible materials.



Fig. 1.1: Welding on a crusher mantle

FIRE SAFE AREAS

A fire safe designated area is an area specifically designed for Hot Work (e.g., welding shops), which are free of any exposed combustibles. Fire safe designated areas are sometimes known as fire safe areas, Hot Work free zones, or fire safe zones. All sites must identify each fire safe area along with the tasks that employees can perform. Sites also must maintain a record of the area and the processes.



Fig. 1.2: Designated fire safe area

¹ FCX Department of Occupational Health and Safety, *Hot Work Policy*, FCX-HS06, (Corporate Safety Portal, DOHS Policies: 2018), 1.

HOT WORK PERMIT

Areas not designated as fire safe require a Hot Work Permit.² The Hot Work Permit helps to guide workers through the process. The supervisor must file the permit for a minimum of one year.

WHEN IS A PERMIT REQUIRED?

Employees must complete a Hot Work Permit when Hot Work operations will be on or near operational processes, or within one of the following:

- 35 feet (11 meters) of distance for flammable/combustible materials
- 50 feet (15 meters) of distance for flammable gases or vapors
- 100 feet (30 meters) of distance for powder magazines³

Employees must also complete a Hot Work Permit when performing work within 35 feet (11 meters) of the following:

- Fuel storage areas or distribution lines
- Battery storage or charging areas
- Cooling towers
- Reagent storage
- Oxygen storage areas
- Sewer and septic systems
- Conveyor belting
- Tire storage areas
- Mobile fuel and lubrication trucks
- Storage/materials handling areas where combustible or flammable materials are present
- Other areas designated as permit required through established signs/labeling

² FCX Department of Occupational Health and Safety, *Hot Work Policy, FCX-HS06*, (Corporate Safety Portal, DOHS Policies: 2018), 1.

³ FCX Department of Occupational Health and Safety, *Hot Work Policy, FCX-HS06*, (Corporate Safety Portal, DOHS Policies: 2018), 1.

ABOUT THE PERMIT

In the event a Hot Work Permit is necessary, those authorizing and performing Hot Work must initiate the process before beginning work. Operations must keep the permit at the job site until 30 minutes after the job is complete and risk of fire has subsided.

A Hot Work Permit is good for only one work shift and one task.⁴ Anyone involved with the Hot Work, or assisting with the Hot Work, must sign the permit. When parties sign the permit, they acknowledge the hazards, Fatal Risks, critical controls, and the roles and responsibilities before the start of the task.

The permit becomes invalid under one of the following conditions:

- A delay of 90 minutes or more of work
- A change in the environment
- A lack of Fire Watch(es)
- Work stopped by anyone due to control failure or hazard recognition

Obtain a Hot Work Permit by following the site-specific procedure. Complete all sections of the permit and do not leave any blanks.

See the following page for Hot Work Permit form.

⁴ FCX Department of Occupational Health and Safety, *Hot Work Policy, FCX-HS06*, (Corporate Safety Portal, DOHS Policies: 2018), 1.

<p>HOT WORK PERMIT FCX-HS06 Version 1</p> <p>Before signing this permit, think through the entire task and identify, evaluate and control energy sources. Safety precautions described in the Hot Work Policy must be followed. Every line on both sides must be completed. Evaluate the use of cold work alternatives prior to starting hot work.</p> <p>Not valid if work is delayed for 90 minutes or more. Good for one shift only</p> <p>Date _____ Shift _____</p> <p>WO No. _____</p> <p>From _____ AM/PM To _____ AM/PM</p> <p>Bldg. or Area _____</p> <p>Dept. _____ Floor _____</p> <p>Task/Activity _____</p> <p>_____</p> <p>Hot Work Performed By _____</p> <p>_____</p> <p>Fire watch assigned? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Required, if uncovered combustibles remain within 35 feet.</p> <p>Fire Watch _____</p> <p>_____</p> <p>Time Released by Fire Watch _____ AM/PM</p> <p>_____</p> <p>I verify that the area has been inspected</p> <p>_____</p> <p>Signatures of Persons Performing Work</p> <p>_____</p> <p>Signature of Area Supervisor or Designee</p> <p>_____</p> <p>Emergency Contact _____</p> <p>_____</p> <p>COMPLETE THIS SECTION AT END OF JOB</p> <p>Work Completed Date & Time: _____</p> <p>I verify the area has been monitored for the absence of fire for 30 minutes after hot work ceased, and that a thorough inspection of the entire work area has been completed.</p> <p>Final Inspection by: _____</p> <p>Time: _____</p>	<p>HOT WORK ON CONTAINERS & FUEL TANKS</p> <p>Containers holding flammable or combustible liquids or gases have been purged, cleaned, and filled with inert liquid or gases and tested for %LEL/LFL. NOTE: Welding on mobile equipment fuel tanks is not permitted.</p> <p>_____ Initial when reading is taken and tested to verify an LEL/LFL less than 10%</p> <p>HOT WORK IN ALL AREAS, INCLUDING THE ABOVE</p> <p>1. Person completing "Hot Work Permit" understands hazards in the hot work zone. <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>2. Flame or spark-producing equipment to be used has been inspected and found to be in good repair. <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>3. Sprinklers and fire water, where provided, are in working condition and will remain in service while this work is being done. <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>4. Portable fire extinguishers are available, are appropriate for the fire hazard, and personnel have been trained to use them. <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>5. All combustibles have been relocated 35 feet from the hot work, and the remainder protected with flame-proof curtains or covers, and a fire watch is assigned as needed. <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>6. All voids and openings leading to other areas (rooms, floors) have been covered. <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>7. All appropriate SOPs and good work practices are being followed. <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>8. Do you have the proper personal protective equipment including welding shields, respirators, hearing protection for the job? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>9. A method for contacting emergency responders is in place. <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>IF ANY ANSWER IS NO, A VARIANCE MUST BE COMPLETED</p> <p>AIR TESTING REQUIRED FOR WORK NEAR FLAMMABLE LIQUIDS AND GASES</p> <p>Oxygen level _____ % LEL _____ % Time _____</p> <p>Oxygen level _____ % LEL _____ % Time _____</p> <p>Oxygen level _____ % LEL _____ % Time _____</p> <p>Work must not proceed if oxygen level is above 23%, or the LEL is greater than 10% (note that oxygen must be above 19.5% in order to accurately measure LEL/LFL).</p>
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Fig. 1.3: Hot Work Permit

5 FCX Department of Occupational Health and Safety, Hot Work Policy, FCX-HS06, (Corporate Safety Portal, DOHS Policies: 2018), 2.

Here is an example of a completed permit.

HOT WORK PERMIT

FCX-HS06

HOT WORK PERMIT:
This section of the permit identifies the Authorized Individual who will be performing the task/activity. This section also identifies:

- Date
- Start and end time
- Location
- Department
- Task/Activity
- Individual(s) performing work
- Fire Watch
- Emergency contact

HOT WORK PERMIT FCX-HS06 Version 1
Before signing this permit, think through the entire task and identify, evaluate and control energy sources. Safety precautions described in the Hot Work Policy must be followed. Every line on both sides must be completed. Evaluate the use of cold work alternatives prior to starting hot work.

Not valid if work is delayed for 90 minutes or more. Good for one shift only

Date: 08/19/19 shift Day

WO No. 882620

From: 08:20 AM PM To: 11:00 AM PM

Bldg. or Area: _____

Dept. Hy: _____ Floor: Basement

Task/Activity: Repair a section of pipe near a settler

Hot Work Performed By: Carol Thomas

Fire watch assigned? Yes No
Required, if uncovered combustibles remain within 35 feet.

Fire Watch: Roger Garcia

Time Released by Fire Watch: 11:20 AM PM

I verify that the area has been inspected
Carol Thomas

Signatures of Persons Performing Work
Dave Jones

Signature of Area Supervisor or Designee
Main Gate, channel 14

Emergency Contact: Main Gate, channel 14

COMPLETE THIS SECTION AT END OF JOB:
Once work is complete, document the date and time. Ensure the final inspection is signed by the assigned Fire Watch 30 minutes from the time the work is completed. Record the end time.

HOT WORK ON CONTAINERS & FUEL TANKS
Containers holding flammable or combustible liquids or gases have been purged, cleaned, and filled with inert liquid or gases and tested for %LEL/LFL. NOTE: Welding on mobile equipment fuel tanks is not permitted.
C.T. Initial when reading is taken and tested to verify an LEL/LFL less than 10%.

HOT WORK IN ALL AREAS, INCLUDING THE ABOVE
1. Person completing "Hot Work Permit" understands hazards in the hot work zone. Yes No

2. Flame or spark-producing equipment to be used has been inspected and found to be in good repair. Yes No

3. Sprinklers and fire water, where provided, are in working condition and will remain in service while this work is being done. Yes No

4. Portable fire extinguishers are available, are appropriate for the fire hazard, and personnel have been trained to use them. Yes No

5. All combustibles have been relocated 35 feet from the hot work, and the remainder protected with flame-proof curtains or covers, and a fire watch is assigned as needed. Yes No

6. All voids and openings leading to other areas (rooms, floors) have been covered. Yes No

7. All appropriate SOPs and good work practices are being followed. Yes No

8. Do you have the proper personal protective equipment including welding shields, respirators, hearing protection for the job? Yes No

9. A method for contacting emergency responders is in place. Yes No

IF ANY ANSWER IS NO, A VARIANCE MUST BE COMPLETED

AIR TESTING REQUIRED FOR WORK NEAR FLAMMABLE LIQUIDS AND GASES

Oxygen level	<u>NA</u>	%	LEL	<u>NA</u>	%	Time
Oxygen level	<u>NA</u>	%	LEL	<u>NA</u>	%	Time
Oxygen level	<u>NA</u>	%	LEL	<u>NA</u>	%	Time

Work must not proceed if oxygen level is above 23%, or the LEL is greater than 10% (note that oxygen must be above 19.5% in order to accurately measure LEL/LFL).

HOT WORK ON CONTAINERS & FUEL TANKS:
Any Hot Work that must be performed on containers holding flammable or combustible liquids/gases must be purged, cleaned and filled with inert liquid or gases and tested for % LEL/LFL.

HOT WORK IN ALL AREAS:
Read each item 1-9 and answer by checking either the "Yes" or "No" box. If any answers checked No, a variance must be completed. For additional information on Variances, please refer to the Policy Administrative Requirements FCX-HS01 located under DOHS Policies.

ATMOSPHERIC TESTING:
Atmospheric testing is conducted where there is a reasonable possibility for flammable gases, vapors, or excessive oxygen.

NOTE:

- LEL must be below 10%
- Oxygen Measurement must be below 23%

Stop all work if oxygen is above 23% or LEL are greater than 10%.
Note: if not applicable to the task, place NA for not applicable

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Fig. 1.4: Completed Hot Work Permit Example

ACTIVITY 2: COMPLETING A HOT WORK PERMIT

Directions: Use the following scenario to fill out a Hot Work Permit.

The administration department requested that the maintenance group repair a flagpole damaged by wind and cracked at its base. You must remain in the field to complete the task.



HOT WORK PERMIT FCX-HS06 Version 1

Before signing this permit, think through the entire task and identify, evaluate and control energy sources. Safety precautions described in the Hot Work Policy must be followed. Every line on both sides must be completed. Evaluate the use of cold work alternatives prior to starting hot work.

Not valid if work is delayed for 90 minutes or more. Good for one shift only

Date _____ Shift _____
WO No. _____
From _____ AM/PM To _____ AM/PM
Bldg. or Area _____
Dept. _____ Floor _____
Task/Activity _____

Hot Work Performed By _____

Fire watch assigned? Yes No
Required, if uncovered combustibles remain within 35 feet.

Fire Watch _____

Time Released by Fire Watch _____ AM/PM

I verify that the area has been inspected

Signatures of Persons Performing Work

Signature of Area Supervisor or Designee

Emergency Contact _____

COMPLETE THIS SECTION AT END OF JOB

Work Completed Date & Time: _____

I verify the area has been monitored for the absence of fire for 30 minutes after hot work ceased, and that a thorough inspection of the entire work area has been completed.

Final Inspection by: _____

Time: _____

HOT WORK ON CONTAINERS & FUEL TANKS

Containers holding flammable or combustible liquids or gases have been purged, cleaned, and filled with inert liquid or gases and tested for %LEL/LFL. NOTE: Welding on mobile equipment fuel tanks is not permitted.

_____ Initial when reading is taken and tested to verify an LEL/LFL less than 10%

HOT WORK IN ALL AREAS, INCLUDING THE ABOVE

1. Person completing "Hot Work Permit" understands hazards in the hot work zone. Yes No
2. Flame or spark-producing equipment to be used has been inspected and found to be in good repair. Yes No
3. Sprinklers and fire water, where provided, are in working condition and will remain in service while this work is being done. Yes No
4. Portable fire extinguishers are available, are appropriate for the fire hazard, and personnel have been trained to use them. Yes No
5. All combustibles have been relocated 35 feet from the hot work, and the remainder protected with flame-proof curtains or covers, and a fire watch is assigned as needed. Yes No
6. All voids and openings leading to other areas (rooms, floors) have been covered. Yes No
7. All appropriate SOPs and good work practices are being followed. Yes No
8. Do you have the proper personal protective equipment including welding shields, respirators, hearing protection for the job? Yes No
9. A method for contacting emergency responders is in place. Yes No

IF ANY ANSWER IS NO, A VARIANCE MUST BE COMPLETED

AIR TESTING REQUIRED FOR WORK NEAR FLAMMABLE LIQUIDS AND GASES

Oxygen level _____ %	LEL _____ %	Time _____
Oxygen level _____ %	LEL _____ %	Time _____
Oxygen level _____ %	LEL _____ %	Time _____

Work must not proceed if oxygen level is above 23%, or the LEL is greater than 10% (note that oxygen must be above 19.5% in order to accurately measure LEL/LFL).

AREA SAFE FOR HOT WORK

Before beginning work, check to see that the Hot Work area is free of any exposed combustibles. Relocate all combustible material and debris at least 35 feet (11 meters) from the work area. If relocation is impossible, secure combustibles with flame-resistant blankets or shield combustibles with heat-resistant curtains.⁶ Protect combustible objects from falling sparks, hot materials, and igneous byproduct generated from Hot Work.

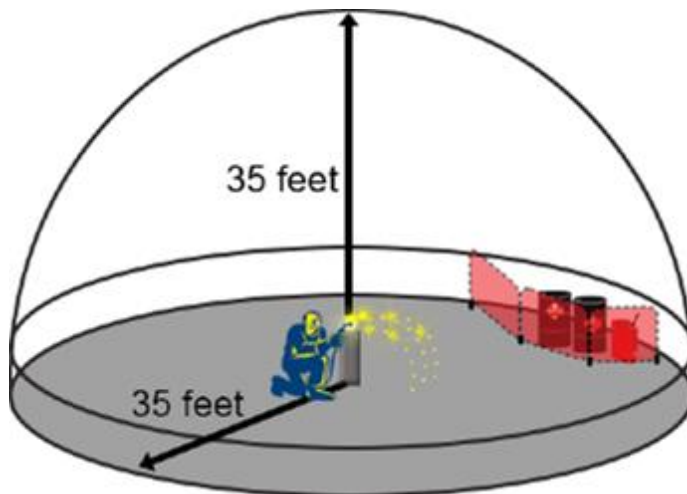


Figure 1.5: Diagram of area safe for Hot Work



Figure 1.6: Welding Shop with curtain

⁶ FCX Department of Occupational Health and Safety, *Hot Work Policy*, FCX-HS06, (Corporate Safety Portal, DOHS Policies: 2018), 1.

FLAMMABLES AND COMBUSTIBLES

Flammable and combustible liquids are present at all of the sites. Fuels and many common products like solvents, thinners, cleaners, adhesives, and paints may be flammable or combustible liquids.⁷ Everyone who works with these liquids must be aware of the hazards and know how to work safely with them. Employees can reference the Safety Data Sheet (SDS) and other reference materials that contain information on the properties of a specific material or liquid.

Table 1.1: Flammable vs. Combustible Material

	Flammable Material	Combustible Material
Definition	Material that can easily catch fire under normal circumstances and with the help of minimal ignition source. A simple spark is sufficient.	Any material that will burn but requires more vigorous conditions. A simple spark is not enough.
Examples	Fuel, solvents, thinners, cleaners, adhesives, paint	Combustible liquids, metal, wood, paper, rubber, certain dust concentrates, plastics
Flash Point	Below 100 degrees Fahrenheit / 38 degrees Celsius (<100°F / 38°C)	Between 100 and 200 degrees Fahrenheit / 38 and 93 degrees Celsius (100°F/38°C - 200°F/93°C)

⁷ Health Safety & Environment, "Flammable Materials," *Hsewebsite.com*, Accessed July 25, 2019, <http://www.hsewebsite.com/flammable-materials/>.

COMBUSTIBLE AREAS

Areas with known, but not readily visible, combustibles must have appropriate signage that requires the use of a Hot Work Permit.⁸ Examples of the areas include the following:

- Electrical installations
- Conveyor galleries
- Machinery that contains rubber or plastic products



Figure 1.7: Signage requiring Hot Work Permit in the area

When working in combustible areas, it is vital to identify and utilize controls on items that are plastic, rubber-lined, combustible, or flammable. Ensure there is a Fire Watch or multiple Fire Watches when introducing ignition sources into a combustible area.

FLAMMABLE GAS

Flammable gases will and do create conditions that expose employees to a hazardous atmosphere.

Where there is a reasonable possibility that flammable gases, vapors, or excessive oxygen may exist, trained personnel must conduct atmospheric testing as part of the permit process. Additionally, trained personnel must conduct periodic atmospheric checks throughout the Hot Work task to ensure flammable gases are within range or eliminated during Hot Work.

Remember, the Freeport-McMoRan Hot Work Policy (FCX-HS06) requires that Hot Work must be 50 feet (15 meters) or more away if flammable gases or vapors are present.⁹



Figure 1.8: Flammable gas propane tank

⁸ FCX Department of Occupational Health and Safety, *Hot Work Policy, FCX-HS06*, (Corporate Safety Portal, DOHS Policies: 2018), 1.

⁹ FCX Department of Occupational Health and Safety, *Hot Work Policy, FCX-HS06*, (Corporate Safety Portal, DOHS Policies: 2018), 1.

HAZARDOUS CONDITIONS

As work progresses, conduct periodic checks of the work area and observe for fire, dust accumulation, adequate ventilation, atmospheric testing, or other hazardous conditions. If anyone observes a hazard, stop the job and correct the problem before continuing work.



Figure 1.9: Employees evaluating new hazardous condition

MODULE 1 QUIZ

Directions: Complete the following quiz.

1. According to the Freeport-McMoRan Hot Work Policy (FCX-HS06), Hot Work is any process that can be a _____ when flammable or combustible materials are present or can be a fire hazard regardless of the presence of flammable/combustible materials in the workplace.
 - a. source of fire
 - b. source of heat
 - c. source of ignition
 - d. source of explosion

2. A fire safe designated area is an area specifically designed for Hot Work (e.g., welding shops), which are free of any exposed _____.
 - a. ignition sources
 - b. combustibles
 - c. heat sources
 - d. flammables

3. Areas not designated as fire safe require a Hot Work Permit.
 - a. True
 - b. False

4. All combustible materials are flammable.
 - a. True
 - b. False

5. Complete a Hot Work Permit when working within _____ of combustible materials.
 - a. 35 feet (11 meters)
 - b. 50 feet (15 meters)
 - c. 90 feet (27 meters)
 - d. 100 feet (30 meters)

Critical Controls



MODULE 2

MODULE 2: CRITICAL CONTROLS

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MODULE 2 LEARNING OBJECTIVES

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

- Identify the use of applicable controls

INTRODUCTION

This module discusses several critical controls and methods to eliminate the risk of fire. The module then describes PPE, fire suppression, and emergency procedures that protect employees in the event of a control failure.

HAZARD CONTROL

While on the job, identify all Fatal Risks and inspect all critical controls already in place to evaluate if they are in proper working order. If conditions change, stop the work.



Figure 2.1: Signage in Hot Work Permit Free Zone

AREA INSPECTION

The first step for implementing Hot Work procedures is to begin by evaluating the work area by identifying combustible/flammable material and Fatal Risks. This evaluation takes place before, during, and after performing Hot Work.

Some questions to ask when conducting a workplace exam:

- What could happen if conditions such as weather and lighting change?
- Have you and your coworkers been trained to perform the given tasks? Do not perform a task unless trained to complete it safely.
- Are there hazards that could originate from outside of your work area? Examples include dust or gas, like vehicle exhaust, which migrates into the work area from somewhere else.
- Are your activities creating hazards for you and others in the area? Examples include working with open holes, welding above people who are walking, or using chemicals that could splash or need specific gloves or equipment to handle.



Figure 2.2: Workplace Exam

When employees cannot relocate work, complete a Hot Work Permit. Protect flammable materials either with fire-resistant or insulating material and assign a Fire Watch.

EMERGENCY PROCEDURES

Completing a workplace exam helps with identifying any safety concerns such as clear walkways, housekeeping issues, and safe access to all escape and emergency exits. Before conducting any work, discuss an escape plan with all the individuals involved.

- Always thoroughly evaluate the scope of the work and develop a rescue plan that includes a way for safe/fast rescue (e.g., man-lift, scissor lifts).
- Become familiar with the area's emergency procedures and do not put yourself in harm's way.
- If an emergency occurs, follow the site's emergency procedures.
 - Know and follow the site's radio procedures.
 - Know the site's emergency numbers and procedures.



Figure 2.3: Example of a handheld radio

FLAGGING AND BARRICADING

Before starting Hot Work, determine if it is necessary to use flagging and barricading. Anyone not involved in performing Hot Work will not pass through a guarded or flagged area or go around a welding curtain unless the employee has the authorization to be in the area or the employee adheres to the Flagging and Barricading Policy.



Figure 2.4: Flagging and tag used to warn others of possible hazard

FIRE SUPPRESSION

Work areas provide fire extinguishers to assist in escape or to extinguish a small fire in its early stages. If there is even the slightest doubt about personal safety, do not fight the fire. Instead, exit the area immediately and notify emergency personnel.

Often during Hot Work, it is necessary to isolate nearby alarm systems. When working on or near fire suppression or alarm equipment, ensure the following:

- Do not deactivate the entire alarm or sprinkler system when working near smoke detectors, alarm sensors, or sprinkler systems.
- Isolate the detectors, sensors, or sprinkler heads in the affected area to prevent false alarms or sprinkler system activation.
- Ensure the device(s) is (are) returned to normal service conditions after the completion of work.
- Make appropriate notifications to site operations.



Figure 2.5: Fire extinguisher location

VENTILATION REQUIREMENTS

The goal of ventilation is to keep fresh air moving through the space, making the air safe to breathe and work in. Always be sure there is an adequate supply of blowers and flexible ducts for the types of operations performed.



Figure 2.6: Local exhaust ventilation

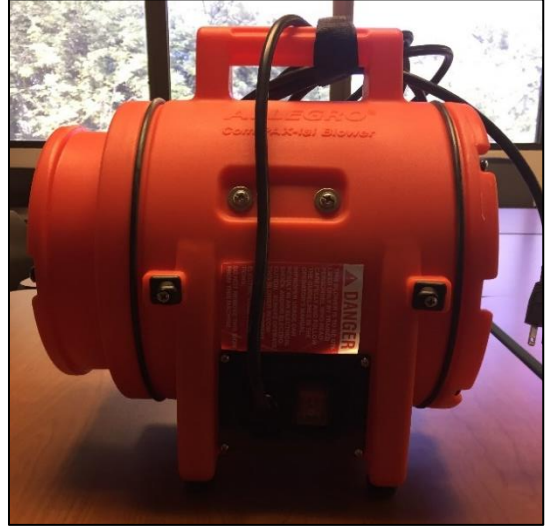


Figure 2.7: Confined space exhaust fan

LOCAL EXHAUST

Local exhaust ventilation systems effectively remove hazardous fumes and dust generated from operations such as welding, cutting, burning, and continuous brazing at or near the generation point.



Figure 2.8: Local exhaust ventilation diagram

FORCED AIR

Sites use forced air ventilation as a primary source of air circulation or in conjunction with a local exhaust system called a Push-Pull system whenever possible. Forced air (dilution) systems are much more effective than local exhaust systems.¹⁰



Figure 2.9: Forced air ventilation diagram

¹⁰ Local exhaust and forced air ventilation diagram image credits: "Silent and Deadly, Proper Gas Detection Saves Lives," PK Safety, September 14, 2014, Accessed July 29, 2019, <https://pksafety.com/blog/silent-and-deadly-proper-gas-detection-saves-lives>.

MODULE 2 QUIZ

Directions: Complete the following quiz.

1. What is the goal of ventilation?
 - a. To keep bad air moving through the space, making the air safe to breathe and work in.
 - b. To keep fresh air moving through the space, making the air safe to breathe and work in.
 - c. To keep fresh air moving through the space, making the air dangerous to breathe and work in.
 - d. To keep bad air moving through the space, making the air dangerous to breathe and work in.

2. When do you create an emergency plan during Hot Work?
 - a. Before the permit expires
 - b. Once an emergency occurs
 - c. Before conducting any work
 - d. After the monthly safety meeting

3. After flagging and barricading an area, personnel not involved in the Hot Work operation cannot pass through the area.
 - a. True
 - b. False

4. Use fire extinguishers to put out large fires.
 - a. True
 - b. False

5. When should employees evaluate the work area by identifying combustible material, flammable material, and Fatal Risks? Circle all that apply.
 - a. After performing Hot Work
 - b. Before performing Hot Work
 - c. During performing Hot Work

Roles and Responsibilities



MODULE 3

MODULE 3: ROLES AND RESPONSIBILITIES

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MODULE 3 LEARNING OBJECTIVES

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

- Describe the roles and responsibilities of persons involved in Hot Work

INTRODUCTION

Performing Hot Work is a complex task that encompasses controlling the risk of injury or death as well as the specific knowledge needed to perform a task. This module explains the roles of qualified and authorized employees who may conduct Hot Work. The module then defines the role of the Fire Watch as well as discusses the required training for the role.

AUTHORIZED AND QUALIFIED PERSONNEL

Freeport-McMoRan only allows authorized and qualified personnel to perform Hot Work activities.

Qualified personnel have the following Hot Work responsibilities:

- Complete the Hot Work Permit Procedure if necessary.
- Remove all flammable or combustible materials within 35 feet (11 meters) of the Hot Work area. Further distances are necessary due to the type of combustible or situation (e.g., for powder magazines the Hot Work must be 100 feet (30 meters) away).
- Shield any combustibles in the Hot Work area that workers cannot remove with non-combustible blankets or other non-combustible materials.
- Use a non-combustible spray or water on combustible floors, walls, or ceiling areas around Hot Work operations if possible.
- Seal any cracks and openings through which hot sparks enter or pass through. Use a fire-resistant shield to block openings.
- Place non-combustible or flame-resistant curtains or screens to protect personnel in adjacent work areas from heat, flames, UV, radiant energy, and weld splatter.
- Inspect all cutting and welding equipment to ensure that they are in proper operating condition and good working order.
- Ensure completion of proper task training in the safe operation of the equipment and the Hot Work process they are about to perform.



Figure 3.1: Qualified person conducting Hot Work

The procedures for the Hot Work Permit include the following steps:

1. The Authorized Person inspects the area before authorizing a Hot Work permit.
2. The employee/Hot Work operator completes the Hot Work Permit at the job area and posts the permit until completion of the job or duration of the permit (not to exceed the work shift).
3. All personnel involved in the Hot Work sign the permit.
4. The employee/Hot Work operator returns the Hot Work Permit to the supervisor after completing or at the end of the work shift.
5. The department who initiated the permit stores and maintains the permit.

FIRE WATCH

A Fire Watch is a trained and authorized person posted at the Hot Work job site who remains there for the duration of the job and beyond as required by the Hot Work Permit. This individual has the following Hot Work responsibilities:

- Assists with fire control, communication, and inspection of the affected area.
- Monitors the Hot Work areas to make sure that conditions do not change when workers cannot effectively remove, protect, or shield combustible materials.
- Helps prevent and extinguish fires at the incipient (beginning) stage.
- Observes for fire, dust accumulation, adequate ventilation, atmospheric testing, or other hazardous conditions that endanger the safety of the workers.
- Performs no other functions or tasks during their assignment as a Fire Watch.
- Is able to activate the alarm if unable to extinguish a fire in the areas exposed to the Hot Work.



Figure 3.2: Fire Watch observing Hot Work

Before permitting any Hot Work, the authorizing individual responsible for identifying and implementing all precautions and assigning the proper individuals must inspect Hot Work area. Procedures require that each person assigned as a Fire Watch sign and date the Hot Work Permit.

LOCATIONS

Freeport-McMoRan requires a Fire Watch whenever performing Hot Work in locations where the following conditions exist:

- The combustible material is closer than 35 feet (11 meters) to the point of operation.
- Combustibles are more than 35 feet (11 meters) away but easily ignited by sparks.
- Wall or floor openings within a 35-foot (11-meter) radius expose combustible material in adjacent areas including concealed spaces in walls or floors.¹¹
- Wherever workers cannot close floor openings or cracks in the flooring, take precautions to eliminate exposure of readily combustible materials.
 - Look for exposure of materials located on floor below to sparks which can drop through the floor.
 - Observe the same precautions about cracks or holes in walls, open doorways, and open or broken windows.¹²



Figure 3.3: Fire Watch with a fire extinguisher

¹¹ Illinois Wesleyan University, “IWU Physical Plant Safety Program,” www.iwu.edu, Accessed July 25, 2019, <https://www.iwu.edu/physical-plant/safety-documents/section09/hot-work-plan.pdf>.

¹² Washington State Legislature, “Washington Administration Code (WAC) 296-24-6950,” apps.leg.wa.gov, Accessed July 25, 2019, <https://apps.leg.wa.gov/WAC/default.aspx?cite=296-24-69503>.

POTENTIAL HAZARDS

The Fire Watch must remain at the Hot Work duty for 30 minutes after the completion of the Hot Work task to detect and extinguish possible smoldering fires.¹³ If, after 30 minutes, the material is still noticeably hot, the workers must cool the surface by appropriate means or extend the watch until the risk has abated.

Put controls in place when any of the following potential hazards exist:

- Cannot remove, protect, or shield combustible materials.
- Possible exposure to welding or toxic fumes.
- Transference of heat from one space to another or to spaces below.
- Potential of fire in adjacent spaces.
- Any coverings used to protect equipment are not fire retardant.



Figure 3.4: Fire Watch observing 30-minute wait period

MULTIPLE FIRE WATCHES

Additional safeguards apply when applying the 35-foot (11-meter) rule involving elevated work. Workers close the doors, seal the floor openings, post the permit, and prevent general access. Supervision determines the need for additional Fire Watches. To protect the operators, position the operator to limit spatter during work if possible and relocate combustible storage or cover with approved barriers. Additionally, protect equipment below and position Fire Watchers to protect potential hazard areas. Always provide a means for communication.

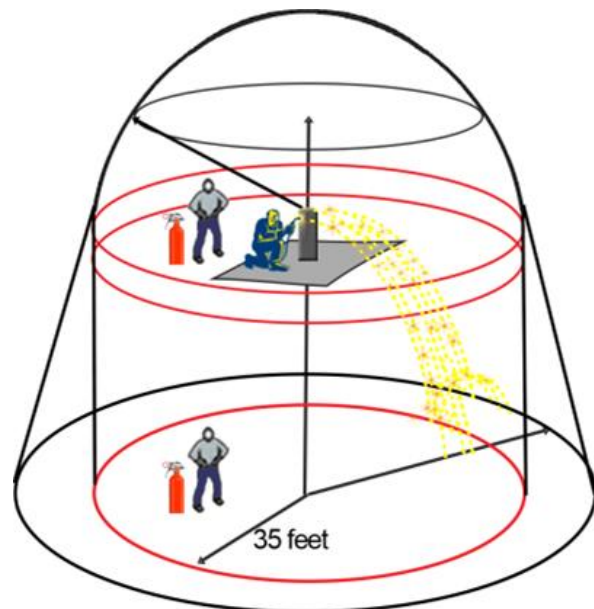


Figure 3.5: Diagram of multiple Fire Watches

¹³ FCX Department of Occupational Health and Safety, *Hot Work Policy, FCX-HS06*, (Corporate Safety Portal, DOHS Policies: 2018), 1.

The following conditions require additional or multiple Fire Watches:

- Fire Watch cannot be present at all times during the performance of Hot Work.
- Fire Watch does not have a clear view of and immediate access to all areas included in the fire watch.
- Fire Watch is unable to communicate with all the workers involved in the Hot Work.
- Fire Watch is unable to extinguish all incipient stage fires in the Hot Work area.
- Fire Watch is unable to alert all employees of any fire beyond the incipient stage.
- Fire Watch is unable to activate the alarm if unable to extinguish a fire in the areas exposed to the Hot Work.

TRAINING

Any individual assigned as a Fire Watch must be physically capable of performing the necessary duties and must complete training in the use of any required fire-extinguishing equipment. Individuals involved with Hot Work must complete training in fire prevention and extinguisher use during initial training and refreshed annually.



Figure 3.6: Fire extinguisher use in simulated training environment

MODULE 3 QUIZ

Directions: Complete the following quiz.

1. Which of the following responsibilities aligns with the individual performing the Hot Work? Circle all that apply.
 - a. Complete the Hot Work Permit Procedure if necessary.
 - b. Inspect all cutting and welding equipment to ensure they are in proper operating condition and good working order.
 - c. Remove all flammable or combustible materials within a thirty-five-foot radius of the Hot Work area.
 - d. Ensure completion of proper task training in the safe operation of the equipment and the Hot Work process about to perform.

2. Only the Authorized Person and supervision must sign the Hot Work Permit.
 - a. True
 - b. False

3. A Fire Watch is a trained and authorized person posted at the Hot Work job site who remains there for the duration of the job and beyond as required by the Hot Work Permit.
 - a. True
 - b. False

4. The Fire Watch must remain at the Hot Work duty for _____ minutes after the completion of the Hot Work task to detect and extinguish possible smoldering fires.
 - a. 5
 - b. 15
 - c. 30
 - d. 45

5. Which of the following situations require multiple Fire Watches? Circle all that apply.
 - a. A single Fire Watch cannot be present at all times during the performance of Hot Work.
 - b. A single Fire Watch does not have a clear view of and immediate access to all areas included in the fire watch.
 - c. A single Fire Watch is unable to communicate with all workers involved in the Hot Work.
 - d. A single Fire Watch is unable to extinguish all incipient stage fires in the Hot Work area and unable to activate the alarm.

Equipment



MODULE 4

MODULE 4: EQUIPMENT

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MODULE 4 LEARNING OBJECTIVES

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

- Summarize the various equipment and hazards for different types of Hot Work

INTRODUCTION

Workers achieve safe mitigation of these hazards by utilizing the correct equipment and ensuring the equipment is safe to use. Inspection and care are paramount to ensuring safe working conditions. The best approach is to eliminate the need for Hot Work if possible. Utilize engineering controls or alternate tools to eliminate the risk of fire and often encourage alternate means to Hot Work.

This module discusses the proper use and selection of equipment to conduct work safely. If there are questions or concerns about the materials or hazards, including which PPE to wear, stop the job and consult with the supervisor or health and safety department before continuing work.

CURTAINS, PADS, AND BLANKETS

Welding curtains, pads, and fire blankets are all controls used to mitigate property damage and injuries. These controls do not eliminate the hazard, but workers can use them as engineering or substitution controls. It is important to know the hazards and applications of the curtains, pads, and blankets.

Table 4.1: Summary of Curtains, Pads, and Blankets

	Curtains/Screens	Pads	Fire Blankets
Material	Heat-resistant fabric	Heat-resistant fabric	Heat-resistant fabric
Application	Vertical applications with light to moderate exposures; prevent sparks from escaping confined area	Horizontal applications with severe exposures; placed directly under Hot Work operation	Horizontal applications with light to moderate exposures
Examples	Chipping, grinding, heat-treating, and light horizontal welding	Molten substances or heavy horizontal welding	Chipping, grinding, heat-treating, and light horizontal welding



Figure 4.1: Examples of welding curtain/screen, welding pad, and welding blanket

WELDING EQUIPMENT HAZARDS

Welding equipment can produce a risk if workers do not complete a proper inspection or do not use the equipment properly. Shock, fume exposure, fire, and explosions are a few risks related to Hot Work. To mitigate equipment risks, use controls such as guards and ground fault equipment. Proper inspection and use of the equipment and control are vital to employee safety.

EQUIPMENT INSPECTIONS

It is vital to inspect all equipment at the start, during, and after each task. Inspect equipment for proper functionality and inspect them to maintain safe working conditions. Never use defective or damaged equipment as it can lead to injury or even death. Follow site-specific procedures for inspection of equipment. When removing damaged or defective equipment from the job, follow the site's tag out procedure.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Protect exposed personnel from heat, sparks, slag, noise, and ultraviolet radiation hazards through the use of fire-resistant screens or shields, or other protective measures. Conducting Hot Work requires standardized and specialized PPE for both the operator and the Fire Watch. Never spray any type of bug repellent or aerosol prior to conducting Hot Work, as this may make the material flammable or combustible.

The correct use of the appropriate PPE allows freedom of movement while still providing adequate protection from Hot Work hazards and preventing burns, the most common welding injury, and exposure to arc flash.

For any Hot Work application, use leather and flame-resistant treated clothing. Synthetic material, such as polyester or rayon (e.g., reflective vests), will melt when exposed to extreme heat. When performing welding out of position, such as vertical or overhead welding, use welding leathers.

The table on the following pages summarizes the various PPE used during Hot Work operations.



Figure 4.2: Personnel wearing leather PPE

Table 4.2: Summary of PPE








Protection Type	Guidelines	Examples
Head and Eye	<ul style="list-style-type: none"> • Use based on hazard • Protect face and eyes • Keep debris from hitting eyes • Choose right shade lens 	<ul style="list-style-type: none"> • Helmets, shields, goggles • Safety glasses with side shields • Filter Lens Shade: #5 for Gas Welding or #10 for Arc Welding • Hard hats  <p><i>Figure 4.3: Shaded face shield for oxyacetylene cutting</i></p>
Hearing	<ul style="list-style-type: none"> • Choose based on type of job and area conditions • Ensure proper fit and allow unrestricted functioning of other PPE • Wear when working near high noise levels 	  <p><i>Figure 4.4: Earplugs and earmuffs</i></p>
Respiratory	<ul style="list-style-type: none"> • Ensure compatible with other PPE • Ensure have proper authorization to use • Complete fit test prior to use • Utilize correct respirator with proper cartridge for job 	<ul style="list-style-type: none"> • Low profile pads or slim cartridges • Use cartridges with R (Oil-Resistant) or P (Oil-Proof) as needed   <p><i>Figure 4.5: Welding hood respirator and back-facing cartridge</i></p>

Table 4.2: Summary of PPE (continued)

Protection Type	Guidelines	Examples
<p>Body</p>	<ul style="list-style-type: none"> • Use fire-resistant material • Never wear polyester/rayon type material (e.g., polyester reflective vest, fleece) • Avoid rolling up sleeves or pant cuffs • Keep pants over top of work boots – do not tuck in • Keep gloves dry to protect from electric shock 	<ul style="list-style-type: none"> • Nomex/Kevlar, coveralls, uniforms, and shirts • Full or half top leathers • Welding gloves • Leather boots with 6-to-8-inch ankle coverage • Metatarsal guards over shoelaces • Heavy, flame-resistant, or leather gloves  <p><i>Figure 4.6: FR-rated long sleeve shirt and welding</i></p>
<p>Fall</p>	<ul style="list-style-type: none"> • Select properly • Use flame-resistant material 	<ul style="list-style-type: none"> • Nomex/Kevlar  <p><i>Figure 4.7: Example of tag indicating Nomex/Kevlar material</i></p>

Learn from Others

On February 2, 2018, an individual was seriously burned while cutting lifting lugs off the liners of an Auto Mill feed cart using an air arc. The victim was positioned at the discharge end of the feed chute, and he was wearing leather gloves and arm/chest protection over the standard uniform shirt (100% cotton). The uniform shirt caught fire when slag/sparks from the air arc hit the lower left side of the shirt. After trying unsuccessfully to take the shirt off, another coworker put the fire out using a fire extinguisher.

The PPE available and worn was inadequate to protect the entire surface area of the employee's torso.



Figure 4.8: Uniform shirt after the incident

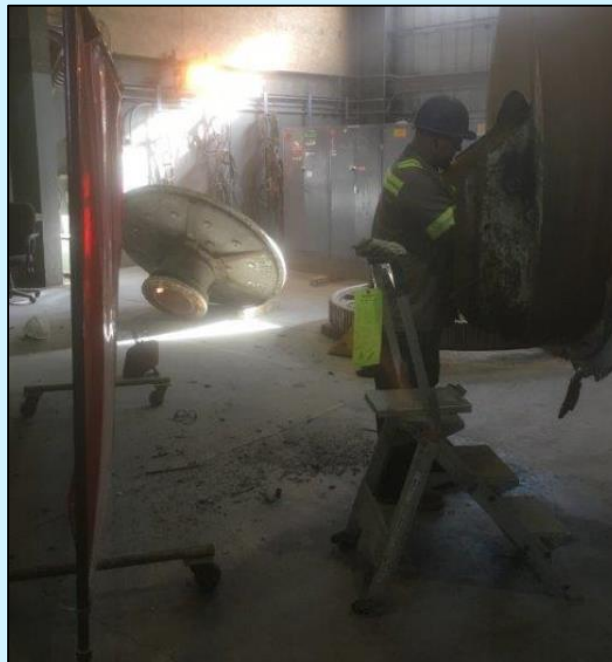


Figure 4.9: Location of employee while performing work

Answer the following question about the incident.

What PPE could have prevented this incident?

OTHER SAFETY CONSIDERATIONS

There are several other safety conditions to be aware of within the Hot Work environment.

- Those working in a confined space or an elevated area need to take extra precautions as these tasks are also Fatal Risks. Utilizing the appropriate critical control can mitigate these risks.
- Pay close attention to safety information on the products used and the safety data sheets provided by the manufacturer.
- Keep hands away from sharp edges if opening cans of the electrode.
- Remove all clutter and debris from the Hot Work area to prevent tripping or falling.
- Never use broken or damaged equipment or PPE.
- Never drive over or park on welding leads with vehicles or equipment.

ACTIVITY 3: DRESSED FOR HOT WORK

Directions: For each image, state whether the employee is properly dressed for Hot Work. If the employee is not properly dressed, state the reason why.

IMAGE 1



Is the employee dressed properly for Hot Work? Yes / No

If no, why not? _____

IMAGE 2



Is the employee dressed properly for Hot Work? Yes / No

If no, why not? _____

IMAGE 3



Is the employee dressed properly for Hot Work? Yes / No

If no, why not? _____

IMAGE 4



Is the employee dressed properly for Hot Work? Yes / No

If no, why not? _____

IMAGE 5



Is the employee dressed properly for Hot Work? Yes / No

If no, why not? _____

IMAGE 6



Is the employee dressed properly for Hot Work? Yes / No

If no, why not? _____

MODULE 4 QUIZ

Directions: Complete the following quiz.

1. What is the purpose of welding curtains, pads, and fire blankets? Circle all that apply.
 - a. Used to eliminate the hazard.
 - b. Used to substitute for the use of PPE and Hot Work procedures.
 - c. Used to mitigate property damage and injuries.
 - d. Used as engineering or substitution controls.

2. Workers only need to inspect equipment at the start of each task.
 - a. True
 - b. False

3. Which type of PPE material(s) do you use for any Hot Work application? Circle all that apply.
 - a. Rayon
 - b. Leather
 - c. Polyester
 - d. Flame-resistant

4. Tucking in the pants into the work boots helps protect feet from falling objects and sparks.
 - a. True
 - b. False

5. Which of the following equipment prevents sparks from escaping a confined area during Hot Work operations?
 - a. Pads
 - b. Blankets
 - c. Guards/barriers
 - d. Curtains/screens

Health Hazards



MODULE 5

MODULE 5: HEALTH HAZARDS

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MODULE 5 LEARNING OBJECTIVES

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

- Describe the health hazards associated with Hot Work

INTRODUCTION

When employees think of safety, they sometimes focus on external injuries rather than internal health. However, protecting your health is just as important. This module discusses common health hazards associated with Hot Work and the mitigation of those health hazards.

SUBSTANCES AND HEALTH HAZARDS

Solids, liquids, gases, mists, and fumes are often present during Hot Work activities. Exposure to hazardous substances can affect the body in many different ways. Skin contact, inhalation, and ingestion can cause damage.

Not properly utilizing controls can lead to exposure. If exposure to a hazardous substance occurs, workers can experience either acute effects or chronic effects of the symptoms and exposures. The following table summarizes the differences between acute and chronic effects.

Table 5.1: Acute vs. Chronic Effects

	Acute Effects	Chronic Effects
Time it takes to notice symptoms	Often immediate	Slower and harder to notice
Duration of exposure	Result from exposures over a short duration	Result from weeks, months, or years of exposure to hazardous substances

CONCENTRATES

Hot Work on anything that has been in contact with concentrate can generate hazards in addition to the hazards produced by conducting Hot Work (e.g., fume from welding, base metals used).

Working with components in contact with concentrates can release high levels of sulfur dioxide. Some concentrates used in the process contain higher concentrations of lead and other heavy metals that create a hazard when workers heat or burn the concentrates. Copper fumes can reach hazardous levels when welding on items that have copper concentrate on them. Hot Work on components in contact with molybdenum concentrate can generate molybdenum trioxide, which is more hazardous than other forms of molybdenum.

Employees must immediately report any potential overexposure to hazardous substances or any signs or symptoms they experience consistent with site hazards to the supervisor, as these conditions may require treatment.

COMMON HAZARDOUS SUBSTANCES

The table on the following pages outlines the substances most often generated when burning or distributing concentrates during Hot Work. The table identifies possible operational uses and the health effects associated with each substance.

Table 5.2: Common Hazardous Substances

Hazardous Substance	Operational Use	Acute/Chronic Effects
Hexavalent Chromium (CR-VI)	<ul style="list-style-type: none"> Where stainless alloys are cut or welded Specifically in locations that use sulfuric acid, including SX Plants, EW Tankhouses, Refineries, Acid Plants, and Smelters 	<p>Acute</p> <ul style="list-style-type: none"> Irritates the nose, throat, and lungs at high concentrations Creates symptoms of itching and burning sensations, sneezing, runny nose, and cough <p>Breathing small amounts of hexavalent chromium even for long periods does not cause respiratory irritation in most people.</p> <p>Chronic</p> <ul style="list-style-type: none"> Manifests most obviously in the nose Develops into nosebleeds and sores May result in the formation of a chrome hole – a perforation of the wall separating the nasal passages <p>Hexavalent chromium is a known carcinogen in part due to chronic irritation constantly provoking an immune response.</p>

Table 5.2: Common Hazardous Substances (continued)

Hazardous Substance	Operational Use	Acute/Chronic Effects
Arsenic	<ul style="list-style-type: none"> • Occasionally released when cutting or welding on certain stainless steels and aluminum • More commonly a concern at Miami's ISA and Converters as well as El Paso's tankhouse and anode casting facilities 	<p>Chronic</p> <ul style="list-style-type: none"> • Known human carcinogen associated with cancers in the lungs, liver, kidney, and bladder • Skin diseases are also common results, manifesting with scaly appearances, lesions, warts, and skin cancers
Manganese	<ul style="list-style-type: none"> • Common alloy used for strengthening metal against wear • High levels found on metal components designed for impact with rocks and ore – haul truck bed liners, loader cutting edges, shovel teeth, and crush & convey components • Present in welding wire, rods, and flux • Health concern when inhaled 	<p>Acute</p> <ul style="list-style-type: none"> • Effects on the nervous system • Differences in memory, reaction time, hand-eye coordination, and mood • Loss of sex drive and sperm damage <p>Chronic</p> <ul style="list-style-type: none"> • Largely acts on the nervous system • Manganism – a condition often compared to Parkinson's due to the similarity of symptoms • Tremors, rigidity, differences in gait, and a fixed gaze

Table 5.2: Common Hazardous Substances (continued)

Hazardous Substance	Operational Use	Acute/Chronic Effects
Sulfur Dioxide	<ul style="list-style-type: none"> • Byproduct in the roaster and at the agglomeration drums, due to the addition of acids • Produced by heating sulfur-containing compounds, found throughout molten sulfur unloading areas, acid plants, leaching, and SX/EW areas • Some concentrates contain sulfur, and if burned release sulfur dioxide 	<p>Acute</p> <ul style="list-style-type: none"> • Reacts with moisture present in mucous membranes of the eyes and respiratory tract to form sulfurous acid, and may further convert to sulfuric acid • Damages structures and tissue in the lungs which are responsible for transporting oxygen and removing foreign material and mucus <p>Chronic</p> <ul style="list-style-type: none"> • Respiratory System – decreased lung function, inflammation, asthma-like symptoms
Copper	<ul style="list-style-type: none"> • Steel associated with hot metal operations • Air-arc gouging to cut thick steel • Carbon monoxide an issue as the graphite electrode is consumed 	<p>Acute</p> <ul style="list-style-type: none"> • Metal fume fever from inhalation of fumes <p>Chronic</p> <ul style="list-style-type: none"> • Irritates the eyes and upper respiratory system • Metal fume fever • Skin discoloration • Skin sensitization
Lead	<ul style="list-style-type: none"> • Common in EW areas • Housekeeping practices to reduce transfer from surfaces in EW areas to lunchrooms, non-work clothing, and homes 	<p>Chronic</p> <ul style="list-style-type: none"> • Not effectively removed by the kidneys • Can stay in the body for a long time • Include stomach pain and intestinal problems, weakness, irritability, insomnia, high blood pressure, and kidney damage

Table 5.2: Common Hazardous Substances (continued)

Hazardous Substance	Operational Use	Acute/Chronic Effects
Zinc & Cadmium	<ul style="list-style-type: none"> Galvanized steel Hot Work on galvanized steel can generate very high levels of these metals 	<p>Acute</p> <ul style="list-style-type: none"> Metal fume fever – lethargy, headache, fever, chills, and other common fever/flu effects Symptoms typically clear 1-2 days after exposure
Cobalt	<ul style="list-style-type: none"> Occasionally in alloys with tungsten-carbide Found in grinding and cutting tools 	<p>Acute</p> <ul style="list-style-type: none"> Causes respiratory sensitization, asthma-like symptoms, and decreased lung function <p>Chronic</p> <ul style="list-style-type: none"> Hard metal lung disease, a form of lung fibrosis
Mercury	<ul style="list-style-type: none"> Process at Miami Absorb into other metals and large amounts released when the metal heated Hot Work on mercury-contaminated steel can cause high levels of mercury vapor 	<p>Chronic</p> <ul style="list-style-type: none"> Neurotoxin Tremors, emotional changes, insomnia, weakness in muscles, and kidney failure

MITIGATING HEALTH HAZARDS

Conducting workplace exams enables the employee to identify what they are working with before conducting Hot Work. SDS sheets, surface prep, sampling, and respiratory protection are all means aimed at reducing health impacts.

SAFETY DATA SHEETS (SDS)

When performing Hot Work, employees need to know what substances, metals, and materials they are working with. Read the Safety Data Sheet (SDS) for the materials used in the work. Use the SDS as a guide for making decisions on how to stay protected when working with hazardous substances and materials.

The screenshot shows the 'SDS Search Center' interface for Freeport-McMoRan Copper & Gold. The page header includes the company logo and 'Comply Plus® v3.6.5 Global Site Viewing Station Sierra'. The main navigation bar contains 'Advanced Search', 'Search Templates Assign Product Categories', and 'Universal Product Search Browse Products at a Location'. The search area includes input fields for 'Common Name', 'Manufacturer', 'Ingredient Name', and 'Ingredient CAS', along with a 'Locations' link. Search options include 'Match ALL supplied criteria' (selected), 'Match ANY supplied criteria', and 'Match Criteria Exactly'. There are 'Search' and 'Clear' buttons. At the bottom, there are checkboxes for 'Search Archived' and 'Search Corporate'. The footer text reads: 'Hosted as Freeport McMoRan Copper & Gold. Comply Plus® Copyright © IHS Inc, 1999-2019. All Rights Reserved.'

Figure 5.1: Freeport's online SDS system

SURFACE PREP

Even the simple task of hosing residue off with water can remove surface contamination and concentrate on the surface. Be sure to follow site-specific procedures for cleaning or prepping surfaces before conducting Hot Work.

Test and continuously monitor the atmosphere of a pipe before and during Hot Work. Employees can utilize critical controls, such as ventilation and personal monitors, to reduce Fatal Risks. Freeport-McMoRan has experienced several events where Hot Work on long pipes ignited flammable gas inside the pipe. Acid is another substance that can react with various steel alloys to generate hydrogen gas in pipes.

SAMPLING

When performing Hot Work, the site's Industrial Hygienist may ask employees to wear a sampling pump to ensure that the employee does not exceed the exposure limits for welding fumes.

ENVIRONMENTAL AWARENESS

It is an expectation for employees to protect themselves and the environment. Always minimize environmental risks by using approved environmental controls. Act promptly and appropriately when faced with environmental concerns. Dispose of spent rods in approved containers and recycle materials appropriately. Contact the supervisor or site environmental department with any environmental questions or concerns.



Figure 5.2: Bucket used to hold spent welding rods

ACTIVITY 4: HAZARDOUS SUBSTANCES IN THE WORK AREA

Directions: With your group, discuss 3 hazardous substances that you may encounter in your work area while performing Hot Work. Discuss methods of mitigating these hazards. Use the space below to take notes and be prepared to share with the class.

HAZARDOUS SUBSTANCE FOUND IN MY WORK AREA: _____

Ways to mitigate the hazard:

HAZARDOUS SUBSTANCE FOUND IN MY WORK AREA: _____

Ways to mitigate the hazard:

HAZARDOUS SUBSTANCE FOUND IN MY WORK AREA: _____

Ways to mitigate the hazard:

MODULE 5 QUIZ

Directions: Complete the following quiz.

1. _____ effects are often immediate and result from exposures over a short duration.
 - a. Chronic
 - b. Acute
 - c. Small
 - d. Large

2. _____ effects are slower and harder to notice, arising from weeks, months, or years of exposure to hazardous substances.
 - a. Chronic
 - b. Acute
 - c. Small
 - d. Large

3. Which resource guides personnel on how to stay protected when working with hazardous substances and materials?
 - a. Fatal Risk Management (FRM)
 - b. Workplace Examination Form
 - c. Safety Data Sheets (SDS)
 - d. Hot Work Permit

4. Only test and continuously monitor the atmosphere of a pipe before Hot Work.
 - a. True
 - b. False

5. Always minimize environmental risk by using approved environmental controls.
 - a. True
 - b. False

High Hazard Areas



MODULE 6

MODULE 6: HIGH HAZARD AREAS

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MODULE 6 LEARNING OBJECTIVES

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

- Evaluate scenarios and categorize the associated hazards

INTRODUCTION

High hazard areas draw attention to potential major hazards when performing a task. Clear communication is crucial when working in high hazard areas where someone's life may be at stake. This module outlines the high hazards encountered during Hot Work. Remember, if you are unsure about something when working in high hazard areas, stop the job and consult the supervisor or health and safety department.

HIGH HAZARD AREAS

High hazard areas are locations that might explode, burn with such vigor as to approximate explosion, produce toxic fumes, or produce other dangerous effects. Awareness of the most common Hot Work hazards and knowing how to avoid them helps ensure a safe and productive work environment for everyone. Consider policies such as the Control of Hazardous Energy and Confined Space Entry in conjunction with the Hot Work Permit. When conducting Hot Work operations, follow the statutory requirements for high hazard areas such as fuel storage areas or explosive magazines. If unsure about the designation of an area, consult with the supervisor and site health and safety department.



Figure 6.1: Fuel storage area



The following are examples of high hazard areas:

- Within 100 feet (30 meters) of powder magazines or explosive or blasting storage area
- Dust collectors, ductwork, and other areas where rubber linings or combustible dust exists
- Public commercial buildings, warehouses, assay labs
- SX/EW plants and related work areas
 - Take specific precautions when performing cutting, welding, or other spark-producing work around SX/EW plants
 - Consult pertinent Standard Operating Procedures (SOPs) before working in these areas
- Above or adjacent to cable trays or electrical cables
- Inside vessels or confined spaces
- Heavy equipment including haul trucks, shovels, drills, graders, and dozers (regardless of the location) where sparks or hot metal contact combustible materials¹⁴

¹⁴ FCX Department of Occupational Health and Safety, *Hot Work Policy, FCX-HS06*, (Corporate Safety Portal, DOHS Policies: 2018), 1.

The following tables summarize high hazard areas.



Table 6.1: High Hazard Areas

Area	Guidelines	Examples
Pressurized System	<ul style="list-style-type: none"> Do not perform Hot Work on any vessel that is under pressure¹⁵ Relieve all pressurized systems of all pressure and purge before completing repairs 	 <p data-bbox="867 741 1268 800"><i>Figure 6.2: Performing Hot Work on pressurized system</i></p>
Confined Space	<ul style="list-style-type: none"> Close torch valves and positively shut off the gas supply to the torch Ensure critical controls: atmospheric testing, pre-inspection risk assessment, and respiratory protection Remove all welding and cutting equipment when not in use 	 <p data-bbox="867 1333 1219 1360"><i>Figure 6.3: Concave air arching</i></p>
Working at Heights	<ul style="list-style-type: none"> Welding or cutting from a ladder without a variance prohibited by policy¹⁶ Consider relocating work Use measures that protect everyone 	<ul style="list-style-type: none"> Fire retardant welding blankets Welding screens Fire-resistant fall protection (e.g., lanyards, wire rope self-tracking lanyard and personal fall limiter, harnesses) Aerial platform

¹⁵ FCX Department of Occupational Health and Safety, *Hot Work Policy, FCX-HS06*, (Corporate Safety Portal, DOHS Policies: 2018), 1.



¹⁶ FCX Department of Occupational Health and Safety, *Working at Heights Policy, FCX-HS02*, (Corporate Safety Portal, DOHS Policies: 2018), 1.

Table 6.1: High Hazard Areas (continued)

Area	Guidelines	Examples
<p>Around Conveyors</p>	<ul style="list-style-type: none"> • Perform Hot Work within 35 feet (11 meters) • Isolate the conveyor belts and screens from the Hot Work through the installation of solid metal barriers • Cover using fire-resistant materials • Use alternate means to complete the Hot Work task if possible • 	 <p>Figure 6.4: Signage warning of rubber or plastic parts in a high hazard area</p>
<p>In or On Tanks</p>	<ul style="list-style-type: none"> • Cut or weld tanks or vessels that contain or have contained flammable, combustible, or other hazardous substance vapors, liquids, or solid residues • Follow the strict procedures 	 <p>Figure 6.5: Tank with combustible material</p>
<p>Flammable Vapors</p>	<ul style="list-style-type: none"> • Ensure Hot Work 50 feet (15 meters) or more away from flammable/combustible gases¹⁷ • Purge, clean, and fill with inert liquid or gases all containers holding flammable/combustible liquids or gases. Then, test these containers to ensure that the LEL/LFL is below 10% 	<p>Explosion can occur when mixing vapors of a flammable or combustible liquid with air in certain proportions and an ignition source like a spark or a flame is present</p>

¹⁷ FCX Department of Occupational Health and Safety, *Hot Work Policy, FCX-HS06*, (Corporate Safety Portal, DOHS Policies: 2018), 1.

Table 6.1: High Hazard Areas (continued)

Area	Guidelines	Examples
<p>Dust Collectors</p>	<ul style="list-style-type: none"> • Create high concentrations of dust, resulting in combustible conditions if introducing a spark or flame • Include rubber-lined parts • Pose a significant fire risk 	 <p>Figure 6.6: Rubber-lined dust collection system</p>
<p>Working Near Explosives</p>	<ul style="list-style-type: none"> • Ensure 100 feet (30 meters) minimum distance between Hot Work and powder magazines or explosive or blasting storage areas¹⁸ 	 <p>Figure 6.7: Flagging indicating not to enter the area</p>

¹⁸ FCX Department of Occupational Health and Safety, *Hot Work Policy, FCX-HS06*, (Corporate Safety Portal, DOHS Policies: 2018), 1.

VARIANCE REQUEST

Periodically, there are special circumstances when workers cannot meet full compliance with the policy. In such cases, the requestor must file a variance with Health and Safety, per the Freeport-McMoRan Policy Administration Requirements. Keep the approved and completed variance form on file with a Standard Operating Procedure or other work procedure established for future action. The company policy also states that an engineer or another qualified individual must review the work, justify the exemption, and give alternate safety controls to minimize or eliminate the risks.¹⁹



FCX-HS01 Variance Request Form

<p>Complete this form with a detailed description of the area and reason for the variance request. A task review by an engineer or other qualified individual to consider other controls must be completed prior to submitting for approval. The approval authority for either long-term or temporary variance request is specified at the bottom of the form.</p>	
Site / Operation:	Variance Duration:
Type of Variance (Check Only One) Long-term <input type="checkbox"/> Temporary <input type="checkbox"/>	From Date/Time _____
	To Date/Time _____
Location of Activity:	Policy:
Purpose of Activity:	Division Manager:
Description of Request:	
<div style="background-color: #e6f2ff; height: 100px;"></div>	
Justification for Variance:	
<div style="background-color: #e6f2ff; height: 60px;"></div>	
Additional Control Measures:	
<div style="background-color: #e6f2ff; height: 60px;"></div>	
Action Plan to Comply with Policy:	
<div style="background-color: #e6f2ff; height: 60px;"></div>	
Responsible Party:	Expected Date of Completion:

Figure 6.8: Variance Form

¹⁹ FCX Department of Occupational Health and Safety, *Policy Administration Requirements, FCX-HS01*, (Corporate Safety Portal, DOHS Policies: 2019), 9-10.

ACTIVITY 5: IDENTIFYING HAZARDS

Directions: Read the following scenarios and identify the Fatal Risks involved. Then, identify the Critical Controls you would use to mitigate the Fatal Risks.

SCENARIO 1

You receive an assignment to repair two broken sections of handrails in the mill. Identify the Fatal Risks involved with the job. How will you mitigate these hazards to ensure safe completion of the job?

Fatal Risk(s): _____

Which Critical Control(s) would you use for this job?

SCENARIO 2

During routine maintenance of Reactor 1, workers identified damage to the ladder. What Fatal Risks are involved in the repair of this ladder?

Fatal Risk(s): _____

Which Critical Control(s) would you use for this job?

SCENARIO 3

Your group's job is to repair the blue trash bin in the photo below, which has a small hole on the front side. What are the Fatal Risks involved with this task?



Fatal Risk(s): _____

Which Critical Control(s) would you use for this job?

SCENARIO 4

You and a coworker are welders and must repair a flange on a 90-degree 10-inch (25-centimeter) stainless steel elbow connected by bolts to 100 feet (30 meters) of stainless pipe. The pipe and elbow are not connected to any source. The work is located in a semi-grassy laydown yard with fuel storage tanks 150 feet (45 meters) away. You will be cutting off the old flange and welding a new stainless flange onto the elbow. When complete, the repaired elbow and flange are in the same location you found them so a maintenance crew can bolt it back on later in the day. What are the Fatal Risks involved with this job?

Fatal Risk(s): _____

Which Critical Control(s) would you use for this job?

MODULE 6 QUIZ

Directions: Complete the following quiz.

1. Which of the following areas are high hazard areas? Circle all that apply.
 - a. In a designated area
 - b. Near dust collectors
 - c. Inside vessels or confined spaces
 - d. SX/EW plants and related work areas
 - e. Within 100 feet (30 meters) of powder magazines or explosive or blasting storage area

2. When conducting work in a confined space, which of the following critical controls help reduce or eliminate risk? Circle all that apply.
 - a. Pre-inspection risk assessment
 - b. Fire suppression system
 - c. Respiratory protection
 - d. Atmospheric testing

3. The Hot Work Policy allows Hot Work on a vessel under pressure.
 - a. True
 - b. False

4. What is the distance from flammable vapors needed to conduct Hot Work?
 - a. 35 feet (11 meters)
 - b. 50 feet (15 meters)
 - c. 100 feet (30 meters)
 - d. 150 feet (45 meters)

5. The Hot Work Policy allows welding from a ladder as long as the worker wears proper PPE.
 - a. True
 - b. False

CONCLUSION

All persons involved in Hot Work must have appropriate training for the task and the hazards involved in any Hot Work. Participants must understand their role and the roles of others to ensure safe working conditions. Maintain and inspect all Hot Work tools and equipment and ensure their safe use. Always follow the Hot Work Permit process to ensure identification of safety measures and Fire Watches. If there is a situation where the Hot Work Policy is not practical, apply for a variance.

Identify and control the Fatal Risks involved in the task performed. The major Fatal Risk in Hot Work applications is Fire. Always use appropriate PPE and the best control from the Hierarchy of Controls. Continually strive for hazard elimination as the first line of defense. Move the Hot Work or find an alternate method to Hot Work when possible.

Always consult the site health and safety personnel before beginning Hot Work operations in high hazard areas or areas with uncertainty.

If unsure about a task, process, or control, always stop the job.

Resources



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GLOSSARY

The glossary provides an alphabetical list of words, acronyms, terms, and phrases relating to and found in this course.

Entry	Definition
Acute Effect	Often immediate and result from exposures over a short duration.
Authorized Person	Someone who has the permissions, need, and knowledge to perform a specific task in a specific area. This person is accountable for the safety of the work they are performing. This person is a Qualified Person who has the authority to approve and authorize Hot Work Permits. The authorized person may delegate the responsibility for conducting the pre-Hot Work inspection to another Qualified Person but cannot delegate his/her accountability for the overall safety of the work performed
Chronic Effect	Slower and harder to notice, arising from weeks, months, or years of exposure to hazardous substances.
Clean Air	Air of such purity that it will not cause harm or discomfort to an individual if inhaled for extended periods.
Combustible Liquid	Have higher flash points above 100°F.
Combustible Material	Can include anything that will burn but requires more vigorous conditions for an ideal combustible material to burn. Combustible liquids, metals, wood, certain dust concentrations, paper, rubber, and plastics are examples of combustible materials.
Confined Space	Spaces which may include underground vaults, chutes, feeders, tanks, storage bins, crushers, vessels, silos, and other similar areas. A confined space is an area with limited means of ingress/egress, large enough to enter, but not designed for continuous occupancy.
Dilution	Airflow designed to dilute contaminants to acceptable levels.
Dust Collector	A device or combination of devices for separating dust from the air handled by an exhaust ventilation system.
Exhaust Ventilation System	A system for removing contaminated air from a space, comprising two or more of the following elements: (a) enclosure or hood, (b) ductwork, (c) dust collecting equipment, (d) exhauster, and (e) discharge stack.
Fire Extinguisher	A tool used to assist in escape or to extinguish a small fire in its early stages.
Fire Safe Designated Area	An area specifically designed for Hot Work, such as welding shops, which are free of exposed combustibles.

Entry	Definition
Fire Watch	A trained and authorized person posted at the Hot Work job site and remains there for the duration of the job and beyond as required by the Hot Work Permit. This individual is also to assist with fire control, communication, and inspection of the affected area.
Flammable Liquid	Have flash points below 100°F.
Flammable Material	Anything that can easily catch fire under normal circumstances and with the help of minimal ignition source. Flammable materials include flammable liquids, aerosols, solids, and gases.
Flash Point	The lowest temperature at which vapors of a liquid will ignite when given an ignition source
High Hazard Area	A location which might explode and/or burn with such vigor as to approximate explosion, produce toxic fumes, or produce other dangerous effects.
Hot Work	Any process that can be a source of ignition when flammable or combustible materials are present or can be a fire hazard regardless of the presence of flammable/combustible materials in the workplace. Common Hot Work processes are welding, soldering, cutting, grinding, and brazing.
Hot Work Permit	A document used to authorize Hot Work activity after taking necessary precautions to minimize the risk of adverse consequences associated with the work.
Mechanical	Air movement caused by a fan or other air-moving device.
Natural	Air movement caused by wind, temperature difference, or other non-mechanical factors.
Qualified Personnel	Individuals with the knowledge, training, and experience to recognize, evaluate, and ensure adequate control of the hazards associated with Hot Work.
Variance	An exemption to a policy where workers follow controls and processes to deviate from a policy safely.
Ventilation	Circulating fresh air to displace contaminated air.



Hot Work Policy

Health and Safety FCX-HS06 | Release 3/2018 | Version 1

POTENTIAL FATAL RISKS

Fire
Exposure to Hazardous Substances - Chronic

CRITICAL CONTROLS

- Segregation/Storage:
- Atmospheric Testing
- Suppression Systems/Fire Extinguishers
- Rescue Systems
- Fire Watch
- Hot Work Permit Execution
- Alarm System
- Hazard Awareness
- Handling Requirements
- Engineered Controls
- PPE

Additional procedures required to perform Hot Work in or on the following:

- Fuel & storage tanks
- Pressure vessels and piping systems
- Rubber lined equipment & belts
- Within 100ft/30m of powder magazines
- Dust collectors
- SX/EW Operations
- Heavy & Mobile Equipment
- Vessels or Confined Spaces
- Within 35ft/11m of combustible or flammable materials
- Within 50ft/23m of distance for gas/fuel/oxy

Available References for Researching Pressure Vessel Management:

- ASME Boiler and Pressure Vessel Code
- API 510
- [OSHA Pressure Vessel Guidelines](#)
- [NBIC](#) certified inspectors for compliance inspections

TRAINING REQUIREMENTS

Hot Work Training: Initial, Annual Refresher and Remedial as necessary

POLICY

OVERVIEW

Hot work is any process that can be a source of ignition when flammable or combustible materials are present, or can be a fire hazard regardless of the presence of flammable/combustible materials in the workplace. Common hot work processes are welding, soldering, cutting, grinding and brazing.

A **hot work permit** is required for hot work operations unless working in designated 'fire safe' area (e.g. welding shop). Fire safe areas shall be documented by management. Hot work permits are valid for one work shift and one task. Operational areas shall have signage indicating fire hazards that may not be easily recognizable to personnel (i.e. machinery containing rubber liners, conveyor galleries, oil containment/storage, etc.).

ACTIONS TO STAY SAFE

- Evaluate other mechanical means/cold work for task completion before hot work is considered as an option.
- Hot work permit must be completed by all involved prior to the work initiating unless the area is designated as 'fire safe,' and remain in the area until work is complete and permit is cancelled.
- Use appropriate controls around conveyance systems to prevent ignition sources from contacting belts or conveyed material.
- Remove combustible materials if possible. Where not feasible, cover and protect areas where potential for fire exists. This includes openings in floors/grating and walls, and flammable garments and PPE.
- Atmospheric monitoring shall be conducted as part of the permit process where there is a reasonable possibility for flammable gases/vapors/excessive oxygen to exist
- Evaluate conditions throughout the shift for potential changes to the work environment.
- Hot work will **not** be performed on vessels or systems under pressure.
- Purge vessels prior to welding/cutting on them.
- LEL must be below 10%.
- Oxygen Measurement must be below 23%.
- Fire extinguishing equipment must be immediately available.
- Fire Watch shall be in place during work and 30 minutes after the work is completed and deploy controls to prevent a fire from occurring.
- Sites will establish procedures for notification and management approval when alarm systems, or fire suppression/sprinkler systems are deactivated for any reason.
- Manage potential risk for fire hazards at all levels around work area (grinding debris, welding slag, sparks etc.).
- Prior to cancelling permit, a thorough inspection of the work area must be completed.

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HOT WORK PERMIT FCX-HS06 Version 1

Before signing this permit, think through the entire task and identify, evaluate and control energy sources. Safety precautions described in the Hot Work Policy must be followed. Every line on both sides must be completed. Evaluate the use of cold work alternatives prior to starting hot work.

Not valid if work is delayed for 90 minutes or more. Good for one shift only

Date _____ Shift _____
WO No. _____
From _____ AM/PM To _____ AM/PM
Bldg. or Area _____
Dept. _____ Floor _____
Task/Activity _____

Hot Work Performed By _____

Fire watch assigned? Yes No
Required, if uncovered combustibles remain within 35 feet.

Fire Watch _____

Time Released by Fire Watch _____ AM/PM

I verify that the area has been inspected

Signatures of Persons Performing Work _____

Signature of Area Supervisor or Designee _____

Emergency Contact _____

COMPLETE THIS SECTION AT END OF JOB

Work Completed Date & Time: _____

I verify the area has been monitored for the absence of fire for 30 minutes after hot work ceased, and that a thorough inspection of the entire work area has been completed.

Final Inspection by: _____
Time: _____

HOT WORK ON CONTAINERS & FUEL TANKS

Containers holding flammable or combustible liquids or gases have been purged, cleaned, and filled with inert liquid or gases and tested for %LEL/LFL. NOTE: Welding on mobile equipment fuel tanks is not permitted.

_____ Initial when reading is taken and tested to verify an LEL/LFL less than 10%

HOT WORK IN ALL AREAS, INCLUDING THE ABOVE

1. Person completing "Hot Work Permit" understands hazards in the hot work zone.

Yes No

2. Flame or spark-producing equipment to be used has been inspected and found to be in good repair.

Yes No

3. Sprinklers and fire water, where provided, are in working condition and will remain in service while this work is being done.

Yes No

4. Portable fire extinguishers are available, are appropriate for the fire hazard, and personnel have been trained to use them.

Yes No

5. All combustibles have been relocated 35 feet from the hot work, and the remainder protected with flame-proof curtains or covers, and a fire watch is assigned as needed.

Yes No

6. All voids and openings leading to other areas (rooms, floors) have been covered.

Yes No

7. All appropriate SOPs and good work practices are being followed.

Yes No

8. Do you have the proper personal protective equipment including welding shields, respirators, hearing protection for the job?

Yes No

9. A method for contacting emergency responders is in place.

Yes No

IF ANY ANSWER IS NO, A VARIANCE MUST BE COMPLETED

AIR TESTING REQUIRED FOR WORK NEAR FLAMMABLE LIQUIDS AND GASES

Oxygen level _____ % LEL _____ % Time

Oxygen level _____ % LEL _____ % Time

Oxygen level _____ % LEL _____ % Time

Work must not proceed if oxygen level is above 23%, or the LEL is greater than 10% (note that oxygen must be above 19.5% in order to accurately measure LEL/LFL).

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STUDENT COURSE EVALUATION

Course Title Hot Work Refresher – Facilitator Led **Site** **Date**

Your Name (optional) **Facilitator**

Directions: Circle the number that best fits your level of agreement with the statement. Then complete the short answer questions.

	Strongly Disagree	Disagree	Agree	Strongly Agree
1. The course content was relevant to my job.	1	2	3	4
2. The course materials were clear and well written.	1	2	3	4
3. The lecture, discussions, and activities improved the quality of the course.	1	2	3	4
4. The facilitator was knowledgeable about the content.	1	2	3	4
5. The facilitator created an atmosphere that enhanced my learning.	1	2	3	4
6. I am confident I can apply the course content to my job.	1	2	3	4
7. The course met my expectations.	1	2	3	4
8. What did you find valuable in the course?				
9. What can be improved in the course?				
10. Please clarify your responses (questions 1-8) and provide any additional comments.				

Thank you for taking the time to complete this evaluation. We value your feedback.

Mail to: Mine Training Institute, Attn: Suzanne Anderson, 18550 S. La Canada Dr., Sahuarita, AZ 85629

Scan or email to: sanderso2@fmi.com

