



**FREEPORT-
McMORAN**

FACILITATOR GUIDE



SFT FCX1017C SULFURIC ACID BULK HANDLING

APRIL / 2019
VERSION 1

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COURSE OVERVIEW

The following sections give basic information about this course.

COURSE DESCRIPTION

This course is intended to educate personnel on standardized operating and safety procedures for loading, unloading, and transporting bulk concentrated sulfuric acid.

COURSE OBJECTIVES

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

- Module 1: Risks and Hazards
 - Identify potential hazards associated with acid handling
- Module 2: Controls
 - Determine appropriate Critical Controls
 - Summarize “Actions to Stay Safe”
- Module 3: Communication
 - Explain the communication process while on Freeport-McMoRan property
- Module 4: Operations
 - Discuss the different types of loading and unloading
 - Outline procedures for entry
- Module 5: Inspections and Audits
 - List various inspection processes
- Module 6: Emergency Responses
 - Discuss action plan for an emergency situation

COURSE PRE-REQUISITES

Before taking this course, students should be familiar with bulk acid handling.

COURSE LENGTH

This course takes approximately 2.5 hours 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 to train employees and contractors who are handling, loading, or unloading sulfuric acid, and other employees as needed.

FACILITATOR QUALIFICATIONS

Facilitators should be well-versed in sulfuric acid handling procedures.

REGULATIONS/POLICIES/PROCEDURES

This course teaches to FCX-HS28 Sulfuric Acid Bulk Handling Policy and FCX-HS28 Sulfuric Acid Bulk Handling Personal Protective Equipment Technical Supplement.

FACILITATOR PREPARATION

The following information helps the facilitator prepare course facilitation.

ABOUT THIS GUIDE

The Facilitator Guide (FG) gives the facilitator a general outline for the flow of the course. It assists the facilitator in presenting content, conducting classroom activities, and managing time to meet the learning objectives. Use the FG in conjunction with the Student Guide (SG) and the PowerPoint (PPT). The guide belongs to the facilitator to make notes and write in as much as needed.

SAFETY

Safety must remain a fundamental component of this course. Students must adhere to safety information in the SG and from the facilitator, and maintain focus on safety procedures throughout the training. Students may not operate equipment without facilitator authorization.

ACTIVITIES

Students participate in many hands-on activities that give students time to practice the knowledge learned throughout the course. They also provide the facilitator with opportunities to give immediate feedback on what each student does/does not do well. Facilitators must review each activity's directions in the FG before guiding students through the learning activities.

GENERAL MATERIALS

Courses consistently need the following materials. Gather the necessary items and verify all equipment functions before starting class.

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






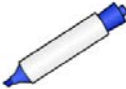




ACTIVITY MATERIALS

Gather the following materials specific to the activities in each module.

Module	Materials
Introduction	<ul style="list-style-type: none"> • Activity 1: Icebreaker <ul style="list-style-type: none"> ○ Gather the appropriate materials depending on the icebreaker chosen • Sulfuric Acid Bulk Handling Policy FCX-HS28 and Sulfuric Acid Bulk Handling Policy Technical Supplement (Enough for each participant) • Course completion certificate (One per participant)
Module 1: Risks and Hazards	None
Module 2: Controls	<ul style="list-style-type: none"> • Activity 2: Actions to Stay Safe <ul style="list-style-type: none"> ○ Pen/Pencil ○ Sulfuric Acid Bulk Handling Policy FCX-HS28 (One per participant)
Module 3: Communication	<ul style="list-style-type: none"> • Activity 3: Critical Control Improvement Brainstorm <ul style="list-style-type: none"> ○ Pen/Pencil
Module 4: Operations	<ul style="list-style-type: none"> • Activity 4: Hot and Warm Zones <ul style="list-style-type: none"> ○ Pen/Pencil
Module 5: Inspections and Audits	None
Module 6: Emergency Responses	None
Conclusion	None

FACILITATOR GUIDE CUES

Facilitators quickly identify slides that have unusual but important features by recognizing the cues used throughout the FG. Reference the table below to understand the purpose of each symbol. On each slide that has a cue, the corresponding talking points are bolded.

Description	Symbol	Purpose
Audio Link		The speaker icon indicates when a PPT slide links to an audio file.
Video Link		The director's clapboard indicates when a PPT slide links to a video file.
Animated Slide		The star indicates when an animation appears on a PPT slide and requires more than one click to view all slide content.
Note		The notepad indicates the PPT slide or FG include a note relating to the slide but not necessarily found in the SG.
Incidents		The first aid symbol indicates when the PPT slide or FG addresses a PFE, testimonial, or other safety-related incidents.
Flipchart		The marker indicates when a facilitator writes down responses given by students on a flipchart or whiteboard.
Discussion		The question mark indicates when students need to participate in a discussion either as a class or in small groups.
Example		The hand indicates when the facilitator holds up an item or passes an example around the class.
Facilitation Tip (FT)		The podium indicates a facilitation technique used by the facilitator to enhance the presentation. A corresponding red box with white text appears near this cue to explain the tip.
Site Specific		The yellow arrow indicates a place where the facilitator needs to prepare and add site-specific information before class starts.

LAWS OF LEARNING

Implementing the Six Laws of Learning can produce a more effective learning experience for both students and facilitators. Refer to the Instructor Fundamentals SG for more information.

Readiness: Students learn when they are ready, and learn little when they are not ready. Motivate students to prepare for learning and participate by setting a purpose, clearly stating objectives, and giving logical reasons for learning at the start of training.

Exercise: Content repeated is remembered. Every time a concept is practiced, learning is reinforced. Exercise includes recall, review, restatement, drills, and physical application.

Effect: People learn better in a favorable situation. Strengthen learning with pleasant motivational feelings. Constant negative motivation stifles the learning process.

Intensity: Students learn more from the real-life applications than from substitutes. Increase intensity, the power of the learning, through performance activities such as demonstrations, skits, audio/video clips, and models.

Primacy: What a student learns first stays. Teach the correct information the first time. Re-teaching may not work immediately and requires more time and practice with the student.

Recency: The most recent learning idea is the easiest to recall. Practice this law with restating, summaries, and conclusions.

FACILITATION REMINDERS

Incorporating feedback and eye contact, while eliminating semantic barriers can produce a more effective learning experience for both students and facilitators.

Feedback: Feedback in the classroom is evaluative or corrective information about a student's performance given by a facilitator to a student. Feedback guides students toward attaining the course objectives.

Eye contact: Eye contact means looking directly into the eyes of the students and at each student equally, not just at a few. It is communication that lets students know the facilitator is interested, allows for nonverbal feedback from students as the facilitator reads their expression, and enhances facilitator credibility as students can view facilitators with more eye contact as being more confident and competent.

Semantic Barriers: One word can confuse what the facilitator says and what the audience interprets. Avoid the overuse of jargon, symbolism, abbreviations, acronyms, and slang. Using clear and concrete words eliminates misunderstandings and helps students receive the message without misinterpretations.



Facilitators have many roles when teaching a course including instructor, manager, leader, planner, and evaluator. To learn more about these roles refer to the Instructor Fundamentals SG.

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 talking points.
3. The facilitator can also choose to do both, which is the **preferred** method. Moving around the room helps the facilitator engage more participants and keeps the students' brains stimulated, thus promoting learning.




PPT is not the course; it acts as a guide to keep the facilitator and students on track, and as a reminder to cover essential material. Know the FG talking points thoroughly so as not to read the PPT word for word, and do not rely on the PPT for all content as the FG talking points contain standardized content all students need to learn.

SETTING THE PRESENTATION MODE

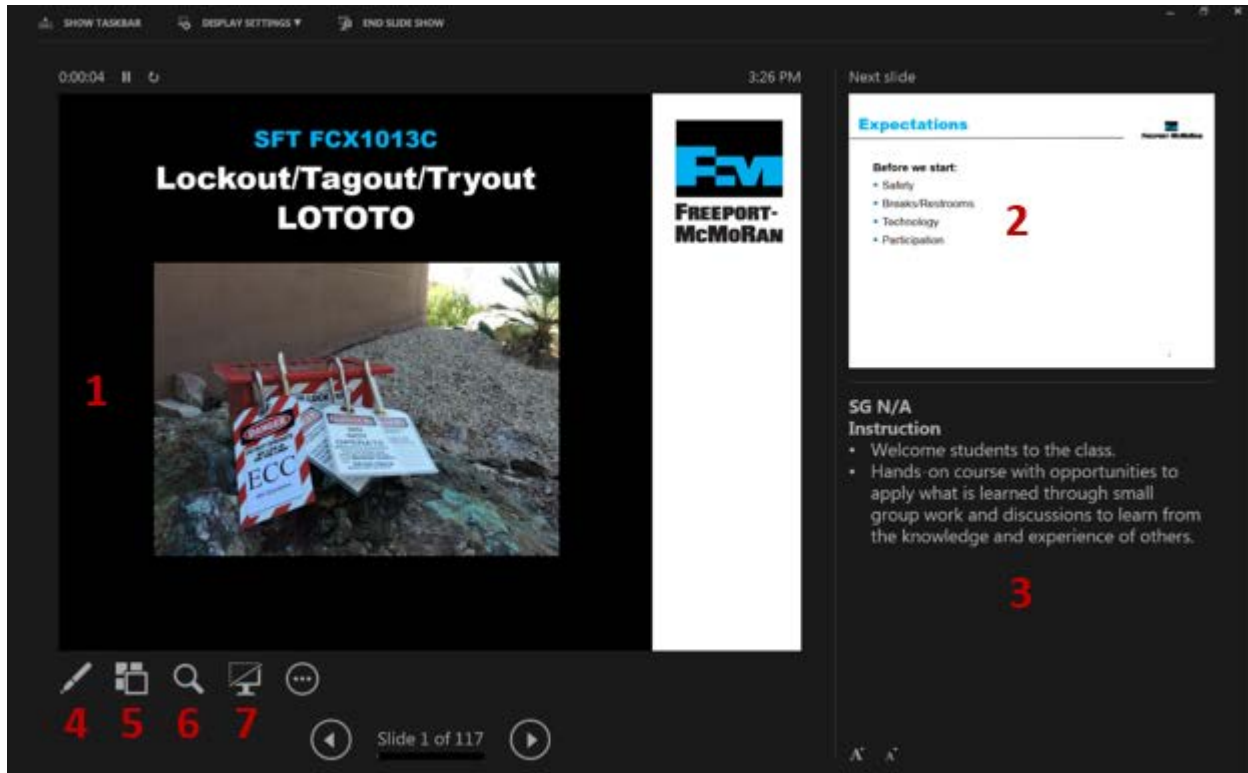
To initiate the presentation mode, do the following.

Step	Action
1	Open the PPT presentation.
2	Find the colored bar at the bottom of the screen. The look and color vary depending on the PPT version used.
3	Select the icon circled in the image below and often found in the bottom right-hand corner of the PPT screen.



PRESENTATION MODE FEATURES

When in presentation mode, the students only see the slide displayed, but the facilitator sees the layout below. Some of the commonly used features available from this view are numbered and explained below.



1. **Current slide** – This is the slide students see on the projection screen.
2. **Next slide** – Shows a visual preview of the next slide.
3. **Notes** – Shows the same talking points available in the FG. The notes shown correspond to the current slide projected to the students.
4. **Pens** – This icon gives the user access to a laser pointer, pen, highlighter, ink color, and arrow options. The tool shows on the facilitator’s screen and the students’ projection screen. Facilitators use the tools to emphasize specific points on the PPT and customize the presentation to suit the needs of the site and students better.
5. **All slides** – This shows small slide images 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 wants to explain content further but feels the PPT slide shown on the screen distracts from the learning, black out the screen to help focus the students.

INTRODUCTION

The introduction sets the tone for the course by introducing the facilitator, setting class expectations, welcoming the students, presenting the course learning objectives, setting safety as a priority, and the ensuring the safe handling of sulfuric acid on the job.

ACTIVITIES

- Activity 1: Icebreaker

For further details, refer to Activity Materials under Facilitator Preparation on page 6.

TOTAL TEACHING TIME

The introduction takes approximately 20 minutes to complete.

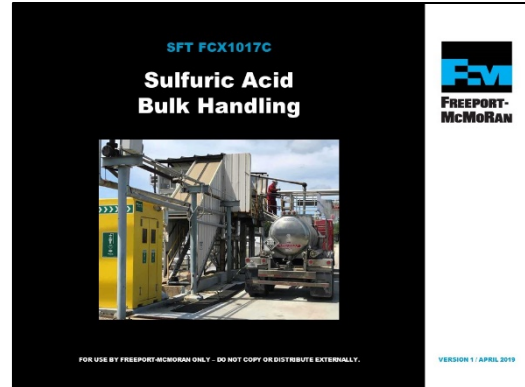


Suggested break times are included throughout the FG. Provide a 10-15 minute break after about every hour of instruction to allow students time to stretch, rest, relax, use the facilities, and refocus their minds.

PPT slide 1

Instruction

- Welcome students to class
- Facilitator introduces self by stating
 - your position at FMI
 - how long you have worked for FMI
 - how long you have worked in mining
- Ask students what they want from the course
 - **Discuss what they want to gain from the course**
 - WIFM – “What’s in it for me?”
 - This increases engagement by getting students vocalizing their opinions from the start of the course
 - This increases motivation by showing students their ideas matter
 - Option – Write down or remember what they want to learn. In a few slides, connect their responses to the learning objectives

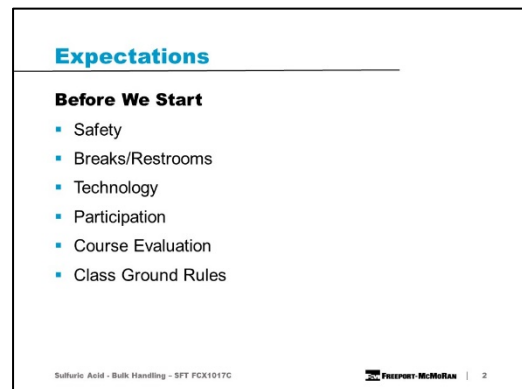


PPT slide 2



Instruction

- Administrative/Classroom policies
 - Safety: Identify the appropriate evacuation procedures, gathering areas, and emergency exits and fire extinguisher locations, etc.
 - Breaks and Restrooms
 - Establish and announce a break schedule to the class
 - Technology policy: Review your expectations on cell phone and laptop use
 - 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
 - Participate
 - Be on time
 - Stay on task
 - Respect the opinions and attitudes of others



Letting students participate in developing course ground rules can empower them, create buy-in, build trust with the facilitator, and result in students more likely to follow and hold each other accountable to the rules.

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 the facilitator can incorporate at the beginning of the course as well as after breaks

Activity 1

Icebreaker

Directions
Participate in an activity getting to know each other

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Using an Icebreaker promotes a safe learning environment, which can reduce student stress levels. Reducing stress in the environment can increase a learner's retention of the content. (Georgi Lozanoz)

Icebreaker	Instructions
<p>Dodgeball (10-15 minutes)</p>	<ol style="list-style-type: none">1. Give students a piece of paper.2. Students write two questions they can ask another student on the paper.3. Students crumble their paper into a ball and split them into two teams.4. On cue, students play dodgeball (throw their balls at members of the opposing team) for 30-60 seconds.5. When time is up, tell students to pick up one ball (not their own) and find a partner.6. Students read and answer their questions with their partner.7. Partners introduce each other to the class. <p><i>Alternative idea: Instead of playing dodgeball, students throw their ball to another student and they become partners.</i></p>

Icebreaker	Instructions
<p>Stranded on an Island (10-15 minutes)</p>	<ol style="list-style-type: none"> 1. Divide the class into groups of three to five students. 2. Students think of three items to take with them if they knew they would be stranded on an island. 3. Students take turns sharing their items with the group explaining why they chose each item. <p><i>NOTE: With a larger group, have students choose less items.</i></p>
<p>Coin Picker (5-10 minutes)</p>	<ol style="list-style-type: none"> 1. Students take a coin out of their pocket or borrow one from somebody. 2. Students introduce themselves by stating their name, the year on the coin, and something that happened that year. <p><i>NOTE: If students do not have coins, assign them a year.</i></p>
<p>The Pocket/Purse Game (5-10 minutes)</p>	<ol style="list-style-type: none"> 1. Give students one minute to find an item with significance they carry on them in their pocket, purse, backpack, etc. 2. Students introduce themselves by showing the item, telling about it and explaining why they chose it.
<p>Three of Anything (10-15 minutes)</p>	<ol style="list-style-type: none"> 1. Divide the class into groups of four to five students. 2. Give students one minute each to share their three favorite (or least favorite) movies, children's books, vacations, etc. 3. Ask a volunteer from each group to share anything that was common between any of the students.
<p>Phrases that Fit (10-15 minutes)</p>	<ol style="list-style-type: none"> 1. Give students two minutes to think about a slogan, commercial, poem, song, etc. that describes his or her life. 2. Students introduce themselves to the class by sharing the slogan and explaining why they chose it.

PPT slide 4, SG page iii

Instruction

- State objective(s) for each module
- Learning objectives are also located at the beginning of each module


Learning Objectives

Module 1: Risks and Hazards

- Identify potential hazards associated with acid handling

Module 2: Controls

- Determine appropriate Critical Controls
- Summarize "Actions to Stay Safe"

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PPT slide 5, SG page iii

Instruction

- State objective(s) for each module
- Learning objectives are also located at the beginning of each module


Learning Objectives

Module 3: Communication

- Explain the communication process while on Freeport-McMoRan property

Module 4: Operations

- Discuss the different types of loading and unloading
- Outline procedures for entry

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PPT slide 6, SG page iii

Instruction

- State objective(s) for each module
- Learning objectives are also located at the beginning of each module


Learning Objectives

Module 5: Inspections and Audits

- List various inspection processes

Module 6: Emergency Responses

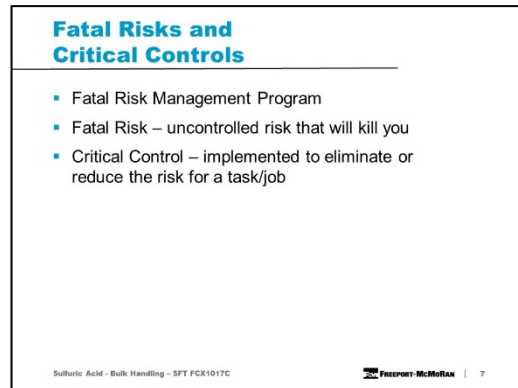
- Discuss action plan for an emergency situation

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PPT slide 7, SG page iii

Instruction

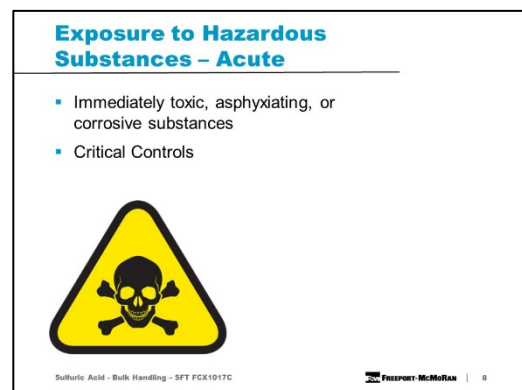
- Fatal Risk Management
 - Continuation of Fatality Prevention Program
 - Focus placed on identifying Fatal Risks and Critical Controls to safeguard employees
 - Standardizes communication by implementing icons, definitions, and Critical Controls for twenty-three Fatal Risks
- Fatal Risks are based on safety issues that have resulted in catastrophic events such as severe injury or death
- 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 next



PPT slide 8, SG page iv

Instruction

- The Exposure to Hazardous Substances Acute Fatal Risk is defined as workplace exposure to substances that are immediately toxic, asphyxiating, or corrosive (e.g. H₂S gas, NO₂ gas, CO gas, concentrated acids, caustics, etc.)
- **Discuss the Critical Controls**
 - Access Control
 - Alarm Systems
 - Engineered Controls
 - Handling Requirements
 - Loading and Unloading Protection
 - Mechanical Integrity of Storage and Distribution
 - PPE



PPT slide 9, SG page v

Instruction

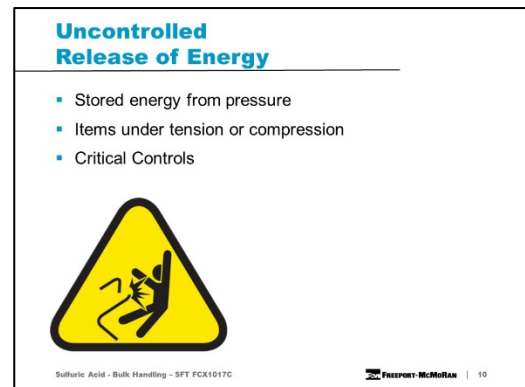
- The Rail Impact on Person Fatal Risk is defined as locomotive, rolling stock, or other rail equipment coming into contact with a person
- **Discuss the Critical Controls**
 - Access Control
 - Equipment Maintenance
 - Positive Communication System
 - Securing Rolling Stock
 - Segregation
 - Signaling and Signage



PPT slide 10, SG page v

Instruction

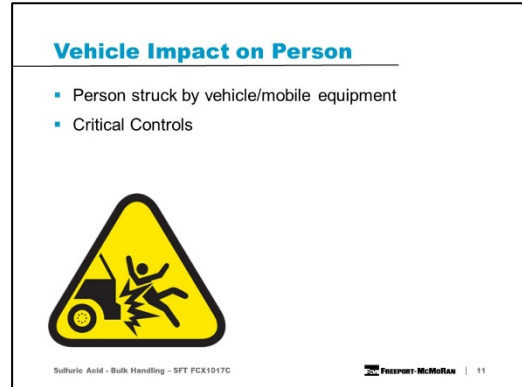
- The Uncontrolled Release of Energy Fatal Risk is defined as exposure to stored energy from pressure (e.g., pneumatic systems, hydraulic systems, steam, tires, etc.); Items under tension or compression (e.g., mooring lines, springs, counterweights, etc.)
- **Discuss the Critical Controls**
 - Energy Isolation/LOTOTO
 - Guards, Barriers and Barricades
 - HDPE Management
 - Hose Coupling Lock System
 - Piping Hoses and Equipment Mechanical Integrity
 - Relief Valves
 - Tensioned Lines Management
 - Tire Management



PPT slide 11, SG page v

Instruction

- The Vehicle Impact on Person Fatal Risk is defined as person struck by vehicle/mobile equipment.
- **Discuss the Critical Controls**
 - Fundamentally Stable Parking
 - Positive Communication System
 - Segregation
 - Signage and Demarcation
 - Vehicle Preoperational Inspection

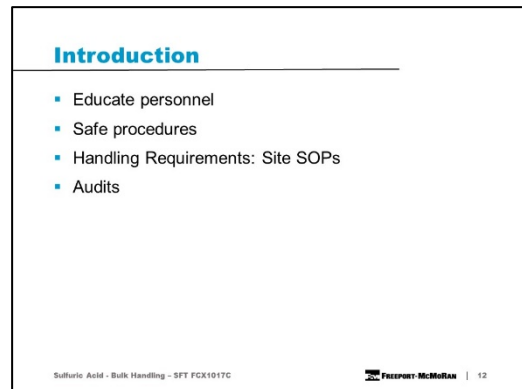


PPT slide 12, SG page vii-viii



Instruction

- This course is intended to educate personnel on standardized operating and safety procedures for loading, unloading, and transporting bulk concentrated sulfuric acid
- **Handling Requirements**
 - Operators need to be familiar with site SOPs when completing the task
 - **NOTE:** Contractor drivers get site SOPs from their employer. If you do not have an SOP, ask for one at site security
 - Contact Training department for additional training requirements for additional site-specific courses
- **Audits**
 - During loading or unloading activities, site personnel may be present to observe the process
 - **NOTE:** What they might look for: PPE in good working order, verification that safety showers and eyewashes are being tested, and facial hair does not interfere with the seal on the respirator (operators must be clean shaven if wearing a tight fitting respirator), etc.



NOTE: Ask participants to follow along in the student guide.

MODULE 1: RISKS AND HAZARDS

This module contains information about the risks and hazards associated with the handling of bulk sulfuric acid.

LEARNING OBJECTIVES

Upon completion of this module, students will be able to

- Identify potential hazards associated with acid handling

TOTAL TEACHING TIME

The module takes approximately 25 minutes to complete.

PPT slide 13, SG page 1



Instruction

- Review learning objectives for the module
- Upon completion of this module, students will be able to
 - Identify potential hazards associated with acid handling



By going over all of the objectives, the facilitator is using the Law of Readiness and preparing the student for learning.



Instruction

Ask for examples of hazards that participants have recognized during loading or unloading of acid.

Hazard Control

- Hazard control begins with recognition
- A hazard is “any source of potential damage, harm, or adverse health effects on something or someone under certain conditions at work”
- Throughout this training, different hazards encountered in the workplace are addressed. Every employee must be able to evaluate the risks associated with any given hazard
- Some hazards such as slips, trips, and falls are easily recognized. However, other hazards such as some chemical exposures are not as easy to identify. Therefore, being able to recognize hazards helps determine and implement controls to reduce risk
- With so many hazards in each workplace, it is difficult to be knowledgeable of them all, so ask questions of your coworkers, supervisors, health and safety representative, and other area experts

Risk Assessment


- Using Hazard Identification, Risk Assessment, and Determination of Controls (HIRDAC), risks are identified including fatal risks or risks that may cause injury or health issues
- Employees and contractors are also responsible for using HIRDAC

Risks Associated with Acid Handling

- Safety is of utmost importance when handling a chemical like sulfuric acid
- The acid itself is highly corrosive and can cause irreversible damage if the acid comes into contact with skin or eyes or if ingested

Hazard Identification

- Hazard Control
- Risk Assessment
- Risks Associated with Acid Handling

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PPT slide 15, SG pages 5-6



Instruction

- **Have students study the chart on SG p. 6.** Point out that the effects can range from mild to severe depending on the severity of the exposure
- Operators should immediately seek medical attention after any exposure
- Use care in the process to avoid exposure of sulfuric acid
- **Ask participants if they have ever experienced any of these effects while handling sulfuric acid. Have them describe their experience**

Contact with Sulfuric Acid

Effects of Exposure

- Inhalation
- Contact with Skin
- Contact with Eyes
- Ingestion

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EFFECTS OF SULFURIC ACID ON THE HUMAN BODY				
	Acute Exposure Effects	Severe Effects	Chronic Exposure Effects	First Aid Measures
Inhalation of Vapor (Mists)	Cough, sore throat, prickling or burning sensation, shortness of breath, and labored breathing	Serious lung damage, can be fatal if inhaled	Tracheobronchitis: Inflammation of the trachea and bronchial airways, harm to the respiratory system	Remove person to fresh air and keep comfortable for breathing, provide oxygen if difficulty breathing
Contact with Skin	Redness, pain, blisters, serious skin burns	Severe necrosis, permanent scarring, death	Dermatitis, corrosion, burns, ulcers	Immediately take off all contaminated clothing and rinse skin for a minimum of 15 minutes
Contact with Eyes	Redness, pain, severe burns, irritation	Corneal burns, total loss of vision	Conjunctivitis: Inflammation of parts of the eye	Rinse with water, remove contact lenses if easy to do, continue rinsing
Ingestion	Burns in mouth and throat, burning sensation behind the breastbone, abdominal pain, vomiting, shock, or collapse	Even small doses (1 teaspoon) may be fatal	Stomatitis: Soreness or inflammation of the mouth Gastritis: Inflammation of the stomach lining	Rinse mouth, do not induce vomiting
After any exposure with eyes, skin, inhalation, or ingestion, immediately obtain medical attention.				

PPT slide 16, SG page 7



Instruction

Ask participants why acid handling may cause fatigue

Ask participants how they prepare for their day

- Fatigue is commonly described as feeling tired, worn out, run down, or lacking energy
- Fatigue is a common reaction to exertion, lack of sleep, boredom, or stress and often results in less than optimal performance on the job
- Fatigue is a workplace hazard that can jeopardize the health and safety of a worker
- Each person is affected by fatigue in different ways such as reduced performance, lack of judgement, reduced reaction time, etc.
- Acid handling may be a task that is likely to cause fatigue
- The physical nature of the task coupled with environmental factors such as extreme temperatures from working outside contribute to workplace fatigue
- Follow Freeport-McMoRan or your regulatory agency or company fatigue management policies to ensure adequate rest between shifts

To manage fatigue:

- Eat healthy meals and snacks
- Drink fluids throughout the day
- Take breaks
- Seek medical help for persistent fatigue

Fatigue

- Effects on performance
- Actions to manage fatigue

Sulfuric Acid - Bulk Handling - SFT FCX1017C

Freeport-McMoRan | 16



Instruction

- **Have students look at the chart on page 8 of the student guide**
- **Ask participants what they can do to replenish loss of electrolytes. Provide examples if necessary**
- What has Freeport-McMoRan done to help remedy the effects of heat-related issues?
 - The best way to prevent heat-related issues is to avoid one in the first place
 - Immediately contact your supervisor or site contact if you or a coworker is experiencing any heat-related symptoms
 - Listed are a few measures for heat-related issues that may occur on the job
 - Heat-related issues can become progressively worse if not addressed
 - Take precautions with early signs of heat-related issues

Heat-Related Issues

- Dehydration
- Loss of electrolytes
- Acclimatization
- Personal fitness
- Past illness
- Medical conditions

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Heat-related Issues	Factors that increase the likelihood	Prevention of Heat-Related Issues
Dehydration	<ul style="list-style-type: none"> • Failure to drink enough water 	<ul style="list-style-type: none"> • Drink lots of water to replenish the fluid lost through sweating.
Loss of electrolytes	<ul style="list-style-type: none"> • Salts, potassium, calcium, etc. lost when you sweat 	<ul style="list-style-type: none"> • Drink about 8 ounces of water for every 20 minutes of activity. • For prolonged activity, drink a sports drink with balanced electrolytes.
Acclimatization	<ul style="list-style-type: none"> • Adjustment to the heat 	<ul style="list-style-type: none"> • Adjust to the heat through short exposure periods followed by longer periods until you are accustomed to the heat. It may take 5-7 days before heat becomes bearable.
Personal fitness	<ul style="list-style-type: none"> • Age, weight, etc. 	<ul style="list-style-type: none"> • Know the signs of heat stress disorders, and monitor yourself and coworkers.
Past heat-related illness	<ul style="list-style-type: none"> • Previous occurrences lower your resistance 	<ul style="list-style-type: none"> • Take plenty of breaks and use a shaded area if you need it. Plan to work in the cooler parts of the day.
Medical conditions	<ul style="list-style-type: none"> • Heart conditions • Diabetes • Illness/fever • Medications • Allergies • Epilepsy 	<ul style="list-style-type: none"> • Do not overwork yourself. Work at a steady pace.



Instruction

- **Have students review the chart on SG p. 9 and discuss the information with their group or with a partner**
- **Ask participants if they have ever experienced or witnessed any heat-related illness**
- Heat cramps are the earliest sign of heat stress
- If precautions to cool off and rehydrate at this point are not made, the more severe stages of heat-related illness can occur in a rapid progression
- The chart shows the causes, symptoms and treatment of heat-related illnesses

Heat-Related Illness

- Heat rash
- Heat cramps
- Heat exhaustion
- Heat stroke

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Heat-related Illness	Cause(s)	Symptoms	First Aid
Heat rash	<ul style="list-style-type: none"> • Sweat that does not evaporate and irritates skin 	<ul style="list-style-type: none"> • Clusters of red bumps on skin • Often appear on neck, upper chest, folds of skin 	<ul style="list-style-type: none"> • Try to work in a cooler, less humid environment if possible • Keep the affected area dry
Heat cramps	<ul style="list-style-type: none"> • Loss of body salts and fluid during sweating 	<ul style="list-style-type: none"> • Muscle spasms • Pain • Usually in abdomen, arms, or legs 	<ul style="list-style-type: none"> • Have worker rest in a cool, shady area • Provide water or other cool beverage • Wait a few hours before allowing worker to return to strenuous work • Have worker seek medical attention if cramps do not go away
Heat exhaustion	<ul style="list-style-type: none"> • Loss of water and salt from heavy sweating 	<ul style="list-style-type: none"> • Cool, moist skin • Heavy sweating • Headache • Nausea or vomiting • Dizziness or Lightheadedness • Weakness • Thirst • Irritability • Fast heartbeat 	<ul style="list-style-type: none"> • Have worker sit or lie down in a cool, shady area • Provide water or other cool non-caffeinated beverage • Cool worker with cold compresses/ice packs • Take to clinic or emergency room for medical evaluation or treatment if signs or symptoms worsen or do not improve within 60 minutes • Do not return to work that day
Heat stroke	<ul style="list-style-type: none"> • Body is unable to regulate its core temperature • Sweating stops and body can no longer rid itself of excess heat 	<ul style="list-style-type: none"> • Confusion • Fainting • Seizures • Excessive sweating or red, hot, dry skin • Very high body temperature 	<ul style="list-style-type: none"> • Call 911 While waiting for help • Place worker in cool, shady area • Loosen clothing; remove outer clothing • Fan air on worker; apply cold packs in armpits • Wet worker with cool water; apply ice packs, cool compresses, or ice if available • Provide fluids (preferably water) ASAP • Stay with worker until help arrives • Do not provide fluids to an unconscious person



Instruction

- Unsafe working conditions come in many forms
- It is important to be aware of hazardous conditions and to make good choices about what actions to take to stay safe

Possible Unsafe Conditions:

- **Red Alerts/Weather**
 - Acid loading/unloading stations are located outdoors where workers are exposed to the elements
 - Weather events can create potentially hazardous conditions
 - Alerts and warning systems vary from site to site. Familiarize yourself with warning systems at each site
- **Gas Hazards**
 - Hazardous gases may be present when loading or unloading
 - In extreme situations, this can be Immediately Dangerous to Life and Health
 - Be aware of what the windsock is telling you before you start work
 - In an evacuation, check the direction of the wind using the windsock
 - **Ask participants how to read a windsock and ask what the windsock is telling them about direction during an evacuation**
 - Travel in the opposite direction of the wind and uphill if possible
- **Leaks**
 - Secure fittings so that leaks do not develop
 - Contact control room if leaks are present
- **Housekeeping:** Keep the work area orderly
- **Defective Equipment**
 - Incidents involving faulty or damaged equipment are a common cause of injury in the workplace.
 - Before loading or unloading acid, check that safety showers and eyewashes are operational. If any problems are noted, communicate with the control room, and all work must be stopped until the showers and eyewashes are fully operational
 - Personal protective equipment or PPE is worn to help minimize exposure to hazards. If PPE is defective or damaged, all work must be stopped until proper PPE can be worn
- **Fit for Duty**
 - Individuals that are not fit for duty may present a safety risk to themselves and others

Unsafe Working Conditions

- Red Alert/Weather
- Gas Hazards
- Leaks
- Housekeeping
- Defective Equipment
- Fit for Duty

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Instruction

- Everyone has the responsibility to stop the job when conditions are unsafe. Taking the time to stop work is a critical component of stopping incidents
- Many of our past incidents could have had a much safer outcome if someone had taken the time to stop work and discuss what the hazards are and how to control them
- Stopping the job may be uncomfortable, but it keeps employees safe. It allows us to take a step back, evaluate the situation calmly, and focus our full attention on the job and task. We all are empowered to stop the job when conditions are unsafe or if Critical Controls are not in place
- When work is stopped because of unsafe conditions, report your findings to the control room, FMI employee, Health and Safety, or site security if the situation cannot be immediately corrected
- **Ask participants if they have ever stopped a job. Have them explain the circumstances and the outcome**

Stopping Work

- Stop the job in unsafe conditions
- Evaluate the situation
- Focus attention to task

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MODULE 1 QUIZ

PPT slides 21-25, SG page 13



Instruction

- Students write answers to the quiz questions in the SG
- Review the answers as a class
- **Click to view the answers**

Quiz Answers

Question	Answer
1	B; p. 11
2	Rash, cramps, exhaustion, stroke; p. 8-9
3	B; p. 10
4	A, B; PPT slide 12

Quiz questions implement the Law of Exercise, which increases learning by repeating and reviewing concepts covered in the module.

Module 1 Quiz

Directions

1. Complete the quiz in the Student Guide
2. Discuss the answers as a class

Quiz

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Module 1 Quiz

1. During an inspection of an eye washing station, you determine one of the sprayers is not working. What should you do?
 - a. In an emergency, use the side that is working
 - b. Stop the job and report the problem to the control room or security
 - c. Report the problem to security when you exit the property
 - d. Use care when unloading

Module 1 Quiz

2. Put the heat-related illnesses in order from least severe to most severe.

Least Severe: Heat rash
Heat Cramps
Heat Exhaustion

Most Severe: Heat Stroke

Module 1 Quiz

3. What is one function of a windsack?
 - a. Alerts workers of dangerous wind events
 - b. Gives guidance on the direction to take in an evacuation
 - c. Alerts workers when hazardous gases are present

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Module 1 Quiz

4. What are some hazards that may be associated with acid handling? Circle all that apply.

<input checked="" type="radio"/> a. Fatigue <input checked="" type="radio"/> b. Heat rash <input checked="" type="radio"/> c. Red alerts/Weather <input checked="" type="radio"/> d. Gas hazards <input checked="" type="radio"/> e. Inhalation of vapor <input checked="" type="radio"/> f. Contact with eyes or skin	*This is not an all-inclusive list of hazards.
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PPT slide 26




Instruction

Discuss the questions on the slide

Debrief

- What are some key concepts learned in this module?
- What do you need to understand better?
- What information surprised you?

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Debriefs are included at the end of each module to help summarize, review, refresh, retain, and clarify content covered in the module. Additional debriefs can occur when returning from breaks, and at the beginning or end of a day. Facilitators debrief material whenever they need to gauge student understanding.

MODULE 2: CONTROLS

This module contains information about hazard identification, Critical Controls, and actions to stay safe.

LEARNING OBJECTIVES

Upon completion of this module, students will be able to

- Determine appropriate Critical Controls
- Summarize “Actions to Stay Safe”

ACTIVITIES

- Activity 2: Actions to Stay Safe

For further details, refer to *Activity Materials* under *Facilitator Preparation* on page 6.

TOTAL TEACHING TIME

The module takes approximately 25 minutes to complete.

PPT slide 27, SG page 15

Instruction

- Review learning objectives for the module
- Upon completion of this module, students will be able to
 - Determine appropriate Critical Controls
 - Summarize “Actions to Stay Safe”

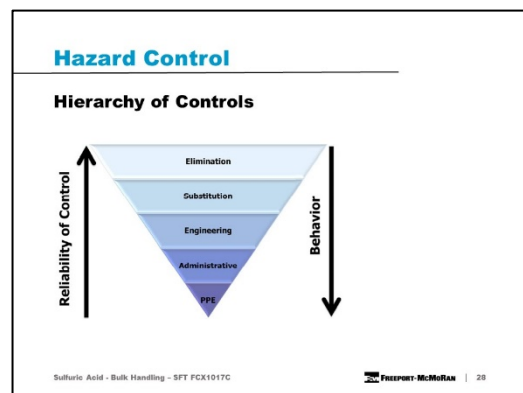


**Module 2:
Controls**

PPT slide 28, SG page 19

Instruction

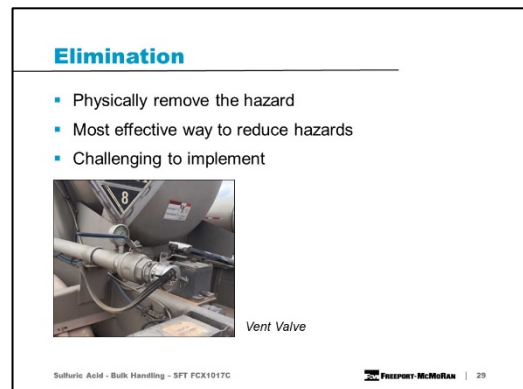
- The five types of controls are shown in order from most effective (Elimination) to least effective (PPE)
- Controls are most effective when they do not rely on individual worker behaviors as behaviors may vary from worker to worker
- Controls at the bottom (such as PPE and Administrative) are less reliable because worker behavior plays a larger role than the controls at the top



PPT slide 29, SG page 20

Instruction

- **Explain Elimination**
 - Physically remove the hazard from the workplace
 - Most effective way to reduce hazard but sometimes difficult to implement
- **Elimination Example Used in Acid Handling:**
 - Vent valves are an example of an elimination control used in acid handling
 - The vent valves are utilized to avoid the need to climb on the tanker platform to open the lid during the unloading process




PPT slide 30, SG page 20

Instruction

- **Explain Substitution**
 - Replaces a chemical, substance, material, or practice with something less hazardous
 - Is sometimes grouped with elimination; both ultimately remove the identified hazard
- **Substitution Example Used in Acid Handling:**
Handling: At Atlantic Copper, the visual tank level indicator has been substituted with a flow control valve for acid unloading to reduce exposure to acid.

Substitution

- Replaces with safer alternative
- Sometimes grouped with elimination



Flow Control Valve

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PPT slide 31, SG page 21




Instruction

- **Explain Engineering**
 - Blocks access with a barrier thus preventing the hazard from coming into contact with the affected individuals
 - If complete enclosure is not feasible, reduce exposure to the hazard with a barrier (handrail) or ventilation
 - Does not have to be expensive or complicated
- **Engineering Example Used in Acid Handling:**
 - Wheel chocks
 - Hose coupling system
 - Sight glass
 - Flange covers (Diapers)
 - Splash Guards
 - Emergency stop
 - Gangways
 - **Ask participants if they have seen these in the field**

Engineering

- Focus on exposure
- Block access with barrier
- Examples:
 - Wheel chocks
 - Hose coupling system
 - Sight glass
 - Flange covers (Diapers)
 - Splash guards
 - Emergency stop
 - Gangways



Hose Coupling Lock System

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Instruction

- **Explain Administrative**
 - Implement rules that change the way employees and contractors do their jobs
 - Includes policies and procedures, SOPs, signage, training, restricted access, equipment maintenance, housekeeping, and personal hygiene practices
- **Administrative Example Used in Acid Handling:**
 - Policies and procedures
 - Signage
 - Restricted access
 - Training
 - Housekeeping
 - Personal hygiene practices
 - **Ask participants why personal hygiene practices are important**

Administrative

- Change in work procedures
- Individuals must follow the rules
- Examples:
 - Policies and procedures
 - Signage
 - Restricted access
 - Training
 - Housekeeping




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Instruction

- **Explain PPE**
 - Personal Protective Equipment
 - Designed to offer the wearer's body a layer of protection from hazards in the work environment
 - Includes (but not limited to) hard hats, protective clothing, gloves, face shields, safety glasses, safety boots, and respirators
 - Seems like a simple solution to a hazard and can offer protection. Its effectiveness depends on individuals choosing to wear the appropriate PPE
 - Both administrative controls and PPE methods have proven to be less effective than other controls as they require effort by everyone involved
- **PPE Example Used in Acid Handling:** When loading and unloading sulfuric acid, wearing the appropriate personal protective equipment such as an acid suit will help decrease the severity of exposure due to an acid spray.

PPE

- Personal Protective Equipment
- Layer of protection
- Effectiveness based on behavior



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Instruction

- **Have students review the Sulfuric Acid Bulk Handling Personal Protective Equipment Technical Supplement or the charts on SG p. 24-25.** The chart details the PPE requirements for acid handling
- All personal protective equipment must be cleaned and stored per manufacturer recommendations
- **NOTE:** If contract/carrier organizations choose to use other protective garments that meet the above standards, they may do so; however, the driver must have the specifications from the manufacturer of the protective garment readily available and be able to provide when requested by site personnel
- **NOTE: Instructor should stress that alterations to garments are not permitted**

Acid Protective Garment Requirements

- Acid Protective Garment
- Gloves
- Boots
- Head, Eye, and Face Protection
- Respirator
- Cleaning and Storage



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ACID PROTECTIVE GARMENT REQUIREMENTS	
Acid Protective Garment	<ul style="list-style-type: none"> • Acid protective garment shall cover the entire body (coveralls or overalls with jacket), have closures (Velcro, elastic, etc.) for wrists and ankles, and have an attached hood. • The garments shall be resistant to sulfuric acid of $\geq 93\%$ concentration for >60 minutes per the ASTM F 903 testing method or equivalent. • The style of protective garment will be purchased in a configuration that is suitable for strong acids (i.e. taped or heat sealed seams instead of stitched, acid resistant drawstrings, etc.). • Alterations to garments is not permitted. Homemade accessories such as helmet mounted neck guards, re-purposed face shields are not permitted.
Gloves	<ul style="list-style-type: none"> • Must be impermeable and resistant to sulfuric acid of $\geq 93\%$ concentration for >30 minutes per the ASTM F 739 or equivalent testing method. • Be gauntlet style and extend beyond at least 4" of protective garment and worn inside the garment sleeves. • When acid resistant garment has a dual sleeve, the gloves are to be worn between the two layers of sleeve.
Boots	<ul style="list-style-type: none"> • Must be impermeable and resistant to sulfuric acid of $\geq 93\%$ concentration for >480 minutes per the ASTM F 903 testing method or equivalent. • Be at least mid-calf high, with a minimum of 4" overlap with protective garment pant leg. • Pants should be worn over the boots. • Meet ANSI or equivalent approved safety boot with safety toe and non-slip sole, of the pull-over type.

Continued on next page

ACID PROTECTIVE GARMENT REQUIREMENTS CONT

<p>Head, Eye, and Face Protection</p>	<ul style="list-style-type: none"> • All eye and face protection shall comply with ANSI Z87.1, 2010. All head protection shall comply with ANSI Z89.1, 2003 or equivalent. • A hood shall be worn that is either integrated into the protective garments, or that has been designed to layer under face shield and over protective garments. Hood is to be worn over a full-face respirator, and snug to the skin. • The hood shall fit closely enough to prevent flaring or create pockets that trap acid. • Hoods are worn under the hard hat. • At a minimum to ensure that no skin is exposed, the following head, eye, and face protection will include: <ul style="list-style-type: none"> <u>Option 1:</u> <ul style="list-style-type: none"> ○ A clear face shield that is non-reactive to strong acid and completely covers the face and exposed skin on the neck and ○ Chemical resistant splash goggles and ○ Half-face respirator. <u>Option 2:</u> <ul style="list-style-type: none"> ○ Full-face respirator. <u>Option 3:</u> <ul style="list-style-type: none"> ○ Helmet style PAPR with chemical resistant shroud or hood and ○ Chemical resistant safety glasses or goggles
<p>Respirator</p>	<ul style="list-style-type: none"> • Respirators shall be worn at all times during loading and unloading processes. • Acid gas P100 cartridges or equivalent must be used with all respiratory protection. • Respirators must be maintained according to manufacturer recommendations. <p><i>Note: Respiratory protection regulations require affected workers be enrolled in a Respiratory Protection Program that complies with 29CFR 1910.134. Employees or contractors wearing tight fitting respirators with a seal must be clean-shaven (in that facial hair will not interfere with the seal of a respirator) per the requirement of the program. Carriers must have a written program, provide medical evaluation, annual fit testing; and ensure issued respirators are maintained in a sanitary manner.</i></p>
<p>All personal protective equipment must be cleaned and stored per manufacturer recommendations.</p>	



Instruction

- **Have students review the list on the Sulfuric Acid Bulk Handling Policy FCX-HS28 or in the SG p. 26**
- **Sulfuric acid can be handled safely if proper precautionary measures are observed**
- Hot Zone and Warm Zone areas shall be signed and demarcated
- A pre-task review, workplace exam and equipment inspection must be completed prior to loading/unloading bulk concentrated acid
- Ensure communication device(s) are working
- Test safety showers and eyewashes prior to performing work
- Maintain unobstructed access between the task and shower/ eyewash
- Verify location of emergency stop button for acid transfer pumps
- Maintain unobstructed access between task and emergency stop
- Ensure tanks have storage capacity before offloading
- Acid resistant PPE is to be inspected and properly worn prior to entering the Hot or Warm Zones. Reference the PPE Technical Supplement for additional details
- Employees and contractors will wear personal gas monitors in designated areas and be trained in their use
- Offloading of acid by gravity should be used whenever possible
- Visually inspect all hoses and fittings prior to unloading
- Ensure all lines are drained after loading/unloading
- Be vigilant for leaking acid. Contact appropriate personnel immediately
- Ensure chocks, blocks or stops are in place for all railcars and trucks as required
- Isolate loading/unloading rail sections from other sections of rail to prevent incoming cars as required
- Always review site-specific processes and procedures prior to starting work
- Ensure camlock splash-guards are in place and serviceable for truck offloading
- **Ask participants if there is anything else in addition to these that they do to stay safe**

Actions to Stay Safe

Proper precautions

- Eyewash stations
- Emergency stop buttons
- Proper PPE
- Visual inspection
- Leaks
- Vehicle chocks
- Splash-guards

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ACTIVITY 2: ACTIONS TO STAY SAFE

PPT slides 36-39, SG page 27



Instruction

- Give students time to write answers to the in the SG
- Have students work in groups or individually
- Review the answers as a class using the slides

Activity Answers

Question	Answers may vary
1	<ul style="list-style-type: none"> • Fatal Risks: Exposure to Hazardous Substances • Actions to stay safe: Always review site-specific processes and procedures prior to starting work, Ensure tanks have storage capacity before offloading
2	<ul style="list-style-type: none"> • Fatal Risks: Exposure to Hazardous Substances • Actions to stay safe: Always review site-specific processes and procedures prior to starting work, Visually inspect all hoses and fittings prior to unloading,
3	<ul style="list-style-type: none"> • Fatal Risks: Exposure to Hazardous Substances • Actions to stay safe: Always review site-specific processes and procedures prior to starting work, Visually inspect all hoses and fittings prior to unloading,

Activity 2

Actions to Stay Safe

Directions

1. Review the Fatal Risks and Actions to Stay Safe in the Sulfuric Acid Bulk Handling Policy
2. For each scenario, identify a potential Fatal Risk and any Actions to Stay Safe that may have been overlooked.

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Actions to Stay Safe #1

A carrier arrives to a Freeport-McMoRan property to unload his tanker. Security personnel advises the carrier to unload at a specific location. The carrier proceeds to the assigned location and begins the procedures to safely unload the acid. The driver hooks up the acid hose and pressurizes the line. Control room contacts the driver to let them know that the acid tank is full.

Actions to Stay Safe #2

During an area inspection, an operator notices a missing camlock and makes note of it on the area inspection form. The operator proceeds to connect the hose and offload the tanker. During the unloading process, acid is dripping from the connection. After the unloading is complete, the operator reports the camlock to site security upon exiting the property.

Actions to Stay Safe #3

An authorized individual is offloading acid from a rail car. The individual removed the acid discharge hose before ensuring the Acid Tanker was at atmospheric pressure.

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PPT slide 40



Instruction

Discuss the questions on the slide

Debrief

- What are some key concepts learned in this module?
- What do you need to understand better?
- What information surprised you?

MODULE 3: COMMUNICATION

This module contains information about communication methods used by operators in sulfuric acid handling areas.

LEARNING OBJECTIVES

Upon completion of this module, students will be able to

- Explain the communication process while on Freeport-McMoRan property

ACTIVITIES

- Activity 3: Critical Control Improvement Brainstorm

For further details, refer to *Activity Materials* under *Facilitator Preparation* on page 6.

TOTAL TEACHING TIME

The module takes approximately 25 minutes to complete.

PPT slide 41, SG page 29

Instruction

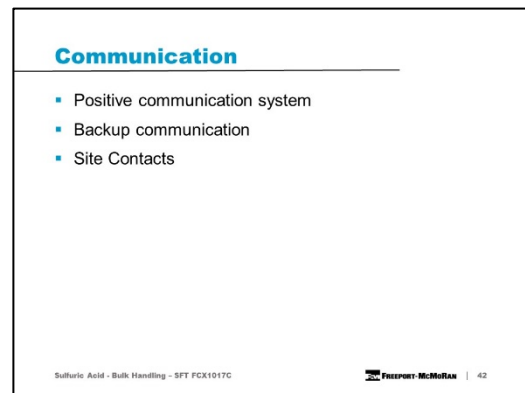
- Review learning objectives for the module
- Upon completion of this module, students will be able to
 - Explain the communication process while on Freeport-McMoRan property



PPT slide 42, SG page 33

Instruction

- Communication plays a critical role in disaster prevention
- A method for communication is to be provided for the carrier, contractor, or FMI employees working in concentrated acid transport and handling areas
- A **positive communication system** allows for two way dialogue
- Each site is required to have a positive communication system with clear and obvious signage in an acid loading/unloading area
- In addition, each site is required to maintain a **backup form of communication** in the event of a failure of one type of communication method
- Any fixed communication device must have conspicuous signage. Signage must include an emergency contact number, name of responsible person, and site radio channel information
- Communication methods vary from site to site, so a carrier needs to be aware of the various methods of communication used by each site





Instruction

Positive Communication (Two Way Communication) Examples

- Mobile phones, two-way radios, and other portable handheld communication devices are one of the most convenient ways to communicate when we are away from our workstations

Handheld Device Guidelines:


- Never allow handheld communication devices to distract your concentration while operating a vehicle or mobile equipment
- Always give full attention to driving and road conditions and never place or receive a call while driving
- Sending/receiving text messages, emails, or conducting web searches are prohibited while operating equipment or vehicles
- Outgoing calls are made only while equipment or vehicles are stationary
- Incoming calls are taken while equipment or vehicles are stationary or when using hands-free devices
- If you work in operations of a surface or underground mine operations, do not stop on haulage travel roads
- Handheld communication devices are a quick means for communicating in an emergency. In the event of an emergency, always pull off the road before placing an emergency call
- The use of display screens for GPS navigation devices, tracking systems, collision avoidance systems, instruments, gauges, and systems providing information about the status of mobile equipment is permissible
- **Emphasize that handheld and Bluetooth devices should not be used when operating a vehicle on property**

GAI-Tronics

- GAI-Tronics is an intercom Page/Party communication system used at some sites
 - The page function provides speaker placement where announcements can be made over the intercom speakers
 - The party line function allows two or more individuals to converse privately without using the paging speakers
 - This communication system may be used to report any issues employees or carriers may encounter, such as pump leaks, pipe leaks, low flow
 - **NOTE:** Talk to the site area supervisor for information about how to use the system

Positive Communication

- Portable handheld device
 - Two-way radio
 - Mobile phone
 - Exercise caution
 - Device guidelines
- GAI-Tronics



GAI-Tronics Handset

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PPT slide 44, SG page 36

Instruction

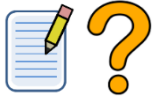
- Sites are required to implement a hazard communication process
- The process may vary from site to site, and individuals need to be aware of the process taken at each site
- If you are unsure of the proper procedures, talk to site security or Health and Safety

Site-Specific Communication

- Process varies from site to site
- Need to know proper procedure

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PPT slide 45, SG page 36





Instruction

- 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
- Critical Controls are only a subset of the myriad safety controls that exist in our operations. The intent is to focus attention on these most important controls in our day-to-day activities
- Acid handling is inherently dangerous because of the nature of the substance. If an operator has a suggestion for a Critical Control improvement, Freeport-McMoRan is open for recommendations on how to improve the process. In some cases, recommendations for Critical Control improvements were not directly applied but generated ideas for similar controls
- **NOTE: If operators have an idea, encourage them to submit the idea to site security or their own management**
- One example of a Critical Control improvement for acid handling is the use of sight glass
- **Have a student read the Description/Details of Improvement of the Critical Control Improvement, Safford Acid Unloading Sight Glass**
- **Ask if they are familiar with sight glass and how they feel about this improvement**

Critical Control Improvements

- Improve the process
- Sight glass



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Continued on next page

<p align="center">Critical Control Improvement</p>		CCI #	CCI – 2017 - 17
		OPERATION:	Safford
	<p align="center">Safford Acid Unloading Sight Glasses</p>	AREA:	Hydromet
		DATE:	3/27/2017
Issued By: Pip Killian		Contact For Additional Details: Pip Killian	

This Advisory is a **NOTIFICATION** of a critical control upgrade at one or more FCX locations. The purpose is to share the information so that others with similar risks can utilize the information to improve the reliability of critical controls where applicable. In some cases the control may not be directly applied but may generate an idea for other to pursue a similar control and thereby reduce risk.

DESCRIPTION / DETAILS OF IMPROVEMENT

Safford unloads several trucks of acid per day. The HIRDAC pure risk is 16 (the highest level). Most of the controls are administrative and rely heavily on PPE, SOPs, and auditing. Historically the drivers feel the weight of the acid hose and judge when it is empty or full or climb on the tanker ladder to look inside the tanker. This exposes them to increased fall hazards and gases from inside the tanker. Based on these methods they would disconnect the hose when they believe the tanker is empty. Several incidents have occurred at FMI sites when a driver disconnected their hose with acid in it.

Safford has purchased and installed sight glasses as an engineering control to enable the driver to see when acid stops flowing down the hose which indicates the tanker is empty. This is a much better method to ensure that the tanker and hose are drained. Each of the 6 unloading stations at Safford now has the sight glasses installed. Feedback from the drivers is positive and during audits we see them using them.



ACTIVITY 3: CRITICAL CONTROL IMPROVEMENT BRAINSTORM

PPT slide 46, SG page 37



Time

Approximately 10 minutes

Materials

- Student Guide p. 37
- Pen/Pencil

Purpose

- This activity gives students the opportunity to brainstorm an idea for a Critical Control Improvement that might be used in acid handling
- **Encourage students to come up with an idea for a Critical Control Improvement that can be used in Acid Handling**
- **Tell them to be creative**

Instruction

1. In groups of 3 or more students, come up with an idea for a Critical Control Improvement that may be applied to sulfuric acid handling. Any idea will work even if it is impractical or overly expensive
2. Write a brief description and details for the improvement
3. Be prepared to share out

Critical Control Improvement Brainstorm	
<p>Directions</p> <ol style="list-style-type: none">1. In your group, come up with an idea for a Critical Control Improvement that may be applied to sulfuric acid handling2. Explain how communicating a Critical Control Improvement idea may help improve safety when loading or unloading sulfuric acid.3. Write a brief description and details for the improvement4. Be prepared to share out	Activity 3
<small>Sulfuric Acid - Bulk Handling - SFT FCX1017C</small>	

PPT slide 47



Instruction

Discuss the questions on the slide

Debrief

- What are some key concepts learned in this module?
- What do you need to understand better?
- What information surprised you?

MODULE 4: OPERATIONS

This module contains information about operation processes to keep personnel safe.

LEARNING OBJECTIVES

Upon completion of this module, students will be able to

- Discuss the different types of loading and unloading
- Outline procedures for entry

ACTIVITIES

- Activity 4: Hot and Warm Zones

For further details, refer to *Activity Materials* under *Facilitator Preparation* on page 6.

TOTAL TEACHING TIME

The introduction takes approximately 20 minutes to complete.

PPT slide 48, SG page 39

Instruction

- Review learning objectives for the module
- Upon completion of this module, students will be able to
 - Discuss the different types of loading and unloading
 - Outline procedures for entry



PPT slide 49, SG page 43




Instruction

- Comply with all FMI driving standards and policies and obey all traffic signage
- Drive to road conditions at all times and yield to heavy mine equipment
- Travel to and from the designated load/unload facility only; travel to any other location is not authorized
- Travel in the mine areas where mixing with heavy off-road mine equipment is possible and requires a valid Pit Driver license
- Left hand driving may be required at some sites
- Use identified roads
- Passing of an operating haul truck is strictly prohibited, even if the haul truck is stopped
- Follow proper passing protocols including proper radio clearance
- **Drivers/operators are expected to:**
 - Be fit for duty and trained for the task
 - Report any safety or environmental concerns/issues
 - Return any equipment picked up on entry
 - Return completed inspection form(s)
 - Secure transport vehicle to prevent leaks to the environment
- **NOTE:** Pit driving may not apply to all sites. In-Pit training will be covered in detail in the Pit Driving Safety course

Expectations of Drivers

- Comply with policies
- Obey traffic signage
- Travel to designated area only
- Review site SOPs

Sulfuric Acid - Bulk Handling - SFT FCX1017C  49

PPT slide 50, SG page 43




Instruction

- Operators must have participated in all on-boarding training and specialized acid handling training. They must follow the Contractor Health & Safety Manual and any FMI procedures about the work activities to be performed, including, but not limited to, this policy
- **Upon arrival at the site gate, operators will do the following:**
 - Present all documents requested by security attendant (**example:** vehicle inspection, company or regulatory agency training, hazard awareness card, pit driving card, Commercial Driver's License, bill of lading, etc.)
 - Be given an area inspection document (**NOTE:** Every site has their own, security issues to the driver who must turn it back in before exiting property)
 - Drive across the scale to document tare weight
 - Take possession of any specific FMI equipment as determined by each specific site
 - **NOTE:** Any operator who cannot provide the required documents will be denied entry to FMI property

Entry Procedures

- May vary from site to site
- Present documents
- Area inspection document
- Tare weight
- FMI equipment

Sulfuric Acid - Bulk Handling - SFT FCX1017C  50

PPT slide 51, SG page 44-45

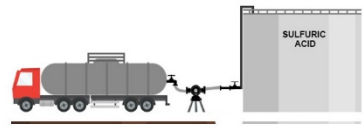



Instruction

- The safe handling of sulfuric acid requires careful attention to proper procedures and should be conducted by trained personnel wearing proper protective clothing
- Truck tanks are loaded through an open fill hole on the top of the truck, but unloading may vary due to design or piping arrangement. Truck tanks may be unloaded from the top or the bottom
- Pump: Acid truck tanks are unloaded from the bottom using a pump
- **Click once:** Gravity: When tanker unloading stations are located at an area above the storage tanks, acid may be unloaded using gravity.
- **Click again:** Pressure: Acid may be unloaded using air pressure if the storage tank is at level with the tanker. Pressure is used when unloading acid from a railcar.

Loading and Unloading

- Pump
- Gravity
- Pressure



Sulfuric Acid - Bulk Handling - SFT FCX1017C  51


PPT slide 52, SG page 45

Instruction

- A Hot Zone is an area where all acid PPE must be correctly worn at all times. Risk of acid exposure to personnel is high
- Risk of exposure is less hazardous in warm zone
- As outlined in the Sulfuric Acid Bulk Handling Technical Supplement, it is a requirement that specially designed PPE shall be worn by personnel handling or working near concentrated sulfuric acid
- Any person entering into this “Hot Zone,” where concentrated sulfuric acid may make contact with persons, must properly wear all specialized PPE, as defined within the policy

Hot and Warm Zones

- Hot Zone
 - Risk of exposure high
 - PPE
 - Follow site-specific training
- Warm Zone
 - Less hazardous
 - PPE

Sulfuric Acid - Bulk Handling - SFT FCX1017C  52



Instruction

- Drivers must follow the minimum PPE requirements for hot and warm zones while loading or unloading acid
- The potential for contamination is the greatest in the hot zone
- The warm zone is less hazardous than the hot zone, and personnel can wear lower levels of PPE
- **Hot Zone Minimum Requirements: The following minimum PPE requirements must be properly worn in Hot Zones:**
 - Acid Protective Garment
 - Chemical Resistant Boots and Gloves
 - Head, Eye, and Face Protection meeting one of the three options listed below
 - Respiratory protection meeting the requirements
 - **Protective garments will be worn with all closures fastened, hood donned, and wrist and ankle openings cinched**
 - **NOTE: No tape is permitted on garments**
- **Warm Zone Minimum Requirements: The following minimum PPE requirements must be properly worn in Warm Zones:**
 - Acid Protective Garment (jacket may be removed, or overalls/coveralls unzipped and open to waist)
 - Chemical Resistant Boots
 - Hard hat
 - Safety glasses
- **The following minimum PPE requirements must be readily available in Warm Zones:**
 - Chemical Resistant Gloves
 - Head, Eye, and Face Protection
 - Respiratory protection

Minimum PPE Requirements

- Hot Zone vs. Warm Zone
- Hot Zone requirements
- Warm Zone requirements

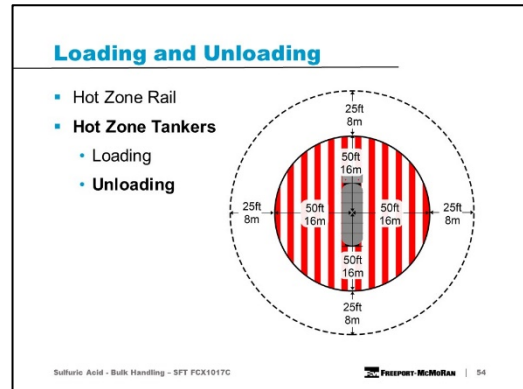
Sulfuric Acid - Bulk Handling - SFF FCX1017C

Freeport-McMoRan | 53



Instruction

- Drivers/operators may exit the Hot Zone during the unloading process but must maintain a line of sight and be attentive to the task and ensure that before re-entry to the Hot Zone all specialized PPE is properly donned
- Hot Zone Rail Car loading
- **Click once:** Hot Zone Tanker loading
- **Click again:** Hot Zone Tanker unloading



ACTIVITY 4: HOT AND WARM ZONES

PPT slides 55-59, SG pages 47-48



Time

Approximately 15 minutes

Materials

- Student Guide pages 47-48
- Pen/Pencil

Purpose

- This activity gives students the opportunity to review the hot and warm zone measurements and required PPE for each zone

Instruction

1. Fill in the hot zone and warm zone measurements using both feet and meters
2. **Click to show the answers for each slide**
3. Explain the requirements for PPE in a Warm Zone and a Hot Zone
4. **Click to show the answers**

Module 4 Activity

4. Using your own words, explain the requirements for PPE in a Warm Zone and a Hot Zone.

In a Warm Zone, Acid Protective garment, chemical resistant boots, hard hat and safety glasses must be worn. Chemical resistant gloves, head/eye/face protection and respiratory protection must be readily available.

In a Hot Zone, Acid Protective garment, chemical resistant boots and gloves, head/eye/face protection and respiratory protection must be properly worn.

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Hot and Warm Zones

Directions

1. Fill in the hot zone and warm zone measurements using both feet and meters SG pgs. 47-48
2. Explain the requirements for PPE in a Warm Zone and a Hot Zone

Sulfuric Acid - Bulk Handling - SFT FCX1017C

Activity 4

Module 4 Activity

1.

Module 4 Activity

2.

Module 4 Activity

3.

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PPT slide 60



Instruction

Discuss the questions on the slide

Debrief

- What are some key concepts learned in this module?
- What do you need to understand better?
- What information surprised you?

MODULE 5: INSPECTIONS AND AUDITS

This module contains information about the use of audits and inspections as a means to identify deficiencies.

LEARNING OBJECTIVES

Upon completion of this module, students will be able to

- List various inspection processes

TOTAL TEACHING TIME

The module takes approximately 20 minutes to complete.

PPT slide 61, SG page 49

Instruction

- Go over the learning objectives for the module
- Upon completion of this module, the students will be able to
 - List various inspection processes



PPT slide 62, SG page 53

Instruction

- A safety inspection looks at the physical conditions and work practices in a workplace
- Equipment is examined to determine whether all safeguards are in place and whether its operation presents any hazards
- Work practices are observed to identify unsafe actions
- The overall goal of a safety inspection is to identify hazards so they can be eliminated, guarded, or protected against
- A workplace examination may also be referred to as an area inspection, pre-shift inspection, and workplace inspection
- Workplace examinations are the first line of defense in protecting yourself and others
- The backbone of an effective workplace examination is hazard recognition. Hazards generally fall under one of three categories:
 - Chemical (e.g., H₂S, lime, solvents)
 - Biological (e.g., bacteria, animal waste, venom)
 - Physical (e.g., noise, radiation, impact injuries)
- Depending on your work area, the hazards to which you are exposed can fall under one or all three of these categories.
- Being skilled at recognizing hazards associated with your work area is a lifelong pursuit.
- Be aware of changing conditions.

Inspections and Audits

- Help identify deficiencies
 - Physical conditions
 - Work practices
- Hazard categories
 - Chemical
 - Biological
 - Physical
- Changing conditions

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Instruction

- It is a requirement to complete a workplace inspection to identify hazards, mitigate hazards to the extent that you are qualified, and to communicate to authorized FMI employees as required by the policy
- ***Do not proceed if equipment is not operable.***
Notify Control Room, Security, or Area Supervisor immediately
- Every driver/operator is expected to perform a work area inspection prior to beginning work
- **Common inspection items include the following (NOT an all-inclusive list):**
 - Safety Showers and Eye Wash Stations
 - Hose fittings— C-clamp, 4-bolt flange, or other
 - Safe Access & Egress
 - Travel Ways
 - Handrails
 - Tie-off Points
 - Lighting
 - Cables/hoses
 - Housekeeping Hazards
 - Environmental Conditions
 - Fire Extinguishers
 - Level indicator lights and Digital displays function
 - Deraileur and Chocks for rail systems
 - Ensure that De-icing Salt is not present (**NOTE:** When salt and acid combine, they form Chlorine gas. Call security if de-icing salt is present.)

Workplace Inspection

- Operators must perform work area inspection
- Common inspection items
 - Eyewash stations/Safety showers
 - Hose fittings
 - Safe access
 - Housekeeping
 - Cables and hoses
 - De-icing salt

Sulfuric Acid - Bulk Handling - SFT FCX1017C Freeport-McMoRan | 63

PPT slide 64, SG page 55



Instruction

- **Unloading complete:**
 - Bleed off residuals which include the tank, hose and connecting equipment
 - Wash down fittings and connections
- **Loading complete:**
 - Follow site protocols to check tanker for leaks
 - Bleed off residuals
 - If a leak is found, stop, contact the control room
 - If no leak is found, wash down fittings and connections
- **NOTE:** Drivers/operators must **never** enter the tank of an acid truck or a rail car.

Post Workplace Inspection

- Unloading Complete
 - Follow site-specific protocols
 - Bleed residuals
 - Wash down connections
- Loading Complete
 - Follow site-specific protocols
 - Bleed off residuals
 - Check for leaks
 - Wash down connections

Sulfuric Acid - Bulk Handling - SFT FCX1017C Freemont-McMoRan

PPT slide 65, SG page 56

Instruction

- The purpose of a checklist is to reduce or eliminate the potential safety hazards associated with sulfuric acid handling
- A checklist is not intended to replace any other area work inspection or procedure
- Site-specific checklists may vary from site to site. Always follow site-specific processes

Checklist Monitoring

- Checklists vary from site to site
- Always follow site-specific processes

SULFURIC ACID LOADING/UNLOADING CHECK LIST

Driver Name:	Date:	FWL Bill of Lading #:
Carrier:	Trailer #:	
BLER, CECR, CFI, CHEM TRANS, BARNBY	Trailer No #:	
The truck driver must initial where indicated after each step.		
Initials	Initials	Initials
Unloading	Unloading	Unloading
Pre-Loading		
1. Check in at Front Gate.		
2. Get empty receipt at Scale.		
Pre-Loading		
1. Check weights.		
2. Put on required safety PPE.		
3. Check that eyewash & shower are in working condition.		
Acid Loading/Unloading		
1. Platform raised.		
2. Check down lid and gasket.		
3. Run fingers along the underside of the down lid perimeter, ensuring that it is seated properly and free of obstructions.		
4. Check All test Valves.		
5. Check Champs Valve, exp.		
6. Check Internal Valve - closed.		
7. Check External Valve - closed.		
8. Check if Head Cap with Gasket is in place.		
9. Check Pressure Relief Valve.		
Comments:		

Example Checklist

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MODULE 5 QUIZ

PPT slides 66-68, SG page 57



Instruction

- Students write answers to the quiz questions in the SG
- Review the answers as a class
- **Click to view the answers**

Quiz Answers

Question	Answer
1	Answers may vary for examples; p. 53
2	A, C, D, E, F; p. 54-55

Module 5 Quiz

Directions

1. Complete the quiz in the Student Guide
2. Discuss the answers as a class

Sulfuric Acid - Bulk Handling - SFT FCX1017C

Quiz

Module 5 Quiz

1. During a safety inspection, hazards generally fall into one of three categories. Name the three categories and give an example for each.

Categories: **Examples:**

Module 5 Quiz

2. Circle items that need to be inspected during a pre-area workplace exam. This is not an all-inclusive list.
 - a. Showers
 - b. Tire pressure
 - c. Housekeeping hazards
 - d. Fire extinguisher
 - e. Eye wash
 - f. Weather conditions
 - g. Handwashing stations

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PPT slide 69



Instruction

Discuss the questions on the slide

Debrief

- What are some key concepts learned in this module?
- What do you need to understand better?
- What information surprised you?

MODULE 6: EMERGENCY RESPONSES

This module contains information about how to respond to incidents at varying levels.

LEARNING OBJECTIVES

Upon completion of this module, students will be able to

- Discuss action plan for an emergency situation

TOTAL TEACHING TIME

The module takes approximately 15 minutes to complete.

PPT slide 70, SG page 59

Instruction

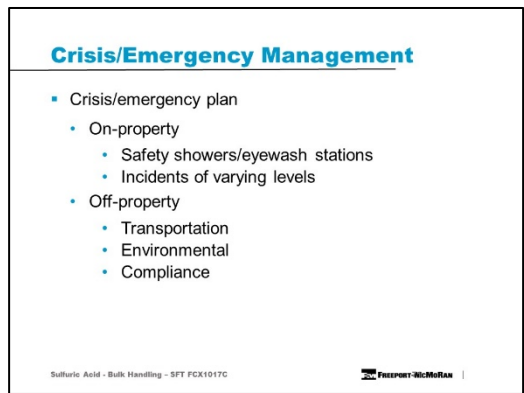
- Go over the learning objectives for the module
- Upon completion of this module, the students will be able to
 - Discuss action plan for an emergency situation



PPT slide 71, SG page 63

Instruction

- Crisis/emergency preparedness involves a plan on how to respond to incidents at varying levels, such as using a safety shower or eyewash station, and extends to emergency responses in case of a major spill
- Individuals need to know the location of emergency equipment, such as eyewash stations, and they need to ensure they are in proper working order
- A crisis/emergency management plan is a plan that is developed, maintained, and practiced to respond to crises and emergencies that may arise on site. **Each site has a crisis management plan in place**



Off-Property

- **Transportation**
 - The transport of sulfuric acid is subject to rules which must be complied with by all drivers involved
 - Follow your company requirements and regulatory agencies' requirements on reporting incidents
- **Environmental**
 - Prevent entry to sewers and public waters
 - Notify authorities if sulfuric acid enters sewers, public waters, or low areas
 - Follow your company requirements and regulatory agencies' requirements on reporting incidents
- **Compliance**
 - Comply with your company requirements and regulatory agencies' requirements on reporting incidents

PPT slide 72, SG page 64




Instruction

- Information on emergency action and incident reporting information is found in the Contractor Health and Safety Manual. (**NOTE:** When referencing this document, make sure it is the current version as the document is updated annually. Discard any copies that are published before and up to the expiration date and reference only the latest document)
- In the event of a serious incident or injury **on Freeport-McMoRan-owned property**, immediately activate the emergency response/notification system and maintain scene safety. This will be site specific and is dependent on the communication device used
- Trained Contractor personnel should render first aid to any incident victims
- FCX will address any media inquiries or announcements and make other decisions critical to the overall site and project
- Emergency telephone numbers/radio channels must be posted in areas accessible to Contractor employees
- For emergencies **off** Freeport-McMoRan-owned properties, comply with your company requirements and regulatory agencies' requirements on crisis management

Emergency Action

- Emergency action
 - Activate emergency response system
 - Emergency telephone numbers
 - Emergency radio channels
- Off-Property emergency
 - Comply with company or regulatory agency's requirements

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Instruction

- **For incidents on Freeport-McMoRan-owned properties**, comply with the Contractor Health and Safety Manual on incident management
- All incidents shall be reported to the FCX Health and Safety Department immediately with the initial written report to be submitted by shift end. Initial reports will include, at a minimum:
 - Location of incident
 - Name of persons involved
 - Equipment involved
 - Time/date of incident
 - Nature of incident: occupational injury, occupational illness, near miss, property damage
 - Brief description of incident
 - Where injured (body part)
 - Name of person contacted for report
- Written final report is due to the Health and Safety Department within 48 hours of the incident, unless otherwise extended based on severity of incident
- **For incidents off Freeport-McMoRan-owned properties**, comply with your company or regulatory agencies' requirements on incident management. If the incident involves any damage to Freeport-McMoRan property, a report of damage is required

Incident Reporting

- Comply with Contractor Health and Safety Manual
 - Initial written report
 - Final written report
- Off-property
 - Comply with regulatory agencies requirements

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PPT slide 74, SG page 65

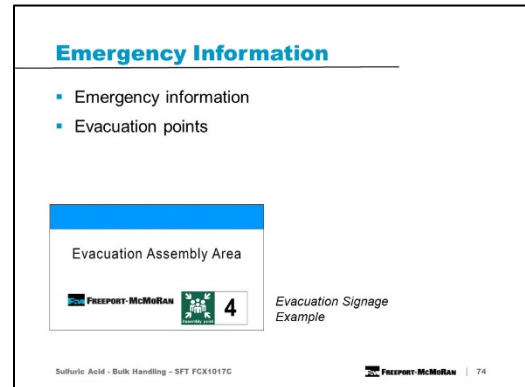
Instruction

Emergency Information

- Each site will provide carriers with relevant information for emergency evacuation and response
- This will be site specific, and will be provided in the site hazard video. All incidents must be reported to health and safety

Evacuation Points

- Evacuation and muster points are located throughout sites. When arriving to site, ensure you know the location of these points
- In the event of an emergency while loading or off-loading acid, note the direction of the wind by checking the windsocks in the area, and proceed to the muster point in the upwind direction
- If you are unsure of muster point locations, consult site security, health and safety, or operators at the loading/unloading locations



MODULE 6 QUIZ

PPT slides 75-78, SG page 66



Instruction

- Students write answers to the quiz questions in the SG
- Review the answers as a class
- **Click to view the answers**

Quiz Answers

Question	Answer
1	A, B, C; p. 64
2	See p. 64
3	C; p. 64

Module 6 Quiz

Directions

1. Complete the quiz in the Student Guide
2. Discuss the answers as a class

Quiz

Sulfuric Acid - Bulk Handling - SFT FCX1017C

Module 6 Quiz


1. In the case of an emergency on Freeport-McMoRan-owned property, what are drivers expected to do? Circle all that apply.
 - a. Immediately activate the emergency response system
 - b. Maintain scene safety
 - c. Trained personnel should render first aid to incident victims
 - d. Contact the media to announce the emergency

Module 6 Quiz

2. List all items that need to be included in an initial incident report.
 - Location of incident
 - Name of persons involved
 - Equipment involved
 - Time/date of incident
 - Nature of incident
 - Brief description of incident
 - Where injured (body part)
 - Name of person contacted for report

Module 6 Quiz

3. If an incident occurs on-property, a written report is required. What is the time frame to submit the *initial* report and to whom should the report be submitted?
 - a. The report should be submitted to the local media immediately.
 - b. The report should be submitted to the FCX Health and Safety Department within 48 hours.
 - c. The report should be submitted to the FCX Health and Safety Department by the end of the shift.
 - d. The report should only be submitted to your employer when applicable and within the carrier indicated timeframe.

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PPT slide 79




Instruction

Discuss the questions on the slide

Debrief

- What are some key concepts learned in this module?
- What do you need to understand better?
- What information surprised you?

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CONCLUSION

The conclusion contains information to help operators return home safely by educating personnel on standard operating procedures for transporting, loading, or unloading concentrated sulfuric acid.

ACTIVITIES

- Student End of Course Questionnaire (in SG)

For further details, refer to *Activity Materials* under *Facilitator Preparation* on page 6.

TOTAL TEACHING TIME

The conclusion takes approximately 10 minutes to complete.

PPT slide 80, SG page 67

Instruction

The conclusion covers

- Review
- Student Course Evaluation




PPT slide 81, SG page 67

Instruction

- Freeport-McMoRan's expectation as a company is for every employee to return home safely at the end of their shift
- This course was designed to educate personnel on standardized operating and safety procedures for loading, unloading, and transporting bulk concentrated sulfuric acid

Conclusion

- Focus on Safety
- Safe Procedures for Handling Sulfuric Acid

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PPT slide 82




Instruction

As the objectives for each module are reviewed, **discuss the students' lingering questions, comments, or concerns**

Debrief

- What are some of the key concepts in each module?
 - Module 1: Risks and Hazards
 - Module 2: Controls
 - Module 3: Communication
 - Module 4: Operations
 - Module 5: Inspections and Audits
 - Module 6: Emergency Responses
- Are there any additional questions, comments, or concerns?

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A debrief is included at the end of the course to help summarize, review, refresh, retain, and clarify content covered throughout the course. Students are often anxious to leave at the conclusion of the course so keep the debrief quick and relevant.

PPT slide 83, SG page 77

Instruction

- Students complete the Student Course Evaluation (in SG)
- Collect and return evaluations (including the Facilitator Course Evaluation in the back of the FG) to the Mine Training Institute according to the directions on the form

Student Course Evaluation

Directions

1. Complete the Course Evaluation in the Student Guide
2. Carefully tear out the evaluation
3. Return the completed form to the facilitator

Sulfuric Acid - Bulk Handling - SFT FCX1017C

Evaluation

FACILITATOR COURSE EVALUATION

Course Name

Facilitator Name

1. What worked well in the course? Please explain.

2. Were the topics effectively sequenced? If not, please provide suggestions for change.

3. Was the content up-to-date with current processes, equipment, etc.? If not, please provide specific examples.

4. Was the content at the appropriate level of difficulty? If not, please provide examples.

5. What in the course needs improvement? Please provide specific examples.

6. Were the course materials (PPT, FG, etc.) of high quality? If not, please provide examples.

7. Were there any inaccuracies or missing content? If so, please provide examples.

8. Do any of the issues you've identified need to be addressed immediately? If so, please list which ones.

Thank you for taking the time to complete the survey.

Please mail to: Mine Training Institute, Attention: Suzanne Anderson, 18550 S. La Canada Drive, Sahuarita, AZ 85629
Or scan and email to: sanderso2@fmi.com

