



Lock Out and Hold Tags



Change record

Date	Reason
September 2020	First LTP edition

Developed by: Health, Safety, Environment Curriculum Development and Evaluation Group

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Isolation, Lock Out and Hold Tags

Unit 1

Isolation, Lock Out and Hold Tags

HSECD & EG

September 2020

Module 1

Importance of isolation

Enabling objectives

On completion of Module 1, you will be able to:

- Describe the Stop Work Authority program.
- Describe the importance of isolation and LOTO in the work permit safety program

Terminal objective

You will correctly identify the main requirements to comply with the Saudi Aramco corporate isolation, lock-out, and use of hold tag program as per General Instruction 6.012.

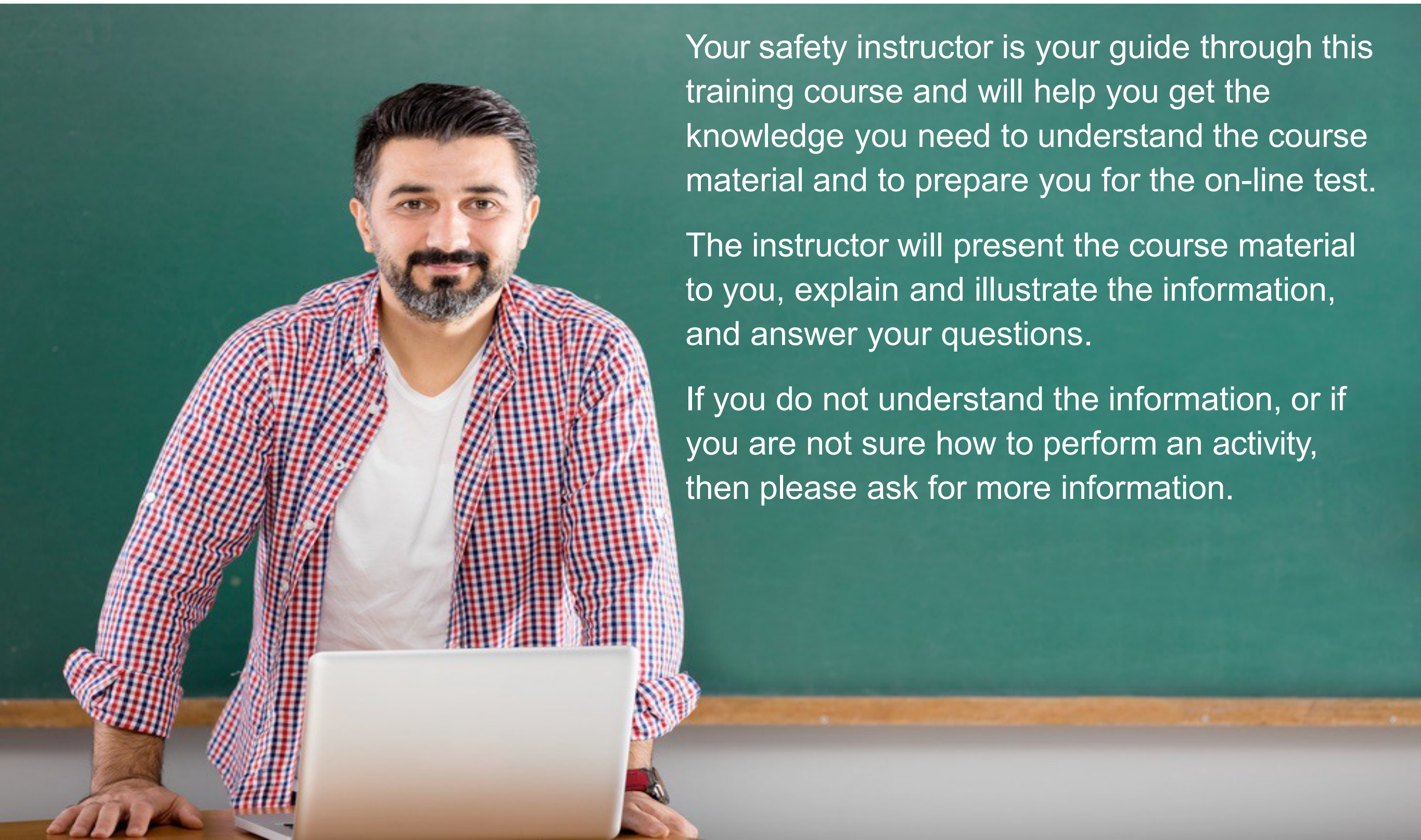
Introduction

Industrial machinery is often large and complex.

When this equipment is shut down to be maintained or repaired, there are typically multiple people from different trades involved.



Instructional staff



Your safety instructor is your guide through this training course and will help you get the knowledge you need to understand the course material and to prepare you for the on-line test.

The instructor will present the course material to you, explain and illustrate the information, and answer your questions.

If you do not understand the information, or if you are not sure how to perform an activity, then please ask for more information.

Stop Work Authority (SWA)

Before we start the Isolation, Lock Out and Tag Out course, you must be fully aware of the Saudi Aramco Stop Work Authority (SWA).

The Stop Work Authority is a program designed to provide employees and contract workers with the responsibility and obligation to stop work when a possible unsafe condition or behavior may result in an incident.



Stop Work Authority

All personnel have the authority to stop any unsafe work.

If you observe any unsafe work that has the potential to injure personnel, damage equipment, or harm the environment, you are empowered to stop work and report your concerns to a supervisor.

Basic Safety Rules

Stop Unsafe Work

1. Immediately STOP any unsafe work that has the potential to injure personnel, damage equipment, or harm the environment.

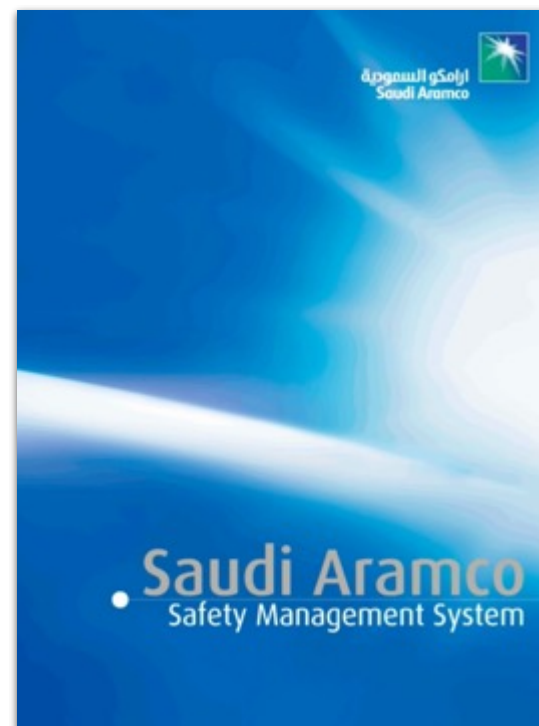
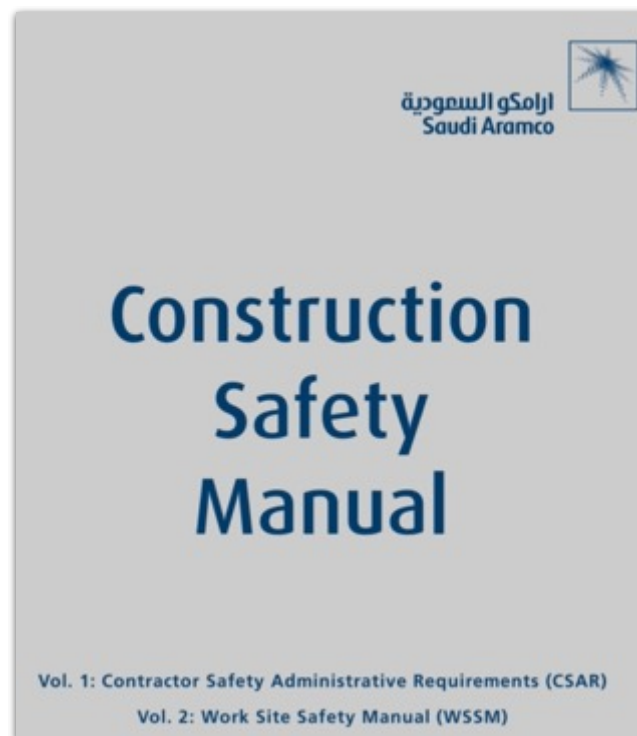
Report Incidents

2. Immediately report all work related injuries/illnesses, no matter how minor, to your supervisor.
3. Immediately report all fires, spills, or releases, no matter how small, to your supervisor.
4. Immediately report any unsafe condition, unsafe act, near miss incident, or vehicle collision to your supervisor.

SWA references

These publications outline the expectations for all personnel to stop work in the event that an unsafe act or situation is observed.

- Construction Safety Manual, Chapter I-4, Work Permit System and Stop Work Authority.
- SMS Manual, Element 6, Safe Operations.
- Safety Handbook Rules 1 and 4.



SWA 5 step process



1. STOP unsafe work.

You are authorized to stop work immediately when coworkers, equipment or the environment are at risk.



2. Notify affected personnel and supervision.

Don't try to correct everything yourself. Notify your supervisor and any other organizations, as required.



3. Investigate the cause for intervention and correct the hazard.

After a stop work action is in place, the proponent organization and those involved should:

- Discuss the situation and come to an agreement on the harmful behavior or condition and a corrective plan.
- If needed, have an external subject matter expert evaluate the situation and confirm whether it is safe to proceed.

If the SWA concern is valid:

- Suspend work until a resolution is in place.
- Verify that all safety issues have been properly resolved.
- Modify work practices or procedures when necessary.

SWA 5 step process



4. Communicate findings and resume work.

Notify all affected personnel about corrective actions to prevent similar issues from occurring.



5. Follow-up.

Promptly review all stop cases to identify any need for additional investigation or follow-up.

SWA Signs

Stop work signage, shall be mounted in clearly visible locations at worksites as per CSM 4.11.4 to remind everyone of their SWA responsibilities.



Review questions



Importance of isolation

In Module 1 you will learn about the following:

- Isolation and LOTO definitions.
- What is an isolation plan.
- When do you isolate.
- Common fatal failures.



Introduction

Most of you have already learned how to perform isolation for your specific craft and type of work.

The Isolation Lockout and Hold Tag course will teach you how to perform the isolation and LOTO procedure when many crafts and people are involved at the same time. It will also help you to recognize if the equipment is isolated, safe and ready for work.

You must understand that you are not alone and must take into account the other workers involved with the isolation process to ensure everyone's safety.



Introduction

Many industrial accidents occur as a result of failing to isolate, or failing to verify isolation. This may result in a person being injured or killed as a result of a third party switching equipment back on before work is completed.

The group lock out procedure using **multiple lock-out clips** and hold tags or **group lock out boxes** ensures that **each worker is individually protected**.

The details of the procedures and implementation may vary from site to site, but the general LOTO guidelines and procedures are identical, and you must follow them.



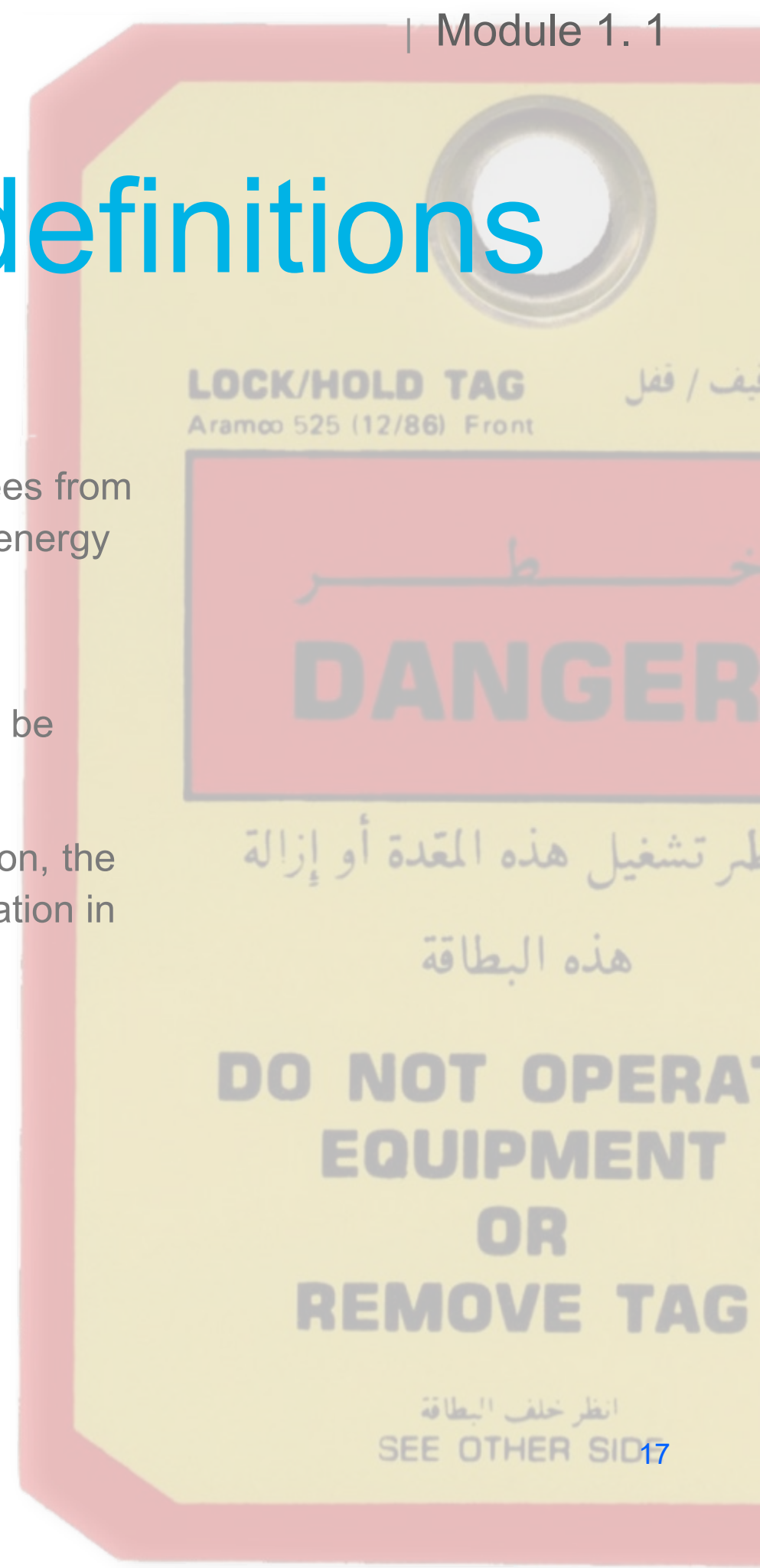
Isolation and LOTO definitions

Isolation: the process where equipment is removed from service and is protected against the release of energy.

Lock-Out/Tag-Out (LOTO): refers to procedures to safeguard employees from the unexpected energization or startup of equipment, or the release of energy during maintenance activities.

Lock-Out: the closure and placement of a lock on an energy isolating device, to ensure that the energy and the equipment or process cannot be operated until the lock out device is removed.

Hold Tags: *Do Not Operate* warning devices to communicate the reason, the authorization of the isolation and also identifies who performed the isolation in case they need to be contacted.



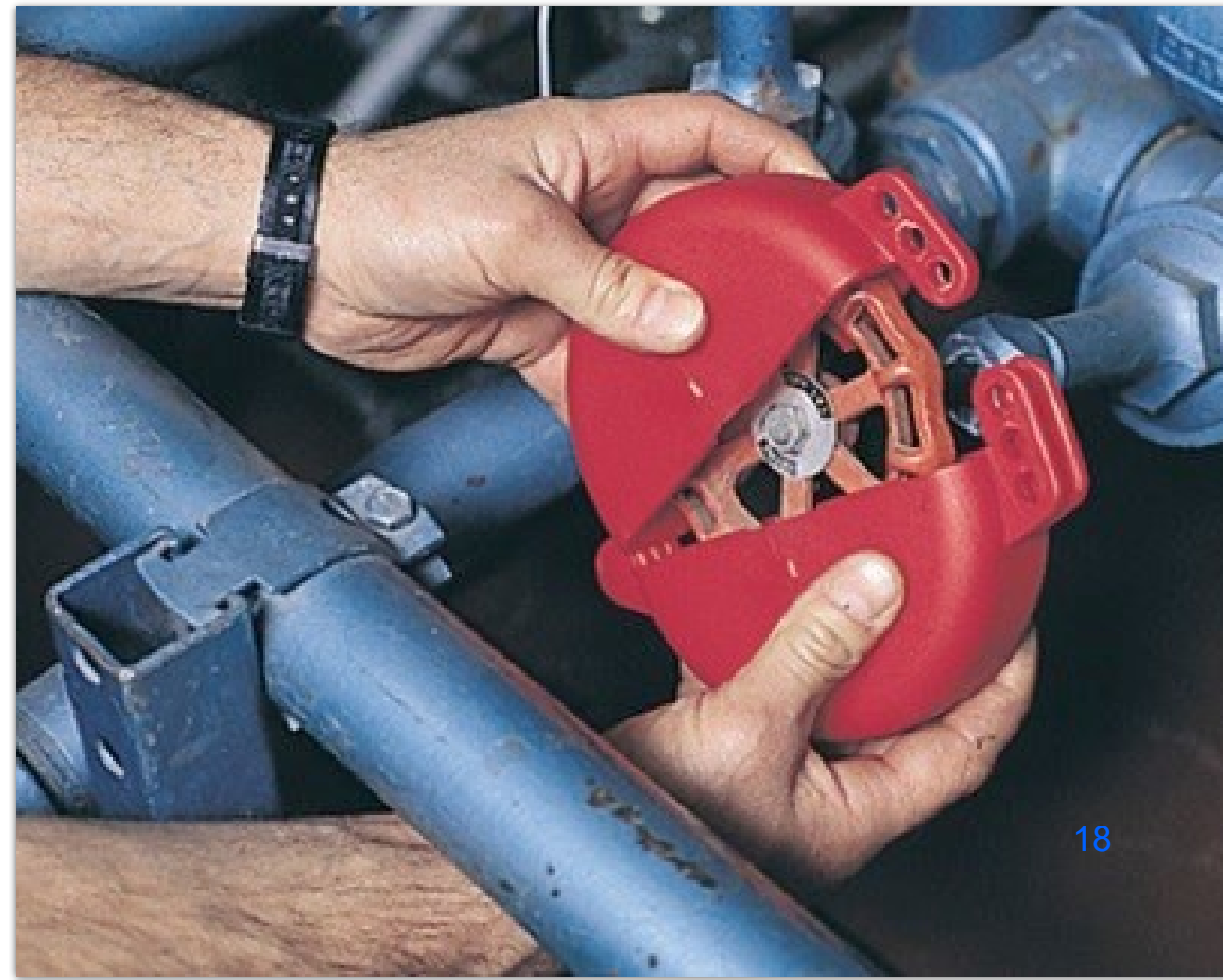
What is isolation?

Isolation is the process of:

- De-energizing equipment or machines.
- Removing the possibility of an unexpected startup of equipment or machines.
- Eliminating all energy sources and stored energy.

Isolation complexity depends on:

- The nature of the energy to be isolated.
- The specific work to be conducted, e.g. routine or complex maintenance.
- The equipment and the configuration.
- The material being handled or processed.



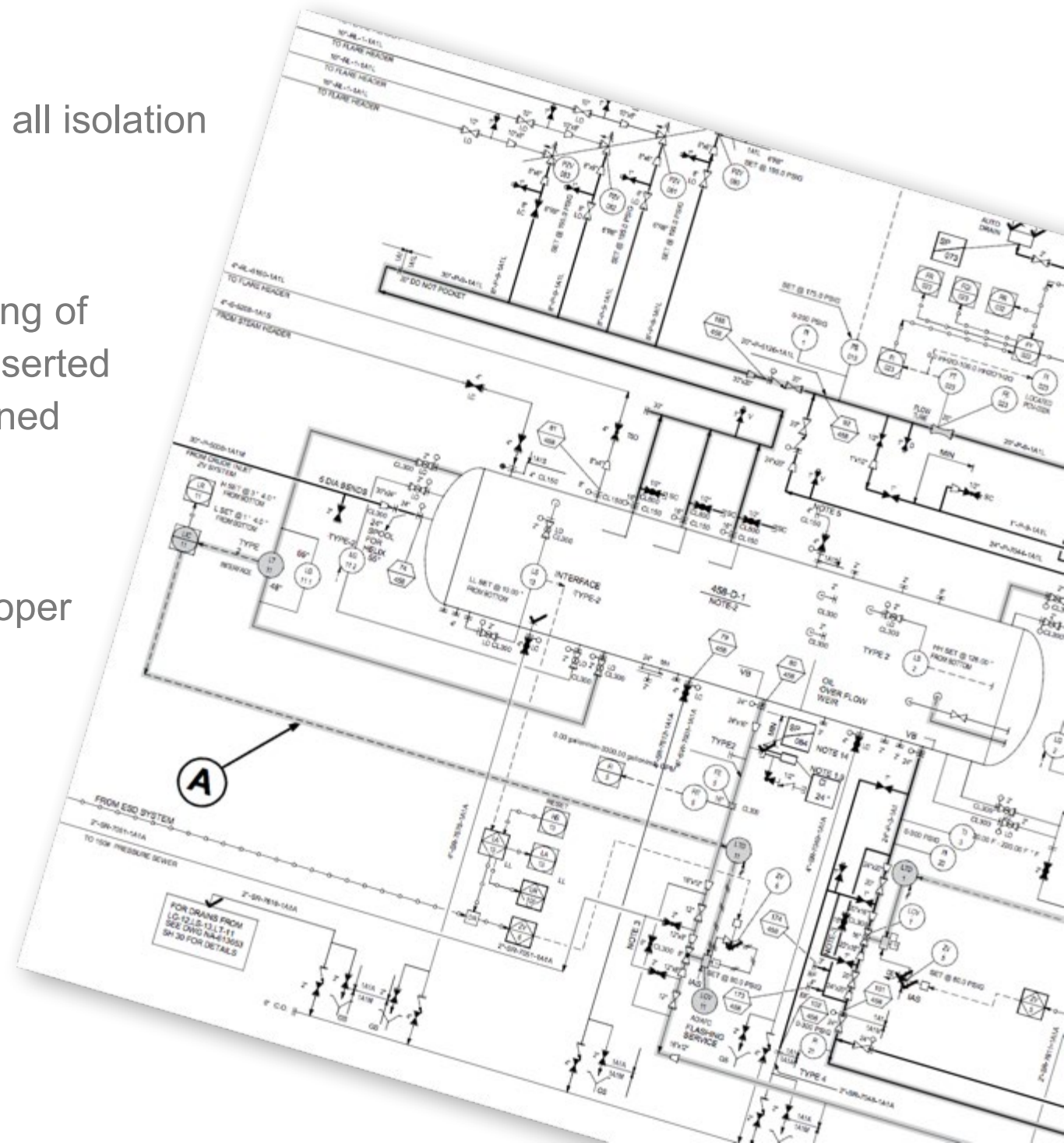
What is an isolation plan ?

Isolation plans are written procedures developed by proponent organizations for major equipment or vessels with multiple connections and several low points where hazardous materials might remain trapped.

Isolation plan includes:

- Drawings (P&IDs, isometric drawings, etc.) indicating all isolation points, nozzles, drains and vents.
- Steps for depressurizing, draining, flushing and purging of equipment and associated piping before blinds are inserted and tagged, including the proper disposal of any drained material.
- Site preparation steps (e.g., covering sewers) and proper sequence for installing isolation devices.

Note: You must always follow the isolation plan.



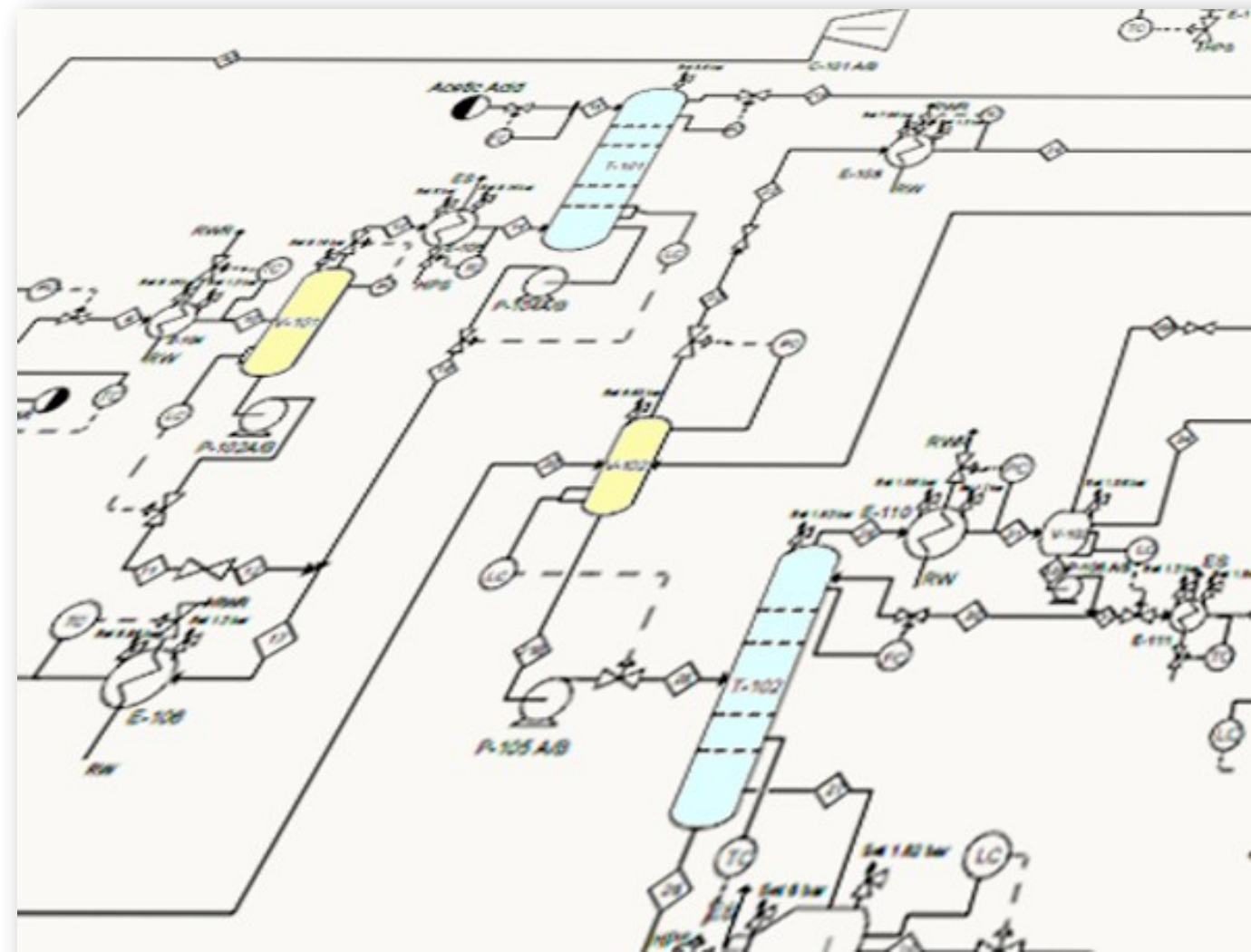
What is an isolation plan ?

Consists of a detailed and approved document that lists:

- All the **energy isolations** with their **locations**.
- The **sequence, steps** and safety measures required.
- **Drawings (P&ID)** of all isolation points, drains, and vents.
- **Blind list** to track installation/removal of blinds and the proper **sequence**.
- **Steps** for depressurization, draining, purging, and disposing of drained material.

- **Types of isolating devices** to be used and site/ job-specific procedures for isolating the equipment.

Site preparation steps (e.g., covering sewers, stopping hot work).



Why is isolation and LOTO important?

Isolation is important because it protects personnel performing maintenance and surrounding personnel. It also protects assets and the environment by safely controlling hazardous energy sources during maintenance, inspection, and testing of equipment.

Proper isolation, lock out and hold tag procedures:

- Provides **individual protection** of workers and Saudi Aramco assets when performing maintenance, inspection or repair.
- Controls energy sources and hazardous materials from accidental release.
- Prevents loss of primary containment of the hazardous material into the environment.



When do you isolate?

You must implement proper isolation to control hazardous energy sources before:

- Any maintenance.
- Repair work.
- Any work that requires a line break and equipment opening.
- Confined space entry.
- Issuing any permits.

This work is normally done by a maintenance crew. Operators need to hand over the equipment in a safe condition for work to be performed.

This means shutting down the equipment/system and removing all sources of potential or kinetic energy.

Operational personnel need to work as a team with the maintenance/operator crew for work to be accomplished safely.



When do you isolate?

You must always implement proper isolation methods to control hazardous energy sources before any maintenance or repair work, any work that requires a line break and any equipment opening, or confined space entry.

Before you can start work, a certified work permit issuer and a certified receiver must issue a work permit or combination of permits.

This is included in the checklist to make sure that proper isolation has been achieved before you issue a work permit.

CONFINED SPACE ENTRY PERMIT

Saudi Aramco 98734 (1/21) Front No. D

Complete this form in English and write clearly. Use ink pen, not pencil.

أرامل
saudi aramco

SECTION 1 – WORK DESCRIPTION

Month _____ Day _____ Year _____ Duration _____

A. Identify plant/facility area:

B. Exact work location:

C. Work to be done:

D. Equipment to be used at the site:

SECTION 2 – HAZARD IDENTIFICATION & CONTROL

A. Identify and attach any supplementary forms required to perform/control the work:

Confined space entry log (mandatory) ☐ CSE Plan (mandatory) ☐ Job Safety Analysis ☐

Gas test records ☐ Isolation plan ☐ Blind list ☐ Critical Lift Plan ☐ Excavation Checklist ☐

Hydrotest procedure(s) ☐ Other _____

B. Energy Types:

Hydrocarbon/gas/team/chemicals ☐ Mechanical ☐ Electrical ☐ Hydraulic/pneumatic ☐

Potential energy (spring loaded, gravity) ☐ Automated extinguishing systems ☐ Other _____

C. Isolation Method(s)

Locked switch/breaker ☐ Mechanical block ☐ Blinding ☐ Disconnect ☐

Positive isolation (blind or disconnect) shall be used for all piping connections to the confined space.

D. Potential Hazards:

High noise level ☐ Hydrogen Sulfide (H₂S) ☐ Flammable liquid/gases ☐ Hazardous/hot materials ☐

Radioactive material ☐ Temperature ☐ High pressure ☐ Other _____

E. Protective Equipment:

Personal H₂S monitor ☐ FRK ☐ ARC rated PPE ☐ Goggles/face shield ☐ Chemical suit/waterfalls ☐

Fall protection ☐ Barricade/warning signs ☐ Mechanical ventilation/blower ☐

Respiratory protection ☐ Explain further in Additional Safety Precautions below

F. Confined Space Entry Supervisor (CESN) ☐ Badge No. _____

G. Confined Space Entry Standby Man ☐ Badge No. _____

H. List any Additional Safety Precautions:

IN AN EMERGENCY:

☐ SEE ATTACHED

SECTION 3 – GAS TESTING/MONITORING

Gas testing frequency: _____

Periodic monitoring required: Yes ☐ No ☐ If yes, attach a supplemental form.

Additional gas tests required prior to entry after break/interruption of work, if site conditions change, and at periodic intervals (as required). Record before or use a supplemental form.

ONLY CERTIFIED GAS TESTERS PERFORM GAS TESTS

	O ₂ (%)	H ₂ (ppm)	O ₂ (%)	CO(ppm)	Others	Badge No.	Signature
Initial							
Revised							
Additional							
Additional							

SECTION 4 – PERMIT AUTHORIZATION & CLOSURE

Additional approvals per GR 2.100 or local instructions:

Signature _____ Position _____ Org _____ Badge No. _____

Signature _____ Position _____ Org _____ Badge No. _____

Receiver Org _____ Issuer Org _____

PERMIT _____ Badge No. _____ Cert. No. _____ Signature _____ Badge No. _____ Cert. No. _____ Signature _____

Open _____

This permit is renewed Date _____ Time _____ Counterpart notified of permit renewal ☐

Renewed _____

This permit is closed Date _____ Time _____

I hereby certify the work was completed and it has been returned to a safe condition.

Closed _____

HAZARD ANALYSIS CHECKLIST

Any "Y" (Yes) answers below shall initiate a "STOP" point where the Issuer and Receiver are to analyze the hazard(s) and develop methods to adequately control the hazard(s) and list the additional precautions on the permit.

	Y	N	N/A
Is the correct type of permit(s) issued for the work?	☐	☐	☐
Have the Job Safety Analysis (JSA) and other applicable supplementary forms been communicated to the work crew?	☐	☐	☐
Are weather conditions (e.g., wind speed, rain, fog, heat, lightning) acceptable to perform the work?	☐	☐	☐
Are slip and trip hazards controlled?	☐	☐	☐
Does the work crew have the correct tool/equipment for the job? Are they in good condition?	☐	☐	☐
Do personnel have the proper certifications to perform the activity and/or operate the equipment?	☐	☐	☐
Is the equipment's inspection sticker valid?	☐	☐	☐
Have all requirements for working at heights (i.e., fall protection) been applied?	☐	☐	☐
Is the scaffold tag completed, current, signed, and with a valid inspection date?	☐	☐	☐
Has the potential for contact with sharp objects, rotating equipment, hot/solid surfaces, or live electricity been eliminated?	☐	☐	☐
Is the system/equipment properly isolated and locked out? Did all workers apply their personal locks?	☐	☐	☐
Has the system/equipment been depressurized, drained, and/or purged before opening?	☐	☐	☐
Has the potential for releasing flammable liquids and gases been considered?	☐	☐	☐
Are all ignition sources eliminated or controlled?	☐	☐	☐
Does the fire watch have firefighting equipment readily available and know how to use the equipment?	☐	☐	☐
Has the potential for exposure to high noise levels, H ₂ S, hydrocarbons, asbestos, hazardous chemicals, or radioactive materials been controlled?	☐	☐	

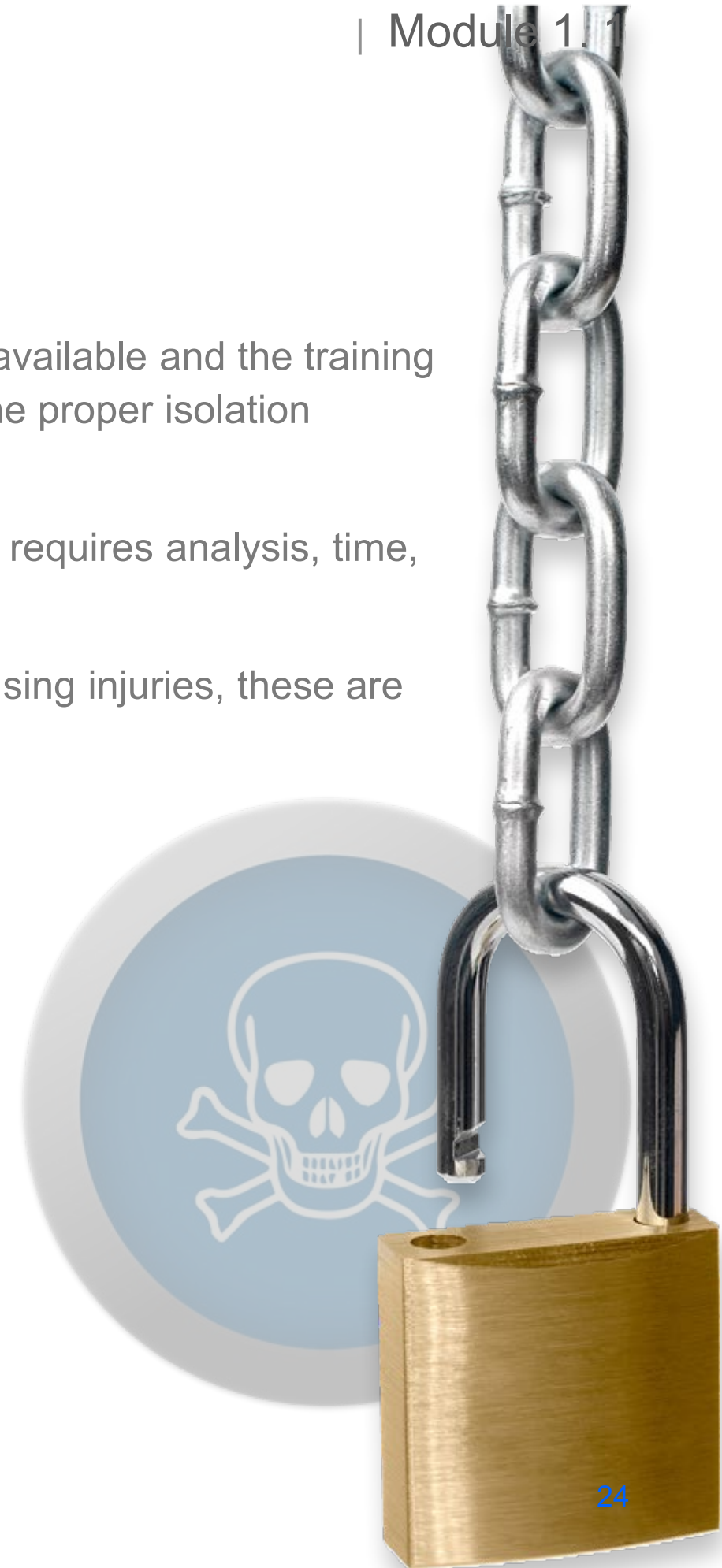
Common fatal failures

Even if all the procedures were developed, all the necessary equipment is available and the training delivered, it is useless if you do not follow the procedures and do not use the proper isolation methods.

Never ever take short cuts or improvise; isolation is a complex process that requires analysis, time, and preparation.

There are seven fatal failure mechanisms that are the main reasons for causing injuries, these are a failure to:

1. Stop or close equipment.
2. Disconnect from the power source.
3. Verify proper isolation.
4. Remove all residual energy.
5. Depressurize before line opening.
6. Prevent unexpected restarting.
7. Clear the area before restarting.



Common fatal failures

Failure to correctly identify and isolate energy sources associated with process plant equipment can lead to an unexpected startup or release of stored energy.

This can escalate and cause a major incident that could injure personnel and/or damage assets.

Injuries in these events can include electrocution, crushing, amputations, burns, fractures, lacerations, and even loss of life.

Never be complacent, even simple maintenance tasks can lead to fatalities if the proper isolation devices and methods are not used to isolate the equipment being maintained.

Failure to verify the isolation can quickly lead to injuries.



Common fatal failures

What are the common fatal factors?

The result of a failure to follow safety procedures related to isolation of potential energy to prevent the release on machinery, pipelines, or electrical equipment.

Understanding what method of isolation to use and following these guidelines will ensure that jobs are performed safely and personnel can avoid any injuries.

Failure to Verify: As you can see, most of the causes of injuries and accidents are caused by employees omitting important steps in the isolation process and too often, failing to verify that the energy source or hazardous material is completely removed or controlled.

As an example, before starting work, you must verify that there is no electricity present, no pressure, and no movement is possible or hazardous gas present.

Also ensure all required permits or combination of permits were issued.



Review questions



Summary

In Module 1 you were introduced to the Saudi Aramco Stop Work Authority and the importance of isolation.

You should now be able to:

Describe the Stop Work Authority program.

Describe the importance of isolation and LOTO in the work permit safety program, including,

- Isolation and LOTO definitions.
- What is isolation.
- What is a isolation plan.
- When do you isolate.
- Common fatal failures.

Your instructor will now start Module 2, roles and responsibilities.



Module 2

Roles and responsibilities

Enabling objectives

On completion of Module 2, you will be able to:

- Describe and comply with duties associated with your role and the responsibilities of the LOTO Program.



Introduction

The responsibility for ensuring compliance with General Instruction 6.012 rests with managers and supervisors.

Employees and contractors also have responsibilities to comply with the requirements of GI 6.012, work permits and plant specific LOTO procedures.

This will help protect you, your co-workers, company assets and the environment.



Roles and responsibilities

In Module 2 you will learn about the following:

- Saudi Aramco and Management responsibilities.
- Authorized personnel.
- Affected personnel.
- Work crews and contractors.



Saudi Aramco responsibilities

Depending on your job title, specialty training or the group you work for (maintenance or operation etc.), you may not be the person conducting the isolation procedure or physically locking and tagging the equipment.

As a worker, you must understand the basic principles of isolation and LOTO to ensure you never work on equipment that is not properly isolated, locked out and tagged.

We will look at the responsibilities for the following:

- Department managers, division heads and supervisors.
- Employees.
- Contractors.

SAUDI ARABIAN OIL COMPANY (Saudi Aramco)		G. I. Number	APPROVED
GENERAL INSTRUCTION MANUAL		6.012	
ISSUING ORG.	LOSS PREVENTION DEPARTMENT	ISSUE DATE	REPLACES
		02/15/2018	02/02/2013
SUBJECT	ISOLATION, LOCK OUT, AND USE OF HOLD TAGS	APPROVAL	PAGE NO.
		AAG	1 OF 16
CONTENTS			
1.0	PURPOSE		
2.0	SCOPE		
3.0	REFERENCES		
4.0	DEFINITIONS		
5.0	RESPONSIBILITIES		
6.0	GENERAL REQUIREMENTS (PIPING AND EQUIPMENT)		
7.0	GROUP LOCKOUT REQUIREMENTS		
8.0	PROCESS PIPING AND EQUIPMENT ISOLATION METHODS		
9.0	GENERAL REQUIREMENTS (ELECTRICAL EQUIPMENT ISOLATION)		
10.0	EMERGENCY REMOVAL OF LOCKOUT DEVICES		
SUPPLEMENTS			
6.012-1	MANDATORY POSITIVE ISOLATION ACTIVITIES		
6.012-2	ISOLATION RISK FACTORS		
6.012-3	T&I ISOLATION METHOD (PROCESS PLANTS)		
1.0 PURPOSE			
The purpose of this General Instruction is to define minimum requirements for safely isolating and controlling			
erating processes at Saudi Aramco facilities and			
(modification, maintenance, inspection, and testing			
n in situations where personnel could be injured or			
bergy or hazardous materials. Sources of energy			
eumatic systems. Examples of hazardous materials			
hydrocarbons, radioactive sources, hot water, and			
activities performed under SAEP-311, Installation of			
ork on cord and plug equipment when the cord is			
e control of the person performing the work.			
COMPLETE REVISION			



Proponent management

Operations or controlling organizations (proponent management) have the responsibility to develop a specific isolation, lock out and hold tag processes for their operations.

Proponent management are Managers, Division heads and

Supervisors. They must:

- Identify authorized personnel and the affected personnel.
- Ensure that all the work permit issuers and receivers have completed the corporate Isolation & LOTO course (BET 40069962).
- Develop local LOTO program and procedures aligned with GI 6.012.
- Develop specific written LOTO procedures for major equipment, complex vessels or hazardous processes with multiple low points.
- Develop local isolation and lock out process/procedures for group lockout box.
- Identify isolating points, via procedures drawing, P&ID in the instruction manuals.
- Train all employees and contractors in all aspects of local LOTO procedures.
- Provide lock out devices and equipment.



Authorized personnel

Throughout the course, we will refer to **authorized personnel** and **affected personnel**, it is important to understand the definition and responsibilities associated with each term.

Authorized personnel:

- Personnel who have the **experience** and **training** in isolation, lock out and hold tag processes
- Who **apply** isolation and lockout devices and tags on equipment or operating processes in order to perform servicing or maintenance.



Authorized personnel

They are responsible to **verify** isolation and **TRY**.

- Usually performed by **Operation** and **Maintenance**.
- Performed on each isolating device and on each piece of isolated equipment during joint site inspection (JSI) for work permit issuance.
- Ensures that each isolating device, or methods are **physically tested** to **confirm** that it cannot be operated.



Affected personnel

Affected personnel: Personnel whose job requires operating or using equipment or operational processes on which servicing or maintenance is being performed under isolation and lock-out, or whose job requires working in an area where such servicing or maintenance is being performed.

Affected personnel may be Saudi Aramco employees or contractors and their work will be affected by the isolation, shutdown, or work conducted on their equipment or work area.

- May be affected by hot work or possible release of hazardous material.
- Operating or using equipment under isolation and lockout.
- Working in an area where servicing or maintenance is being performed.

They must **follow instructions** given by the **authorized personnel** and never attempt to operate or energize the equipment without their authorization.



Work crew and contractors

The responsibilities of the work crew are as follows:

- They must verify that the isolation and lock out performed by the operations crew was done correctly.
- Must check and verify personally that isolation was performed correctly and the equipment is safe to work on.
- Each worker places his personal locks and tags on the multiple lock clip (Hasps) and/or on the group lock box as per local isolation and LOTO procedures.
- Follow procedures for multiple lock out clips with tags or group lock out procedure if many crafts are working on the equipment.
- Each issuing organization must use a system for uniquely identifying the locks applied by each person, and locks must be individually keyed. (e.g. engraving, color coding, tags, log book).

ONE MAN = ONE LOCK with ONE KEY



Contractors

The responsibilities for contractors are as follows,

For existing facilities or equipment:

Contractors are required to follow **local site specific** isolation **procedures** and Saudi Aramco **GI 6.012**

For grassroots projects:

Contractors shall **establish** an **isolation and LOTO** procedure that is **compatible with** Saudi Aramco **GI 6.012**.

The contractor is responsible for ensuring that any sub-contractors they use follow Saudi Aramco's lock out/tag out procedures.

The on site employer must ensure that his/her employees understand and comply with the restrictions and prohibitions in relation to the proponents LOTO program.

Stop Work Authority (SWA) also applies, and they are responsible to stop work if they see something dangerous.



Review questions



Summary

In Module 2 you were introduced to the isolation and LOTO roles and responsibilities.

You should now be able to:

Describe and comply with duties associated with your role and the responsibilities of the LOTO Program, including,

- Saudi Aramco responsibilities.
- Proponent management responsibilities.
- Authorized personnel.
- Affected personnel.
- Work crews and contractors.

Your instructor will now start Module 3, identify equipment, energy and isolation methods.



Module 3

Identify equipment,
energy & isolation
methods

Enabling objectives

On completion of Module 3, you will be able to:

- Identify the equipment, energy, or systems that require the application of LOTO and identify the correct isolation devices and methods to make them safe to work on.



Introduction

An energy control program ensures proper procedures are followed to prevent unexpected energizing, startup, or release of stored energy that could occur and cause injury.



Identify equipment, energy and isolation methods

In Module 3 you will learn about the following:

- Energy control program.
- Energy isolating devices.
- Hold tag procedures.
- Energy requiring isolation.
- De-energize and verification.



Energy control program

An energy control program ensures proper procedures are followed to prevent **unexpected energizing, startup, or release** of stored energy that could occur and cause injury.

Machines or equipment must be isolated from the energy source and rendered inoperative before any employee performs any servicing or maintenance.

The three key elements of an energy control program are

- **Specific written procedures.**
- **Training.**
- **Periodic inspections.**



Energy control program

The three key elements of an energy control program are,

Specific written procedures for:

- Shut down.
- Isolating/blocking.
- Applying individual locks or tags.
- Relieving stored/residual energy.
- Verifying zero energy state.
- Removing and transferring locks.

Training:

- Authorized employees and Affected employees.
- Other employees.
- Certify (document/authorize).



Energy control program

Periodic inspections:

- Conducted by authorized employee(s).
- Evaluate each authorized employee during the procedure.
- Are the steps in the energy control procedure being followed.
- Do the employees involved know their responsibilities.
- Is the procedure adequate and what changes, if any, are needed.
- Certify (document).



Energy isolating devices

Lock out: refers to **mechanical locking devices**, (such as a lock), that physically prevents the transmission or release of energy and include:

- Manually operated circuit breakers.
- Disconnect switches.
- Valves.
- Blinds.
- Any similar devices used to block or isolate energy.



Main Disconnect



Line Valve



Circuit Breaker

NOTE: push buttons, selector switches and other control circuit type devices are **not** energy isolating devices.



Energy isolating devices

Hold tags: are **warning devices** (such as a tag) affixed to energy isolating devices to communicate the reason and authorization of the isolation.

- Tags are essentially warning or communication devices affixed to energy isolating devices.
- A tag does not block or positively lock the equipment; the locking device does that.
- The placement of a tag on an energy isolating device is to indicate: *“Danger, do not operate equipment or remove tag”*.



Hold tag procedures

Saudi Aramco requires that **both locks and tags** are to be installed.

- When a tag is attached to an energy isolating device, it is not to be bypassed, ignored or removed without the permission of the authorized person.
- Tags must be legible in order to be effective. When it is no longer legible, it must be replaced.
- Tags must be securely attached to energy isolating devices.
- Tags and their attachment must be made of materials which will withstand the environmental conditions (zip ties or wire).

LOCK/HOLD TAG
Saudi Aramco 525 (1/90) Reverse

بطاقة توقيف / قفل
(Refer to G.I. 6.012)

(ضع هذه البطاقة على كل الأقفال واجهزة العزل)
PLACE THIS TAG ON ALL LOCKS AND ISOLATING DEVICES

Location/Plant No. Shedgum Liquid Recovery	رقم العمل / المكان	Date/Time June 15, 2019 9:30 a.m.	التاريخ / الوقت	
Equipment Pump Motor G-44	المعدات			
Reason for Tag Maintenance to replace bearing on pump motor				
سبب وضع هذه البطاقة				
على من يضع البطاقة أن يدرج المعلومات في المخطط رقم (١) يستعمل السطران رقم (٢) ورقم (٣) عند تغيير الترخيص. INSTALLER FILLS IN LINE 1. LINES 2 & 3 FOR SHIFT CHANGE ENDORSEMENT.				
الاسم NAME	الدائرة ORGANIZATION	رقم الشارة BADGE NO.	رقم التلفون PHONE NO.	الإمضاء SIGNATURE
1 Ali Hassan	30000143	293434	5774577	Ali Hassan
2				
3				

LINE 1 ■■■→
LINE 2 ■■■→
LINE 3 ■■■→

DATE REMOVED: _____ تاريخ إزالة البطاقة:

LOCK/HOLD TAG
Aramco 525 (12/86) Front

لا تفتح هذه المعدة أو إزالة

هذه البطاقة

**DO NOT OPERATE
EQUIPMENT
OR
REMOVE TAG**

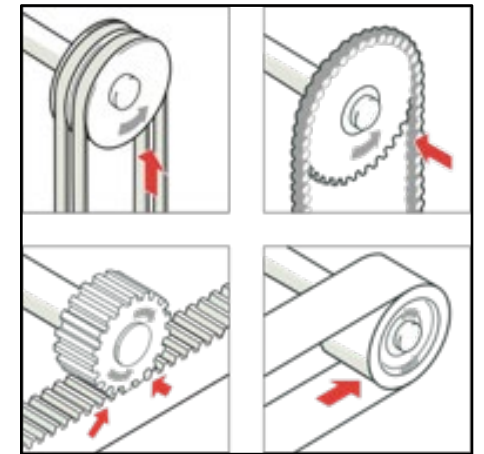
انظر خلف البطاقة
SEE OTHER SIDE

Energy requiring isolation

Various types of energy fall under the 'isolate, lock and tag' classification.

Equipment or material energy can be:

- Electrical.
- Mechanical.
- Steam.
- Hydraulic.
- Pneumatic.
- Chemical.
- Potential or stored energy.



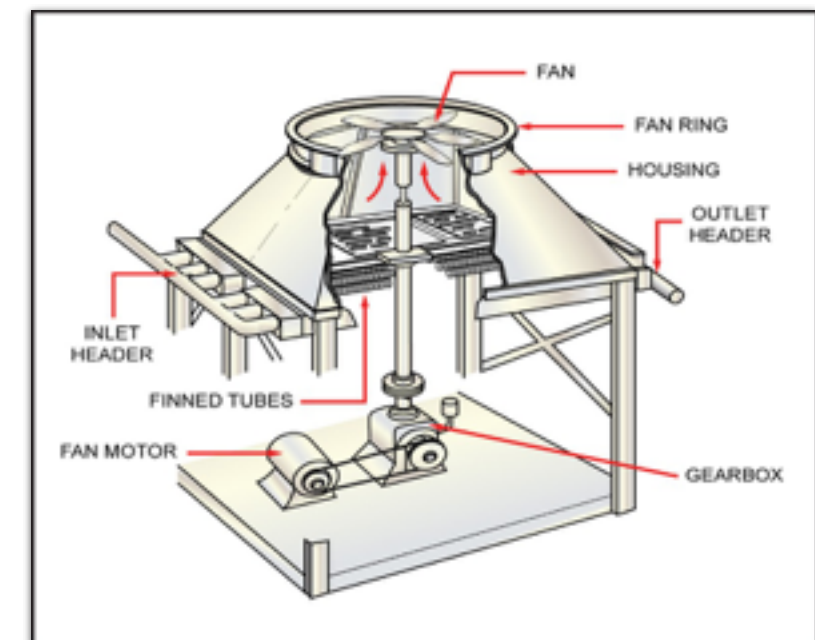
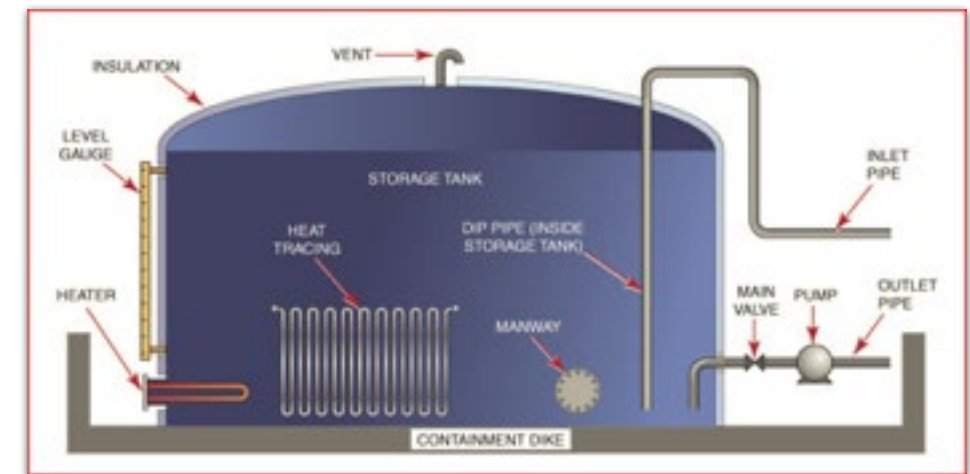
Equipment requiring isolation

In mechanical systems, consideration must be given for the different types and combinations of energy sources that may be present.

For example, a mixing tank may have mechanical energy for the mixer, electrical for the motor and chemical energy from the material inside the tank.

Below are common examples of equipment that will require isolation:

- Pipelines.
- Electrical equipment.
- Pumps.
- Motors.
- Compressors.
- Pressured lines/ Pipelines.
- Vessels, tanks and confined spaces.
- Hydraulic presses.
- Fin fans.



De-energize verification

Remember, work is not allowed to commence and no maintenance material or device may be placed on the isolated equipment until a verification test has been performed.

Always verify yourself that the isolation and lock and hold tag has been properly done and equipment is ready and safe to work on.



Review questions



Summary

In Module 3 you were introduced to the equipment, energy and systems that require the application of isolation, locks and tags.

You should now be able to:

Identify the equipment, energy, or systems that require the application of LOTO and identify the correct isolation devices and methods to make them safe to work on, including,

- Energy control program.
- Energy isolating devices.
- Hold tag procedures.
- Energy requiring isolation.
- De-energize and verification.

Your instructor will now start Module 4, steps to perform isolations.



Module 4

Steps to perform isolations

Enabling objectives

On completion of Module 4, you will be able to:

- Identify the steps to perform safe isolation and group lockout.



Introduction

Once equipment is locked and tagged, all potentially hazardous energy must be made safe. Before any work begins you must ensure that the correct LOTO steps have been taken and verify that the equipment is isolated and de-energized.



Steps to perform isolations

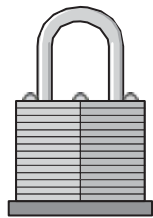
In Module 4 you will learn about the following:

- Isolation and LOTO steps.
- Piping isolation.
- Primary isolation - single block valves and double block and bleed.
- Positive isolation - blinds and disconnection.
- Confined space isolation.
- Electrical isolation.
- Group lockout.



Steps to perform isolation

Authorized personnel (**operations first / maintenance verifies**), performs the shutdown and then the isolation and lock out and tag out procedures.



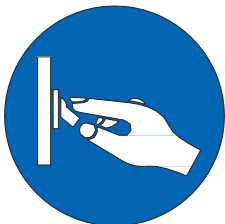
Lock: apply only approved locks and locking devices (chains, cable or special locking devices) as per the local procedures.



Tag: apply only Saudi Aramco approved tags at locking points.



Clear: clear the work area of affected personnel.



Try/Verify: each isolation point, ensure the controls cannot be moved to the ON or OPEN position and ensure all energy is removed, ensure the controls are return to OFF or CLOSED position.

NOTE: Inform maintenance that the equipment is isolated and ready for their LOTO.

Isolation and LOTO steps

Steps	Actions
Prepare shutdown	Identify hazards and take precautions, identify all isolation points , prepare all required tools and gear.
Communicate	Inform all affected personnel using equipment or working around the equipment area.
PPE	Use proper PPE for the job.
Shutdown	Follow standard shutdown procedure for the equipment.
Isolation	Physically turn off energy isolation devices (switches, valves, electrical panels) as per the isolation plan.
LOTO	Lock and tag equipment, one lock and one tag at each isolation point by authorized personnel (minimum) or group lock box.
Clear	All personnel from around the equipment and the work area.
Verify/try	Verify that equipment is properly isolated and de-energized or de-pressurized and try to turn on and then return to off .

CSE positive isolation

Confined spaces are complex and often require specialized procedures and steps to prepare to isolate and lock-out and tag-out.

- Always follow the **isolation plan** and **confined space entry plan and permit**.
- You must prevent flammable, toxic, or oxygen displacing gases from entering the space.
- Gas testing is mandatory.
- Use **positive isolation** (blinding or disconnection) for confined space entry.
- Purge or flush the space between the isolation and the confined space.
- Always check for interconnected equipment.
- Always confirm/verify adequate lock out or tag out.

CONFINED SPACE ENTRY PERMIT
Saudi Aramco 9873-4 (1/17) Front No. 0
Complete this form in English and write clearly. Use ink, pen, not pencil.

Month _____ Day _____ Year _____ Duration _____

A. Identify plant/facility area: _____
B. Exact work location: _____
C. Work to be done: _____
D. Equipment to be used at the site: _____

SECTION 2 – HAZARD IDENTIFICATION & CONTROL
A. Identify and attach any supplementary forms required to perform/control the work:
Confined space entry log (mandatory) ☐ CSE Plan (mandatory) ☐ Job Safety Analysis ☐
Gas test records ☐ Isolation plan ☐ Blind list ☐ Critical Lift Plan ☐ Excavation Checklist ☐
Hydrotest procedures ☐ Other: _____
B. Energy Types:
Hydrocarbon/gas/steam/chemicals ☐ Mechanical ☐ Electrical ☐ Hydraulic/pneumatic ☐
Potential energy (spring loaded, gravity) ☐ Automated extinguishing systems ☐ Other: _____
C. Isolation Method(s):
Locked switch/breaker ☐ Mechanical block ☐ Blinding ☐ Disconnect ☐
Positive isolation (blind or disconnect) shall be used for all piping connections to the confined space.
D. Potential Exposures:
High noise level ☐ Hydrogen Sulfide (H₂S) ☐ Flammable liquid/gases ☐ Hazardous/toxic materials ☐
Radioactive materials ☐ Temperature ☐ High pressure ☐ Other: _____
E. Protective Equipment:
Personal H₂S monitor ☐ PRC ☐ ARC rated PPE ☐ Goggles/face shield ☐ Chemical sub/suinals ☐
Fall protection ☐ Barricade/warning signs ☐ Mechanical ventilation/blower ☐
Respiratory protection ☐ Explain further in Additional Safety Precautions below.
F. Confined Space Entry Supervisor (CSES) ☐ Badge No. _____
G. Confined Space Entry Standby Man ☐ Badge No. _____
H. List any Additional Safety Precautions: _____

IN AN EMERGENCY: ☐ SEE ATTACHED

SECTION 3 – GAS TESTING/MONITORING Gas testing frequency: _____
Periodic monitoring required: Yes ☐ No ☐ If yes, attach a supplemental form.
Additional gas tests required prior to entry, after break/interruption of work, if site conditions change, and at periodic intervals (as required). Record below or use a supplemental form.

	LEL (%)	H ₂ (ppm)	O ₂ (%)	CO (ppm)	Others	Badge No.	Signature
Initial							
Renewed							
Additional							

SECTION 4 – PERMIT AUTHORIZATION & CLOSURE
Additional approvals per QI 2.100 or local instructions:
Signature _____ Position _____ Org _____ Badge No. _____
Signature _____ Position _____ Org _____ Badge No. _____
Receiver Org: _____ Issuer Org: _____
PERMIT: _____ Badge No. _____ Signature _____ Badge No. _____ Signature _____
Open _____ Date _____ Time _____ Counterparts notified of permit renewal ☐
Renewed _____ Date _____ Time _____
This permit is closed _____ Date _____ Time _____
I HAVE INSPECTED THE WORK SITE AND CONFIRM THAT IT HAS BEEN RETURNED TO A SAFE CONDITION.
Closed _____

HAZARD ANALYSIS CHECKLIST
Any "N" (No) answers below shall initiate a "STOP" point where the Issuer and Receiver are to analyze the hazard(s) and develop methods to adequately control the hazard(s) and list the additional precautions on the permit.

	Y	N	N/A
Is the correct type of permit(s) issued for the work?	☐	☐	☐
Have the Job Safety Analysis (JSA) and other applicable supplementary forms been communicated to the work crew?	☐	☐	☐
Are weather conditions (e.g., wind speed, rain, fog, heat, lightning) acceptable to perform the work?	☐	☐	☐
Are slip and trip hazards controlled?	☐	☐	☐
Does the work crew have the correct tools/equipment for the job? Are they in good condition?	☐	☐	☐
Do personnel have the proper certifications to perform the activity and/or operate the equipment?	☐	☐	☐
Is the equipment's inspection sticker valid?	☐	☐	☐
Have all requirements for working at heights (e.g., fall protection) been applied?	☐	☐	☐
Is the scaffold tag completed correctly, signed, and with a valid inspection date?	☐	☐	☐
Has the potential for contact with sharp objects, rotating equipment, hot/cold surfaces, or live electricity been eliminated?	☐	☐	☐
Is the system/equipment properly isolated and locked out? Did all workers apply their personal locks?	☐	☐	☐
Has the system/equipment been depressurized, drained, and/or purged before opening it?	☐	☐	☐
Has the potential for releasing flammable liquids and gases been controlled?	☐	☐	☐
Are all ignition sources eliminated or controlled?	☐	☐	☐
Does the fire watch have firefighting equipment readily available and know how to use the equipment?	☐	☐	☐
Has the potential for exposure to high noise levels, H ₂ S, hydrocarbons, asbestos, hazardous chemicals, or radioactive materials been controlled?	☐	☐	☐
Is the correct personal protective equipment (PPE) available for use by personnel?	☐	☐	☐
If the work may impact others nearby, or vice versa, have the work crews discussed their activities with each other (i.e., simultaneous operations [SIMOPS])?	☐	☐	☐
Is there an emergency contingency plan in place to respond to the work being performed?	☐	☐	☐
Does the work crew know what to do in the event of an emergency, such as evacuation routes, location of emergency equipment, and where assembly areas are located?	☐	☐	☐

Signatures:
Issuer or Designated Representative _____
Receiver _____

Piping isolation

There are four methods for isolating process pipelines and equipment:

Primary isolations:

- Single block valve.
- Double block and bleed.

Positive isolations:

- Blinding.
- Disconnecting piping.

The method of isolation is determined by the task(s) to be performed.



Piping isolation

There are four different methods of isolating process piping and equipment.

Here we see them in the order of the level of protection they provide (low to high):

- Single block valve.
- Double block and bleed (DB&B).
- Blinding.
- Disconnection.

NOTE: All these methods must be combined with the proper work permit program and gas testing requirements.



Single valve isolation

Single block valve isolation **shall not be used** when equipment or piping containing hazardous materials is to be used for confined space entry or hot work activities.

Single block valve isolation offers **minimum (low) protection** and is suitable for some routine maintenance activities (e.g., filter changes or cleaning) or as primary isolation for blind installation.

A single block valve cannot be used for confined space entry.

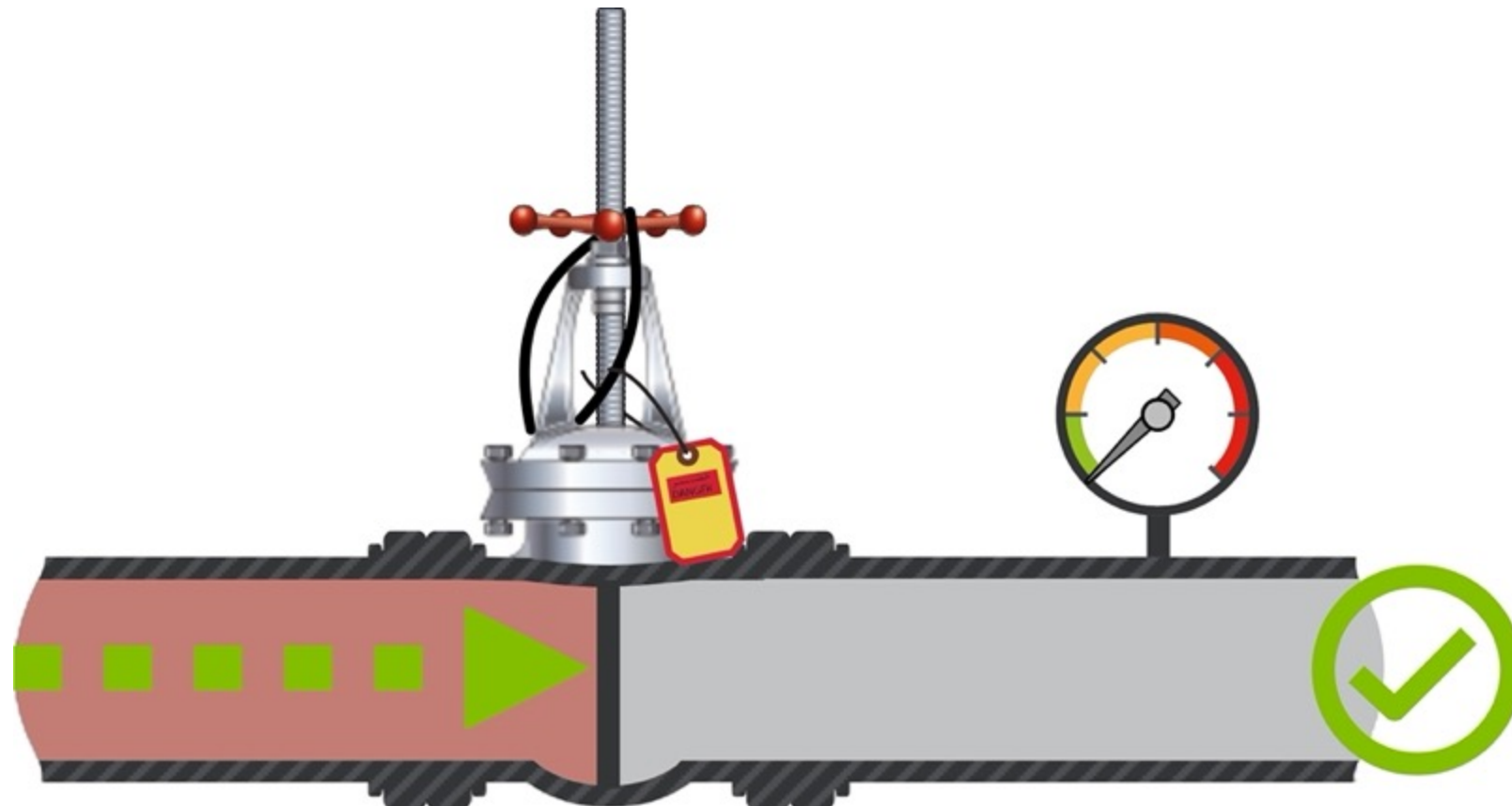


Single valve isolation

How to complete a single block valve isolation:

- Close the valve, lock and tag.
- Drain, vent and purge contents.
- Ensure/check isolation integrity, check for passing.
- Check pressure gauge indicates zero and stays at zero.

When completed this is referred to as a 'proven isolation'.

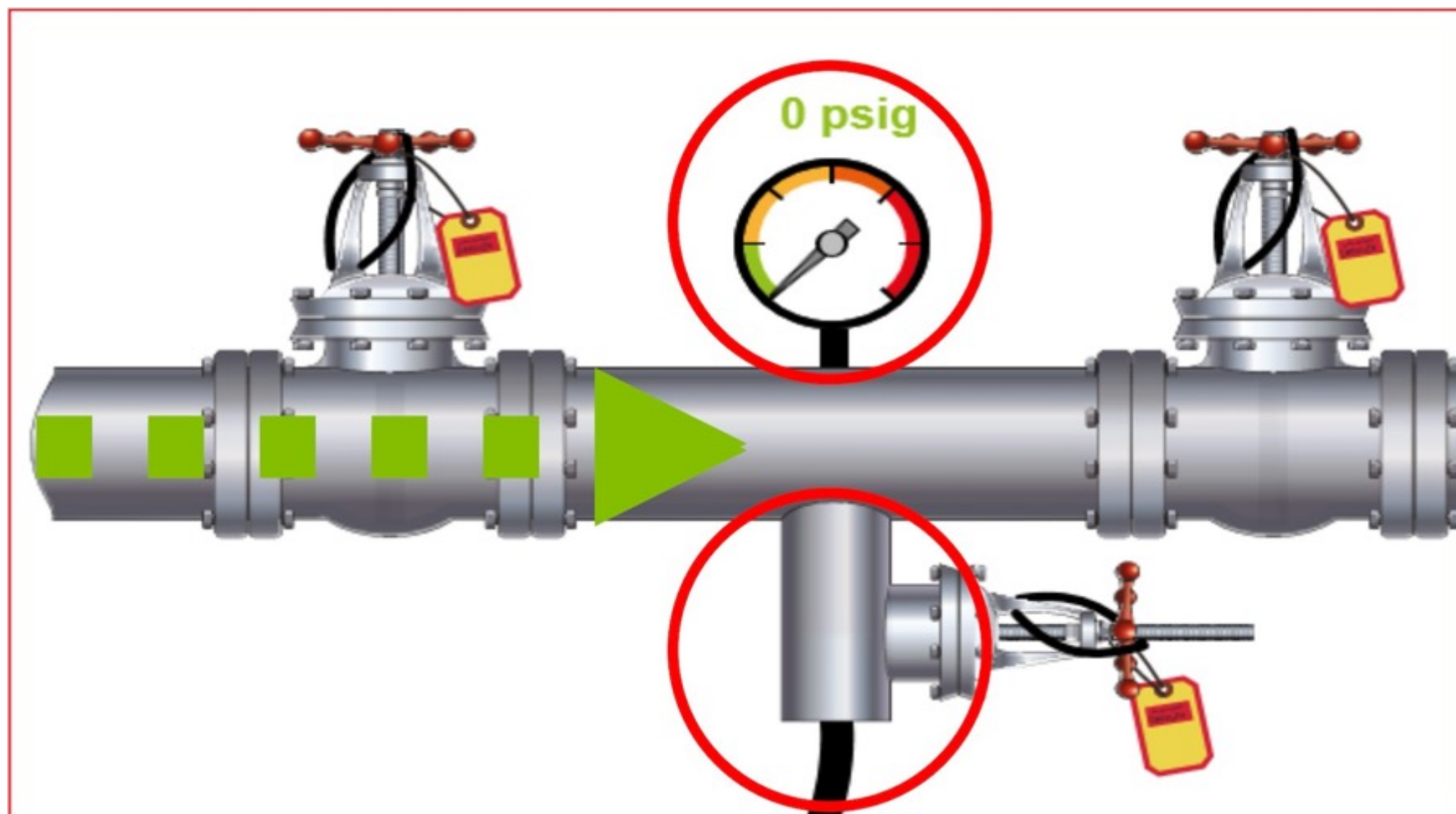


Proven single valve isolation

All valve isolation must be proven, if you are not able to prove the isolation, then an **isolation risk assessment** shall be conducted. (GI 6.012, para 8.0)

Methods for determining if a **single valve** isolation is **proven**:

- A downstream pressure or flow indicator is **zero** and **maintains zero** once the valve is closed.
- A downstream low point or vent is checked to verify that the flow of the material has been stopped by the single valve isolation.

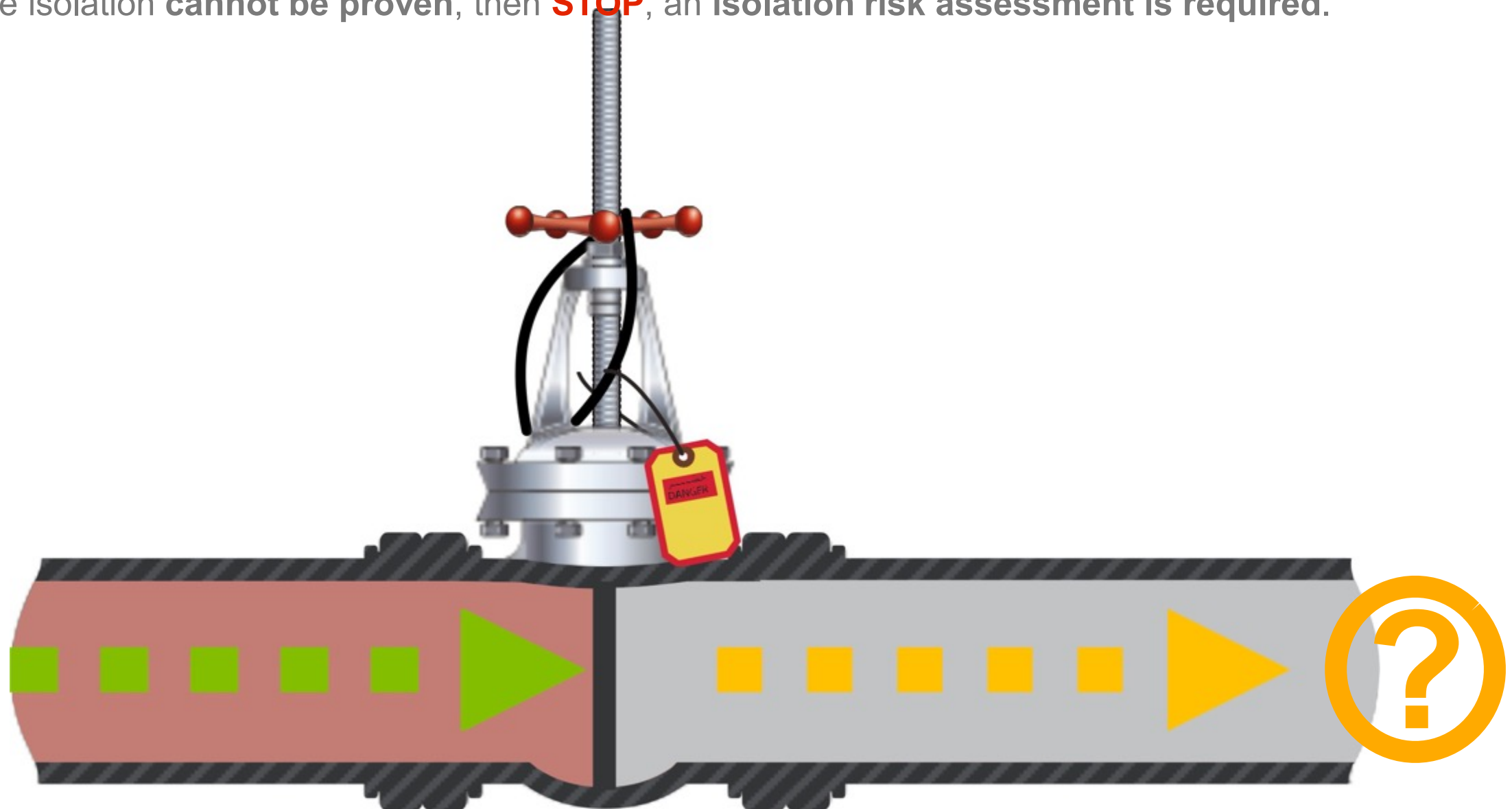


Unproven single valve isolation

When isolating a single valve and no vent or pressure gauges are available downstream to verify if the valve is passing or leaking, **you cannot prove** that isolation is successful and it is safe to work on the equipment.

The valve isolation **must be proven** somehow to ensure it is not leaking or passing.

If the valve isolation **cannot be proven**, then **STOP**, an isolation risk assessment is required.



Isolation risk assessment

All valve isolation must be **proven** to ensure that it does not pass or leak.

If you not able to prove the isolation, then an isolation risk assessment must be conducted. (GI 6.012, para 8.5).

Proponent management must:

- Create a team of experts to conduct analysis.
- Must include a representative from engineering services and loss prevention.
- Complete the isolation risk assessment.
- Proponent division head must approve the plan.

Note: This is not the same as a Job Safety Analysis (JSA).

Abqaiq Plants Operation Department
 NGL Division
 SNGL-I Unit

ISOLATION RISK ASSESSMENT FOR NORTH FLARE KNOCK-OUT DRUM (D-350)

PURPOSE:
 To document risk assessment performed in-order to safely de-blind the 84" inlet line of north flare knock-out drum (D-350) after completion of T&I. The blind (marked in the attached drawing) is required to be removed but the isolation valve (MOV-320) cannot be proven.

RISK ASSESSMENT
 Severity Ranking

Risk Factor	Risk Severity		
	Generally Acceptable	Risk is Increasing	→
Single Block Valve History	Good PM History	Little or No valve test history	Valve is passing
Line Size	Less than 4 inch	4 – 16 inch	Greater than 16 inch
Line Pressure	Up to 50psig	Up to 150psig	More than 150psig
Line Contents	Non Hazardous – Low Hazard (e.g., water, LP steam).	Mildly Hazardous Toxic, (contents below IDLH) Flammable, but temperature is below flashpoint	Hazardous Contents above IDLH (e.g., H ₂ S more than 100ppm) High Temperature (greater than 66C) Highly Flammable
Congested or complex work area	Not congested – Spacious work area with good access and egress	1, Congested with other plant equipment nearby 2, Restricted space to open the flange	Congested or complex area with restricted access / egress

The risk factors above can be utilized to support the isolation risk assessment.
 Detailed risk analysis may utilize the selection tool in HSG 253 to determine the baseline standard for final isolation.

* CHANGE ** ADDITION NEW INSTRUCTION COMPLETE REVISION X

Justification
 Valve was maintained and sealant injected before the blind was installed
 84"
 3 psig
 Hazardous
 On top of platform, access & egress via fixed ladder
 is per year in Abqaiq Plants)

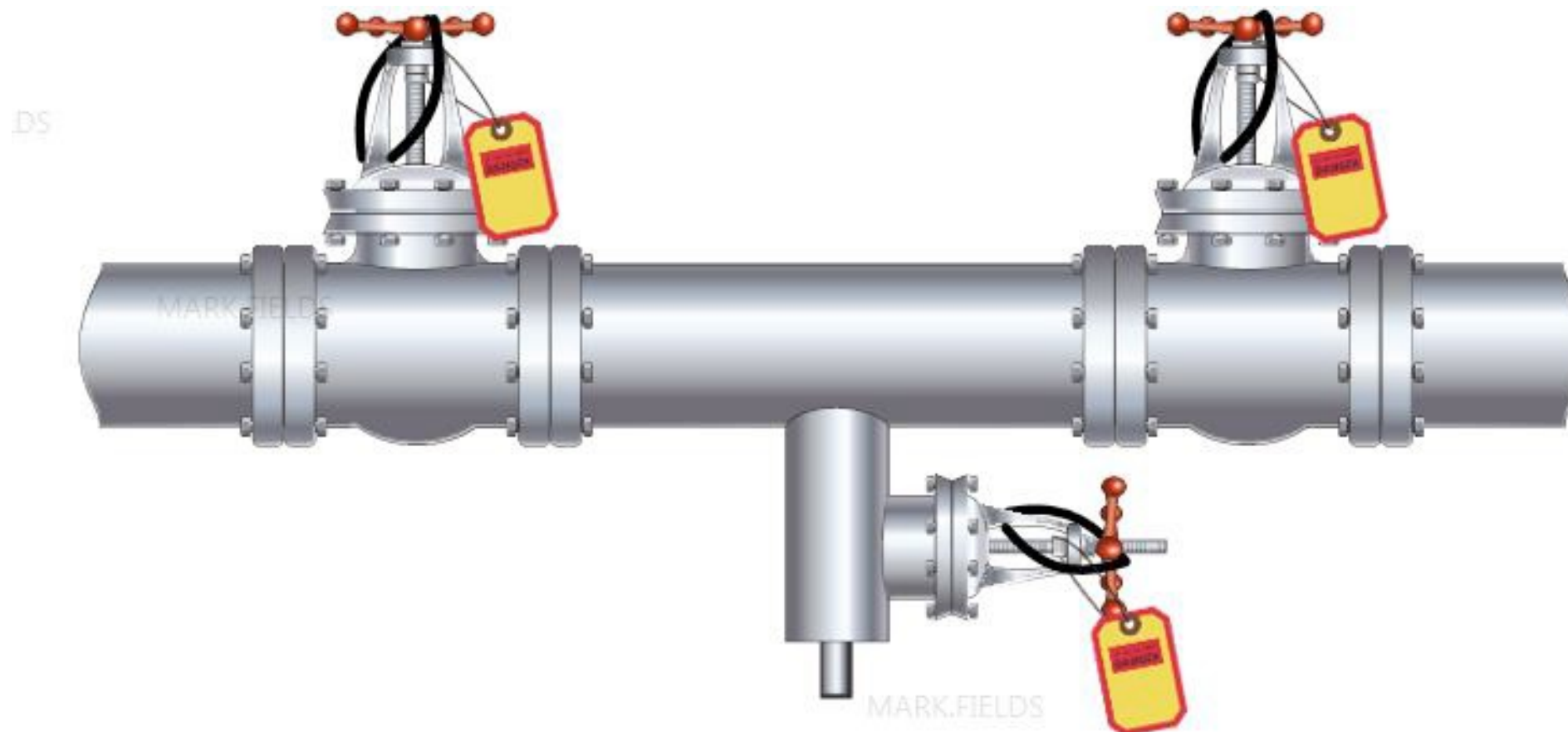
Double block and bleed

Double block and bleed (DB&B) isolation involves closing and locking two consecutive valves and opening and locking a bleed valve between the two closed valves to release liquid or gas that is trapped.

DB&B isolation **is not to be used** as the method of isolation **for confined space entry** or hot work activities when the piping contains flammable or toxic materials.

Double block and bleed may be used as a **primary** means of **isolation**.

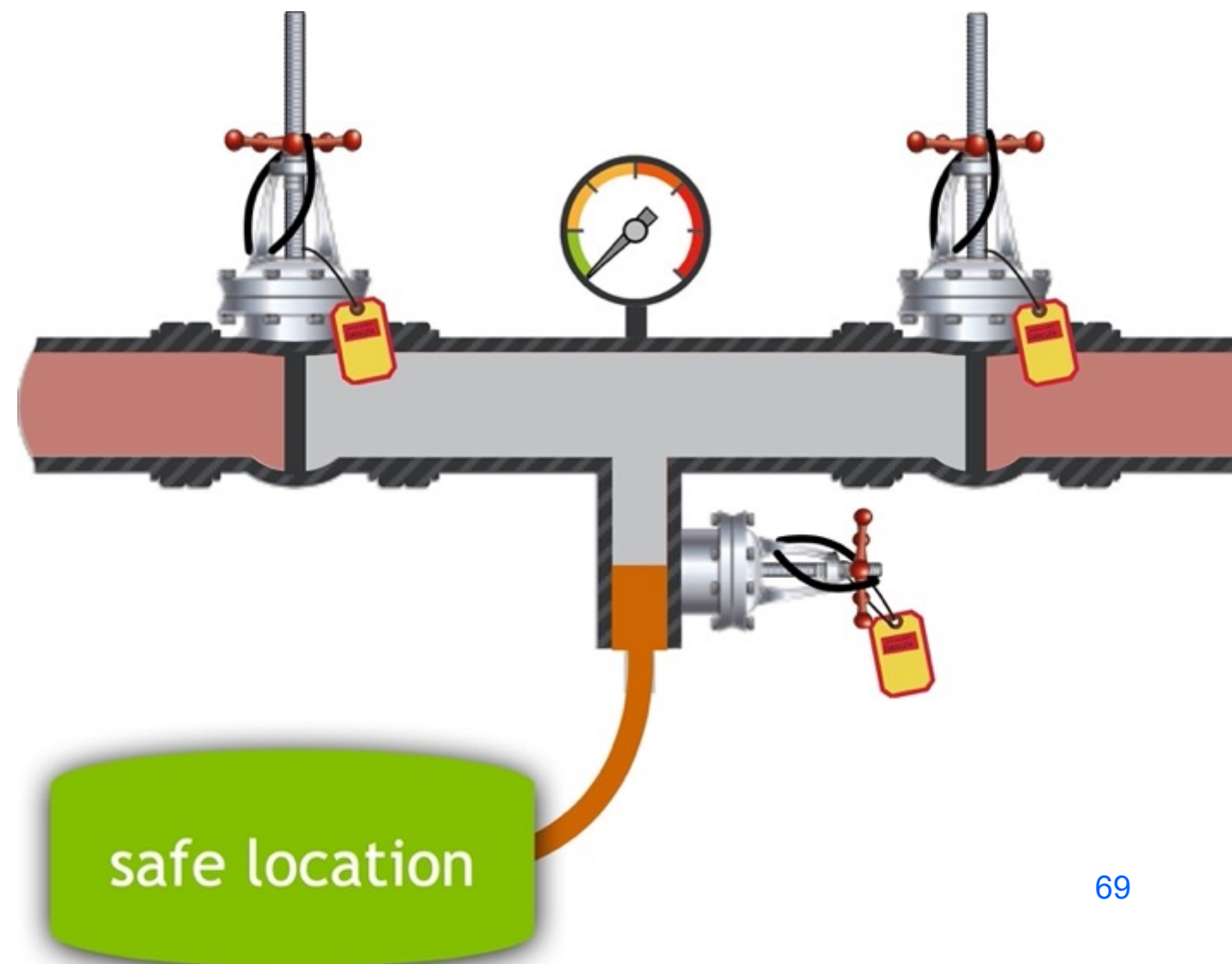
However, double block and bleed **is not** considered **positive isolation**.



Double block and bleed

To perform double block and bleed isolation:

- Close the block valves, lock and tag them.
- Check that the drain/vent valve is not clogged or blocked.
- Attach a hose or hard piping to the drain/vent valve.
- Open the drain/vent valve and monitor to verify if any of the DB&B valves are passing liquids or gases.
- Lock and tag the drain vent valve in the open position.
- Verify that isolation is working and no content is passing through the valve.



DB&B sequence

1. **Operations:** shuts down/Isolate equipment, removes all energy source and “verify/try” it cannot be re-energized.
 2. **Issuer (Operation):** “verify/try” equipment is safe and ready for Lockout and hold tags.
 3. **Issuer:** applies locks and tags at each Isolation points.
 4. **Receiver (Maintenance):** does same, “verify/try” and applies locks and tags at each Isolation points.
 5. All keys from the isolation points (Operations and Maintenance) are put into the group lockout box.
 6. Group lockout box is then locked with all keys inside by **Issuer/Operation supervisor**, he keeps the key of the box safe in an other location.
 7. All other workers, put their personal locks on the group lockout box and not on the isolation points and they keep their key.
- Operations:** ensure/check isolation integrity, the pressure gauge returns and remains at zero and no material is dripping from drain.

Positive isolation

Positive isolation is a secure method of isolation that prevents the uncontrolled release of hazardous energy or material into spaces or equipment which may create a hazard and must be achieved prior to performing the activities below:

- All **confined space entry**.
- **Hot work** on process piping or equipment (exception: steam, air, water systems at less than 150 psi).
- Work on systems at greater than 150 psi.
- Work on systems containing **flammable or toxic material**.
- Work on systems containing materials **above their auto-ignition temperature**.
- Work on systems with temperatures greater than 66^c (150^f).
- When carrying out **equipment opening or line breaking (EOLB)** tasks which result in open-ended pipework.
- Isolations involving High Pressure/Low Pressure (HP/LP) interfaces where there is a potential risk of **over pressurizing the LP system**.
- **All boundary isolations** (e.g., battery limit and crossover tie-ins).
- **New pipework** tie-ins to existing systems (that are not yet commissioned).
- Systems isolated for **more than 6 months**.

Positive isolation

We covered the primary isolation methods, now let's look at the positive isolation methods:

- **Blinding.**
- **Disconnection.**

The method of isolation is determined by the activity to be performed, hot or cold work and task location, such as a confined space and the type of material being handled like hydrocarbon or water.

The confined space must be isolated to prevent entry of material and hazardous contaminants using one or more of the following methods:

- Inserting a blind, sized and rated for the proper pressure in piping nearest to the confined space.
- Depressurizing and disconnecting contaminant supply line(s) and providing a blank or blind on piping leading into the confined space.
- Disconnecting pipe(s) at connections closest to the confined space and capping, blinding, and plugging ends.



NOTE: equipment opening or line break (EO/LB) permit is required.

Blinds

Blinding is the installation of a solid metal plate between pipe flanges or at the end of a disconnected pipe to prevent the release of hazardous materials and is **considered to be positive isolation**.

- Always use the proper blind identified in the isolation plan or blind list.
- If more than two blinds are used, a blind list must be prepared.
- Blinds are always indented with #number, rating, size.

Some criteria considered for blind selection:

- Size.
- Pressure / temperature rating.
- Location.
- Material (salt water, acids, crude).

Facility built (fabricated) blinds may be used but must be approved by engineering for service, rating and the results documented. They may be used in a **specific location for one time use** and destroyed upon completion of the work.

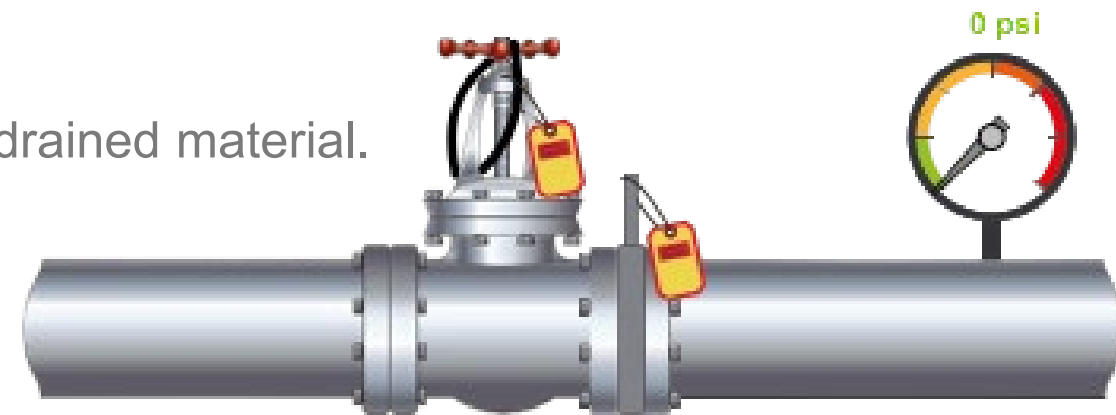
Factory produced blinds (manufactured) are always recommended.



Blinds - isolation plan

A written procedure or “isolation plan” is required for blinding major equipment with multiple connections and low points where hazardous materials could remain trapped. It includes:

- Drawings of all isolation points, drains, and vents.
- Blind list to track installation and removal of blinds.
- Steps for depressurization, draining, purging, and disposing of drained material.
- Site preparation steps (e.g. covering sewers, stopping hot work).
- Proper sequence for installing blinds.



The blind list must include the blind number, location, installation and removal date, blind rating, installer name, remover name, and required signatures.

Blinds **must be tagged** for identification as an isolation device and are an acceptable method for confined space entry and hot work.



Blinding sequence

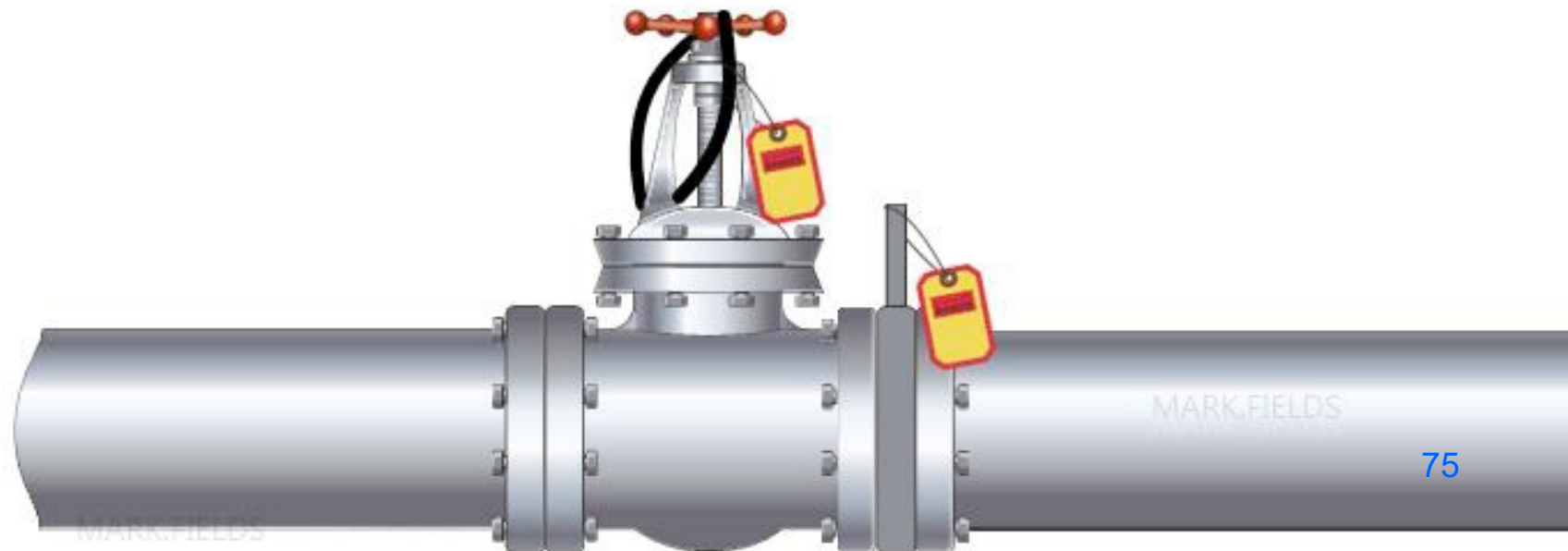
To perform a blinding isolation:

- Close the block valve, lock and tag.
- Drain, vent, and purge the contents of the system.
- Ensure the integrity of the isolation, check for leakage/passing before starting the work, check pressure or flow indicator is showing **zero** and **maintains zero** for safe line break.
- Unbolt the flange and separate the flange faces.
- Insert the blind at the isolated side of the valve, and tag the blind, blind must be as per the blind list.
- Verify that isolation is working and no content is passing/leaking.

Ensure proper PPE is used, you have a EO/LB permit and a certified gas tester has performed gas tests before and right after opening

Blinding is acceptable for:

- Hot work activities
- Confined space entry



Disconnection

Disconnection is the **physical disconnection of piping**, such as dropping a spool piece.

Disconnect the pipeline to provide the necessary isolation if it is not possible to insert a fully rated blind.

This method may be used for **long term maintenance** and is considered positive isolation. It is also acceptable positive isolation method for hot work and **confined space entry**.

This activity requires an equipment opening/line break (EO/LB) permit and appropriate gas testing before, and after opening.



Disconnection sequence

Follow these steps to isolate using the disconnection method:

- Close the valve, lock and tag.
- Drain, vent and purge the contents.
- Ensure/check the integrity of the isolation, check for leakage/passing before starting the work, check pressure or flow indicator is showing **zero** and **maintains zero** for safe line break.
- Unbolt the flange and remove the section of piping.
- Blank flange fitted at the process side, tag the blind, blind must be as per the blind list.
- Verify that isolation is working and no content is passing/leaking.

Ensure proper PPE is used, you have a EO/LB permit and a certified gas tester has performed gas tests before and right after opening.

Disconnection is acceptable for:

- Long term maintenance.
- Hot work activities.
- Confined space entry.



CSE positive isolation

Disconnection is an acceptable method for positive isolation for confined space entry.

Confined space entry requires a more complex preparation to control all energy sources and hazards before isolation, lock out and tag out.

The space must always be prepared:

- Drained, purged (Inert gas/Nitrogen) or cleaned.
- Ventilation and gas tested.
- Blinded or disconnected – positive isolations.
- Isolated from all sources (electrical, disconnect mechanical, e.g., belt, chain drive, shaft).
- Lock out and tag out.
- Confined space entry permit required.

CONFINED SPACE ENTRY PERMIT
Saudi Aramco 9813-4 (1/15) Form No. 0
Complete this form in English and write clearly. Use ink pen, not pencil.

أرامكو السعودية
saudi aramco

SECTION 1 – WORK DESCRIPTION
Month _____ Day _____ Year _____ Duration _____
A. Identify plant/facility area: _____
B. Exact work location: _____
C. Work to be done: _____
D. Equipment to be used at the site: _____

SECTION 2 – HAZARD IDENTIFICATION & CONTROL
A. Identify and attach any supplementary forms required to perform/control the work:
Confined space entry log (mandatory) ☐ CSE Plan (mandatory) ☐ Job Safety Analysis ☐
Gas test records ☐ Isolation plan ☐ Blind list ☐ Critical Lift Plan ☐ Excavation Checklist ☐
Hydrotest procedures ☐ Other: _____
B. Energy Types:
Hydrocarbon/gas/toxic/chemical ☐ Mechanical ☐ Electrical ☐ Hydraulic/pneumatic ☐
Potential energy (spring loaded, gravity) ☐ Automated extinguishing systems ☐ Other: _____
C. Isolation Method(s):
Locked switch/breaker ☐ Mechanical block ☐ Blinding ☐ Disconnect ☐
Positive isolation (blind or disconnect) shall be used for all piping connections to the confined space.
D. Potential Exposures:
High noise level ☐ Hydrogen Sulfide (H₂S) ☐ Flammable liquid/gases ☐ Hazardous/toxic materials ☐
Radioactive materials ☐ Temperature ☐ High pressure ☐ Other: _____
E. Protective Equipment:
Personal H₂S monitor ☐ PPE ☐ ARC rated PPE ☐ Goggles/face shield ☐ Chemical sub/overalls ☐
Fall protection ☐ Barricade/warning signs ☐ Mechanical ventilation/blower ☐
Respiratory protection ☐ Explain further in Additional Safety Precautions below.
F. Confined Space Entry Supervisor (CSES) ☐ Badge No. _____
G. Confined Space Entry Standby Man ☐ Badge No. _____
H. List any Additional Safety Precautions: _____

HAZARD ANALYSIS CHECKLIST
Any 'N' (No) answers below shall initiate a "STOP" point where the Issuer and Receiver are to analyze the hazard(s) and develop methods to adequately control the hazard(s) and list the additional precautions on the permit.

	Y	N	NA
Is the correct type of permit issued for the work?	☐	☐	☐
Have the Job Safety Analysis (JSA) and other applicable supplementary forms been communicated to the work crew?	☐	☐	☐
Are weather conditions (e.g., wind speed, rain, fog, heat, lightning) acceptable to perform the work?	☐	☐	☐
Are slip and trip hazards controlled?	☐	☐	☐
Does the work crew have the correct tools/equipment for the job? Are they in good condition?	☐	☐	☐
Do personnel have the proper certifications to perform the activity and/or operate the equipment?	☐	☐	☐
Is the equipment's inspection sticker valid?	☐	☐	☐
Have all requirements for working at heights (e.g., fall protection) been applied?	☐	☐	☐
Is the scaffold tag completed correctly, signed, and with a valid inspection date?	☐	☐	☐
Has the potential for contact with sharp objects, rotating equipment, hot/cold surfaces, or live electricity been eliminated?	☐	☐	☐
Is the system/equipment properly isolated and locked out? Did all workers apply their personal locks?	☐	☐	☐
Has the system/equipment been depressurized, drained, and/or purged before opening it?	☐	☐	☐
Has the potential for releasing flammable liquids and gases been controlled?	☐	☐	☐
Are all ignition sources eliminated or controlled?	☐	☐	☐
Does the fire watch have firefighting equipment readily available and know how to use the equipment?	☐	☐	☐
Has the potential for exposure to high noise levels, H ₂ S, hydrocarbons, asbestos, hazardous chemicals, or radioactive materials been controlled?	☐	☐	☐
Is the correct personal protective equipment (PPE) available for use by personnel?	☐	☐	☐
If the work may impact others nearby, or vice versa, have the work crews discussed their activities with each other (e.g., simultaneous operations (SNAOPS))?	☐	☐	☐
Is there an emergency contingency plan in place to respond to the work being performed?	☐	☐	☐
Does the work crew know what to do in the event of an emergency, such as evacuation routes, location of emergency equipment, and where assembly areas are located?	☐	☐	☐

SECTION 3 – GAS TESTING/MONITORING
Gas testing frequency: _____
Periodic monitoring required: Yes ☐ No ☐ If yes, attach a supplemental form.
Additional gas tests required prior to entry, after break/interruption of work, if site conditions change, and at periodic intervals (as required). Record below or use a supplemental form.

ONLY CERTIFIED GAS TESTERS PERFORM GAS TESTS

	US (PSI)	H ₂ (ppm)	O ₂ (%)	CO (ppm)	Others	Badge No.	Signature
Initial							
Revised							
Additional							
Additional							

SECTION 4 – PERMIT AUTHORIZATION & CLOSURE
Additional approvals per GI-2.100 or local instructions:
Signature: _____ Position: _____ Org: _____ Badge No. _____
Signature: _____ Position: _____ Org: _____ Badge No. _____
Receiver Org: _____ Issuer Org: _____
PERMIT: _____ Badge No. _____ Cert. No. _____ Signature: _____ Badge No. _____ Cert. No. _____ Signature: _____
Open: _____
This permit is renewed: _____ Date: _____ Time: _____ Contingency notified if permit renewed ☐
Renewed: _____
This permit is closed: _____ Date: _____ Time: _____
I HAVE INSPECTED THE WORK SITE AND CONFIRMED THAT IT HAS BEEN RETURNED TO A SAFE CONDITION.
Closed: _____

Signatures:
Issuer or Designated Representative _____
Receiver _____

Electrical isolation

As you have learnt in previous parts, the policy of lock and hold-tag applies to all facilities where the unexpected energization or startup of the machines or equipment is possible during servicing and maintenance of machines and equipment.

For electrical systems, appropriate isolation could include locking or removing switches, circuit breakers, fuses, other energy-isolating devices or disconnecting power supplies.

Residual energy in any system must be removed before work begins.

The application of Locks and tags are required for the following electrical work:

- Performing maintenance.
- Making repairs.
- Electrical cords.
- Working on energized equipment.

Power Operations Department: live electrical work is not allowed **except** for line wash (relates to a tubular bus carrying high voltages, mostly 230 KV outside the substations in switch yards).



Electrical isolation

There are several different devices and methods available for electrical isolations, these can include the following:

- Control panels.
- Circuit breakers.
- Cords.
- Switches.

Appropriate electrical isolation could also include locking or removing switches, fuses or disconnecting power supplies.

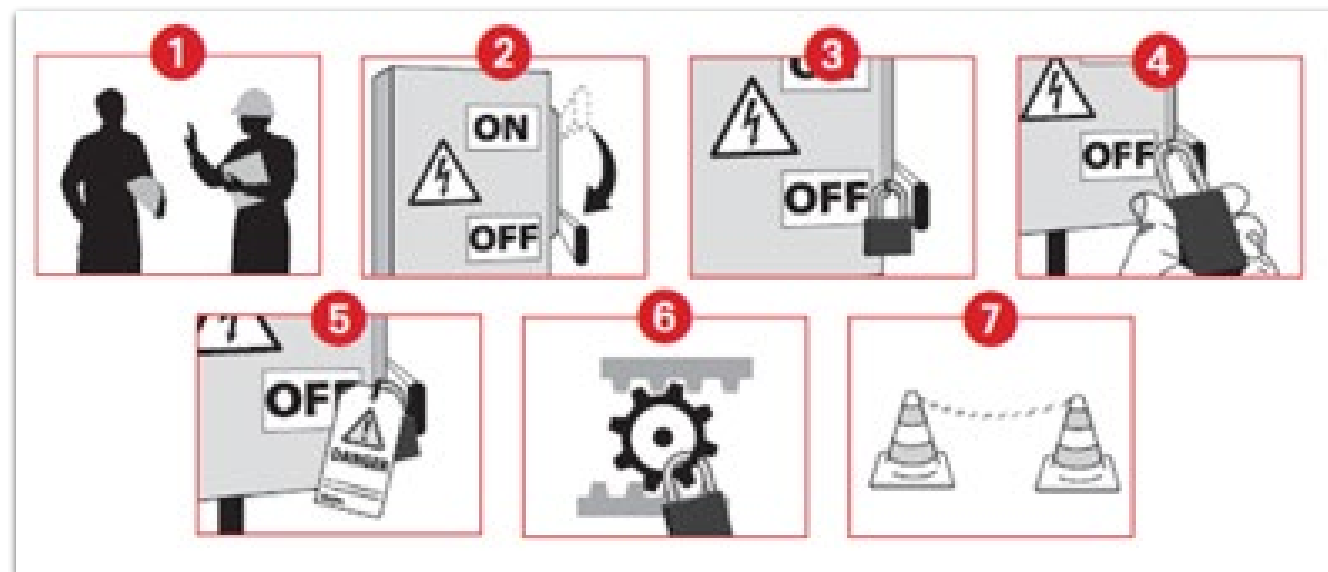


Electrical isolation

Prior to stating the work, the proponent organization must:

- Identify the location of applicable energy isolating devices and types of lock out devices required.
- Electrical isolation point location lists shall be developed and referenced on accompanying work permits when multiple electrical isolations occur.

Proponent management should consult with technical experts such as POD or electrical specialists if necessary.



Electrical isolation

Appropriate electrical system isolation will depend on the voltage rating, isolation could include:

- Turning off switches and circuit breakers.
- Removing fuses.
- Equipment grounding.
- Circuit interruption.
- Disconnecting cables.
- Physical equipment removal (rack-out switch gear or MCC).
- Disconnecting backup power supplies.
- Always follow removal of stored energy safe work practice.
- Wear PPE rated for voltage being isolated.



High voltage isolation

You should be aware that when isolating high voltage equipment there are some inherently unique hazards that could be present.

Saudi Aramco Power Operations Department (POD) shall issue clearances as required before work is performed on or near high-voltage electrical equipment.

Clearances shall be issued by POD dispatchers in addition to any work permits that are required.

The proponent organization and contractors shall contact POD directly to coordinate with the POD electric system operators for assistance.

Do not attempt to isolate high voltage unless:

- Proper POD isolation permits are completed.
- You are properly trained according to GI 2.721 (Electrical Arc Flash Hazard Mitigation).
- You use the proper arc rated PPE.

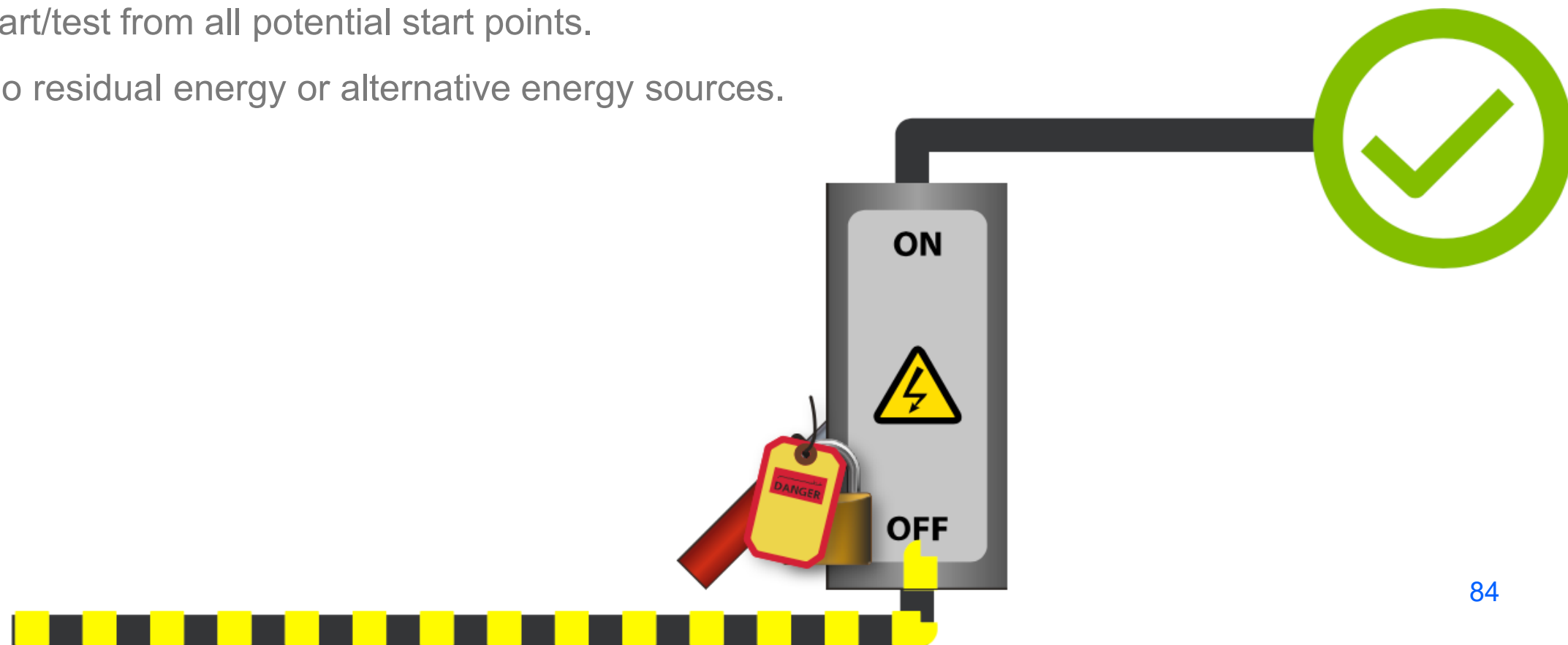


Electrical isolation steps

Prior to commencing work, the proponent organization has already identified the location of applicable energy isolating devices and types of lock-out devices required.

Follow these steps for most isolations:

1. Equipment shall be electrically isolated, lockout devices installed (**LOCK**).
2. Hold tags installed for each lockout device (**TAG**).
3. Work area cleared of equipment and affected personnel (**CLEAR**).
4. Try isolation of equipment to verify that all residual energy has been removed (**VERIFY/TRY**).
 - Always try to start/test from all potential start points.
 - Verify there is no residual energy or alternative energy sources.



Electrical isolation

If the energized equipment **cannot** be locked and tagged out using chains or locks, then try alternate methods such as:

- Removing fuses.
- Disconnecting electrical cables.
- Physically disconnecting and removing electrical cables.

Note: These methods are not as secure as LOTO.

When you physically remove of a component from a system supplying energy to the equipment, the point of physical interruption shall be identified with a completed hold tag.

Isolation is considered complete **only when** no associated control device, such as a push button, control interlock or automatic start-up circuit, has the capability of energizing equipment.



Group lockout

For routine maintenance or repairs where only a small number of craftsmen are involved, the proponent may decide that each craftsman will apply his individual lock and tag on a multiple lock clip at each Isolation.

When larger numbers of personnel are involved, a group lock-out box can be used to avoid large numbers of locks and tags on each isolating points.

The proponent will decide which methods to be used depending on:

- The nature of the work.
- Plant size.
- Type of hazards.
- Material processed.
- Number of people involved.



Multi lock clip (hasp)

Used on simple or routine maintenance activities:

- Each individual worker applies a personal lock and tag at each isolation
- points. Use a multiple lock clip/hasp.
- Only one clip/hasp per isolation point allowed.
- Daisy chain of clips/hasps is not approved.

If the number of locks and tags exceeds the number of holes (6) on the clip/hasp, then it will be more practical to use a group lockout box.



Group lockout box

Sometimes it is necessary for a large number of maintenance personnel to lock and tag many isolation points on process equipment and/or electrical breakers, such as during major maintenance, repairs, and T&Is.

When larger numbers of personnel are involved in performing maintenance or servicing activities, a group lockout box can be used to avoid large numbers of locks and tags on each isolating points.

Following group lockout box procedures gives each worker the same **individual protection** as when they each place their personal lock and tag on lock-out clips (hasps) and maintain possession of their key.



Group lockout steps

A group lock-out procedure can be employed to ensure individual protection while avoiding large numbers of locks and tags on an isolation point as follows:

- Operations lock and tag each isolation point.
- Maintenance / construction supervisor lock and tag the isolation point.
- Operation, maintenance / construction supervisors lock key(s) from each isolation points are placed in the group lock-out box.
- **Operations** installs lock and tag on the group lock out box first and keeps the key(s) until the job is complete.
- **Each member** of the maintenance / construction crew places **his approved and identifiable lock** on the group lock out box and keeps the key until the job is complete, or until they leave the worksite.
- A log book, a tag or color coded locks may be used to uniquely identify the person that fitted the lock. Follow the local procedure.



Group lockout responsibilities

Group lockout responsibilities for leaving the site, when **work is not completed**:

Temporarily: If crew members leave the job site temporarily, their locks and tags may be left installed.

Shift change: If a shift change occurs while the work is incomplete, the oncoming shift may:

- Replace the previous shift's locks and tags with their own locks and tags on isolation points or group lock box and complete the lock log book.
- Or may transfer lock keys, the oncoming shift must verify isolation in the field, approved for one shift change only (work permit validity).

Proponent organizations locks and tags may be left installed following a detailed review by supervisor of the installed locks and tags, the hold tags do not need to be updated, keys for locks must be transferred at this time.



Group lockout responsibilities

Responsibilities for leaving the site, when **work is completed**:

When a craftsman completes his work or leaves the job site permanently, his lock out devices shall be removed.

The craft foreman or supervisor must advise the operations supervisor that the craftsman has completed his work and is removing his locks and tags.

Operations or proponent must always be the **first to install** a lock and tag on a piece of equipment and the **last to remove** them.

Locks and tags shall not be removed until operations personnel have checked and examined the equipment to ensure it can be safely energized.



Group lockout responsibilities

Responsibilities for leaving the site, when work is **not completed**, but will **continue the next day** with no other shift coming.

When a craftsman did not complete his work and leaves the job site at the end of the working day and **no other shift is coming on duty**:

- He must remove his individual lock out and tag out devices.
- Craftsman re-applies them at the beginning of the shift the next day.
- Operations / proponent, and maintenance supervisor must maintain their locks on the isolation points in the field and on the lock box until the work is complete.



Group lockout

Expectations and advantages of the group lockout box:

- Provides **individual protection** for all involved while minimizing the number of locks in the field at all isolation points.
- Facilitates application of individual lock at one central location at the lock box (commonly held at a mustering point or in the local control room / permit issue point).



Review questions



Summary

In Module 4 you were introduced to the steps required to perform safe isolation and group lockout.

You should now be able to:

Identify the steps to perform safe isolation and group lockout, including,

- Isolation and LOTO steps.
- Piping isolation.
- Primary isolation - single block valves and double block and bleed.
- Positive isolation - blinds and disconnection.
- Confined space isolation.
- Electrical isolation.
- Group lockout.

Your instructor will now start Module 5, removal of lockout devices.



Module 5

Removal of lock out devices

Enabling objectives

On completion of Module 5, you will be able to:

- Summarize the removal of lockout devices and how to return equipment to a safe operational state.



Introduction

Once maintenance and servicing on equipment is completed there are a number of steps that you will need to follow to bring the equipment back into service.

It important to ensure that all personnel are informed of the restoration of normal operations and that LOTO devices will be removed before equipment or systems are started.



Removal of lockout devices

In Module 5 you will learn about the following:

- LOTO removal.
- LOTO emergency removal.
- Complete a hold tag activity.



LOTO removal

When can LOTO devices be removed?

- Shift changes.
- When the job is complete.
- When the LOTO device owner permanently leaves the job.

Supervisors:

- Must advise the operations supervisor that the work has been completed and that the locks and tags have been removed.
- Locks and tags shall not be removed until operations personnel have checked and examined equipment to ensure it can be safely energized.



LOTO removal steps

Sequence for LOTO removal and the re-energizing of equipment	
Restore the work area	Inspect the LOTO locations to confirm the work is complete, the worksite has been returned to a safe condition and all permits are signed off and blind lists are up to date.
Notify personnel	Communicate with all affected personnel prior to equipment or systems being placed back in to service.
Remove LOTO devices	Ensure that all isolation devices are removed in the proper sequence and all permits are closed and signed.
Follow approved start up procedures	

LOTO emergency removal

Emergency removal of lock out devices is referenced in GI 6.021, Section 10.

No lock or lock out device shall be cut or forcefully removed without the permission of the lock owner's superintendent or the operations shift superintendent.

The proponent shift superintendent:

- Attempt to contact the individual (or his superintendent) who installed the lock, to confirm work site/equipment is safe, the worker is safe and that the padlock can be removed.
- If they cannot be contacted, shift superintendent may remove the lock and tag after reviewing the equipment and process that are to be energized or restarted.
- Advises the operation's division head.
- Records removal of lockout device in the operations log book.
- Documents incident in a written memo to operation's division head.

Hold tag activity

Using information given on this page, fill out a hold tag. Your instructor will distribute tags to you.

Ensure that the following information is clearly written onto the tag.

Date and time: Today at 9:30 a.m.

Location: Shedgum Liquid Recovery.

Equipment name and number: Pump Motor G-44.

Reason for the tag: Maintenance to replace bearing on pump motor.

Operator name: Use your name.

Organization: 30000143.

Badge number: Your badge number.

Telephone number: 05 xxx xxxx.

Signature: Signature.



LOCK/HOLD TAG
Saudi Aramco 525 (1/90) Reverse

بطاقة توقيف / قفل
(Refer to G.I. 6.012)

(ضع هذه البطاقة على كل الأقفال واجهزة العزل)
PLACE THIS TAG ON ALL LOCKS AND ISOLATING DEVICES

Location/Plant No.	رقم العمل / المكان	Date/Time	التاريخ / الوقت
Equipment		المعدات	
Reason for Tag		سبب وضع هذه البطاقة	

على من يضع البطاقة أن يحدد المعلومات في السطر رقم (١). يستعمل السطران رقم (٢) ورقم (٣) عند تغيير الترخيص.
INSTALLER FILLS IN LINE 1. LINES 2 & 3 FOR SHIFT CHANGE ENDORSEMENT.

الاسم NAME	الدائرة ORGANIZATION	رقم الشارة BADGE NO.	رقم التلفون PHONE NO.	الإمضاء SIGNATURE
1				
2				
3				

LINE 1 █ █ █ █
LINE 2 █ █ █ █
LINE 3 █ █ █ █

DATE REMOVED: _____ تاريخ إزالة البطاقة:

Hold tag example

LOCK/HOLD TAG
Saudi Aramco 525 (1/90) Reverse

بطاقة توقيف / قفل
(Refer to G.I. 6.012)

(ضع هذه البطاقة على كل الأقفال واجهزة العزل)
PLACE THIS TAG ON ALL LOCKS AND ISOLATING DEVICES

Location/Plant No.	رقم العمل / المكان	Date/Time	التاريخ / الوقت	
Ras Tanura Liquid Recovery	XX XXX 2020	9:30 a.m.		
Equipment	المعدات			
Pump Motor G-55				
Reason for Tag	سبب وضع هذه البطاقة			
Maintenance to replace bearing on pump motor				
على من يضع البطاقة أن يدرج المعلومات في السطر رقم (١). يستعمل السطوران رقم (٢) ورقم (٣) عند تغيير الفريق. INSTALLER FILLS IN LINE 1. LINES 2 & 3 FOR SHIFT CHANGE ENDORSEMENT.				
الاسم NAME	الدائرة ORGANIZATION	رقم الشارة BADGE NO.	رقم التلفون PHONE NO.	الإمضاء SIGNATURE
1 Ali Hassan	30000143	293434	5774577	Ali Hassan
2				
3				

DATE REMOVED: _____ تاريخ إزالة البطاقة:

LOCK/HOLD TAG
Aramco 525 (12/86) Front

بطاقة توقيف / قفل

خط
DANGER

يحظر تشغيل هذه المعدة
هذه البطاقة

**NOT OPERATE
EQUIPMENT
OR
REMOVE TAG**

انظر خلف البطاقة
SEE OTHER SIDE

Review questions



Summary

In Module 5 you were introduced to the steps required to safely remove lockout devices.

You should now be able to:

Summarize the removal of lockout devices and how to return equipment to a safe operational state, including,

- LOTO removal.
- LOTO emergency removal.
- Complete a hold tag activity.

The completion of Module 5 completes the LOTO course.

This course covers the minimum corporate Saudi Aramco standards for Isolation and LOTO as per GI 6.012.

It is important that you check and understand your local site Isolation and LOTO procedures before you start your work.





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