ارامكو السعودية
Saudi Aramco

Safety Handbook

Minimum Safety Rules

Emergency Actions

Report All Emergencies Immediately

How to Report Emergencies?

- From a Saudi Aramco telephone, **call 110**.
- From an outside phone or mobile phone, call

  – Central Area: 03-872-0110
  – Southern Area: 03-572-0110
  – Northern Area: 03-673-0110
  – Central Region: 01-285-0110
  – Western Region: 02-427-0110.

- Say, "**This is an emergency!**"
- Describe the incident location.
- Describe the incident.
- Report injuries, if any.
- Give your name and badge number.
- Repeat the above information.
- Stay on the line until further instructed.

What to Do During Emergencies?

- Follow local plans or instructions.
- Remain calm.
- Stop work.
- Proceed safely to assembly point.
- Remain at assembly area until **all clear**.

Name: _____

Safety Handbook
Minimum Safety Rules

This handbook contains the minimum safety rules applicable to employees, contractors, or anyone performing Saudi Aramco work activities. Compliance to these rules is a condition of employment for Saudi Aramco employees and a contractual obligation for contractor employees.

There are many applications to safety — many more than can be addressed in such a handbook. If you see an unsafe condition or behavior, do not disregard it because it is not listed in this handbook.

For additional information, consult related Saudi Aramco reference materials.

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Saudi Aramco Loss Prevention Policy

Saudi Aramco will conduct its business in a manner which prevents incidents or accidents which cause loss of life, bodily injury or illness, or damage to property, assets or the environment. As reflected in Saudi Aramco's Corporate Values, the Company will continuously maintain the highest standards of safety, security, health and environmental protection. Accordingly, the Company will:

- Advise all employees and contractors of their loss prevention responsibilities and regularly measure their performance;
- Evaluate, identify and eliminate or manage safety risks prior to beginning any new operation or activity and continue to review such risks, complying with all applicable laws and regulations;
- Communicate loss prevention objectives and procedures regularly to employees and all affected parties;
- Train employees and provide resources to maintain job competencies, including loss prevention responsibility and accountability;
- Design and construct Company facilities utilizing recognized best technology and practices to safeguard property and people;
- Operate and maintain Company facilities to ensure safe operations;
- Require that contractors, suppliers and others adhere to the Company's loss prevention policies, procedures and goals;
- Prepare for emergencies and other contingencies and respond promptly and effectively to any incidents or accidents resulting from operations;
- Report all incidents, review performance and communicate progress;
- Promote off-the-job safety and community awareness, and
- Review and improve the Company's loss prevention program and performance continuously.

Safety Responsibilities

Personnel, as referred to in this handbook, include employees of Saudi Aramco (SA) and contractors. SA managers, division heads, supervisors, foremen, employees, and contractors have the following safety responsibilities:

Manager/Supervisor Responsibilities

- Establish and communicate safety rules and standards to all employees and contractors.
- Provide appropriate resources, tools, and training for employees.
- Award contracts using safety, health, and environmental criteria.
- Conduct and document safety meetings.
- Correct unsafe acts and conditions promptly.
- Conduct routine safety and environmental inspections and tours.
- Maintain facility emergency plans and conduct regular emergency drills.
- Investigate injuries, spills, and other incidents and promptly provide corrective actions.
- Review organization and employee safety performance periodically and provide feedback.

Employee Responsibilities

- Comply with applicable rules, standards, and safe work practices.
- Communicate safety rules and standards to contractors and coworkers.
- Maintain knowledge of safety requirements, including emergency response action.
- Participate in safety meetings.
- Operate, inspect, and maintain facilities in a safe condition.
- Report injuries, spills, unsafe conditions, near misses, and incidents immediately.
- Assist in incident investigations as necessary.

Safety Responsibilities

Contractor Responsibilities

- Ensure that contractor employees and their subcontractors are trained in SA safety rules and are competent in their craft or skill.
- Comply with all SA rules, policies, and procedures.
- Report injuries, spills, unsafe acts and conditions, near misses, and incidents immediately.
- Operate SA equipment only with proper SA authorization and certification.
- Hold pre-job meetings and other safety meetings during the job.
- Assist in incident investigations as necessary.

Basic Safety Rules

Report Incidents

1. Immediately report all work related injuries/illnesses or vehicle collisions, no matter how slight, to your supervisor.
2. Immediately report all fires, spills, and releases, no matter how small, to your supervisor.
3. Immediately report any unsafe condition, practice, near miss, or incident to your supervisor.

Follow Safe Practices

4. Operators of vehicles shall comply with all traffic requirements, particularly speed limits.
5. All persons in vehicles shall wear seat belts at all times.
6. When ascending or descending stairways, use the handrail and take only one step at a time.
7. Erect barricades/flagging around hazardous work areas, such as holes in decking and floor surfaces, trenches, road crossings, and overhead hazardous work.
8. Use only proper tools and equipment maintained in a safe working condition. Homemade tools are prohibited.
9. Maintain good housekeeping in your work area at all times.
10. Smoking is permitted in designated areas only. Matches and lighters are prohibited in restricted areas.
11. Eating or resting is permitted in designated areas only.
12. Use proper manual lifting techniques, or obtain assistance or mechanical lifting aids when lifting loads.
13. All operating machinery and electrical switchgear shall have all safety guards, switches, and alarms in place and functional.
14. Whenever a safety device is removed from service and/or defeated, the appropriate supervisor and affected parties shall be notified, the device tagged, and the action properly documented.
15. All block valves on pressure relief systems in service shall be chain-locked or car-sealed open.
16. All fire extinguishers and other emergency equipment shall be in good condition, inspected regularly, and kept clear of any obstruction.
17. All chemical or hazardous material containers shall be properly labeled and stored. Drums shall be stored in secondary containment areas or on drum containment pallets.

Avoid Unsafe Activities

18. Climbing or standing on equipment, piping, valves, or unstable surfaces (e.g., chairs or barrels) to perform work is prohibited.
19. Approved fall protection measures (e.g., safety harnesses or scaffolding) shall be used if the working height is greater than 1.8 m (6 ft) from floor or platform level.
20. Running in work areas is prohibited, except during emergencies.
21. Finger rings, wristwatches, jewelry, loose clothing, unsecured long hair, and other loose accessories shall not be worn within an arm's reach of rotating equipment or electrical switchgear.
22. Do not apply compressed air or other gases to yourself or others.
23. Operating equipment having a "DANGER, DO NOT OPERATE" (hold) tag is prohibited.
24. No work shall be started in any area or on any equipment without consent of the SA person-in-charge.
25. Non-approved electrical/electronic devices (e.g., cellular phones, pagers, and instruments) shall not be used in *classified areas* unless properly permitted.
26. Horseplay or fighting on SA premises is prohibited.

Protect Yourself

27. Approved hard hats without defects shall be worn in designated areas. Metallic hard hats are prohibited.
28. Approved safety footwear shall be worn in field operations, process areas, and other designated areas.
29. Approved safety eyewear with side protection shall be worn where designated.
30. Approved additional hazard-specific eye/face protection (e.g., goggles and/or a face shield) shall be worn where foreign objects may injure the eye or face (e.g., grinding, welding, drilling, or scraping).

31. Proper personal protective equipment (PPE) prescribed by the Chemical Hazard Bulletin (CHB) or Material Safety Data Sheet (MSDS) shall be worn when handling chemicals or hazardous materials.
32. Approved hearing protection shall be worn in high noise areas (i.e., 85 decibels [dBA] or higher).
33. Proper hand protection (e.g., gloves) shall be worn when performing tasks that may present a hand injury risk.

Operational Safety Processes

This section outlines general permitting and isolation requirements for the following safety processes in SA facilities:

Safety Process 1: Hot Work Permit
Safety Process 2: Cold Work Permit
Safety Process 3: Confined Space Entry Permit
Safety Process 4: Release of Hazardous Liquids or Gases Permit
Safety Process 5: Excavation Requirements (Checklist)
Safety Process 6: Isolation, Lockout, and Use of Hold Tags (including Blinding)

Often these safety processes are related and used in conjunction with each other in safe operations. However, each work permit has a specific purpose and to ensure proper individual review and approval of these important activities, *each permit type shall only be used for its intended purpose.*

Permit Procedure – General

1. The permit Receiver requests appropriate permit(s) from the permit Issuer (i.e., Supervisor).
2. A *joint site inspection* shall be conducted by the Issuer or his designated representative and the Receiver before the permit is approved/signed.
3. The issuer reviews permit, requirements for type of work, verifies required gas tests, lists applicable isolation and other precautions per Safety Process 6, "Isolation, Lockout, and Use of Hold Tags," then signs and issues the permit.
4. The issuer obtains approval and signature of other operations supervisors (Issuers) whose operations may be affected.
5. The Issuer and Receiver are jointly responsible for the safety of people and equipment in the area. Periodic reviews of the job site, including gas testing, shall be conducted.
6. The Receiver shall not leave the job site unless replaced by another qualified delegate who has been approved by the Issuer.
7. The Receiver shall keep a copy of the active permit posted at the job site.

8. A *joint site inspection* shall be conducted by the Issuer or his designated representative and the Receiver before the permit is closed.
9. Permits are closed by obtaining the signatures of both the Issuer and Receiver.
10. The original copy of the permit is maintained by the Issuer for a minimum of 3 months.

Permit Duration

- One (1) shift or end of job, whichever occurs first.
- Permit can be extended up to a total of 16 hours by agreement and signatures of the Issuer and Receiver.
- Permit can be issued up to 30 days under certain conditions (i.e., no hydrocarbons present) by Division Head approval.
- Any unscheduled work stoppage and/or emergency condition shall cancel the permit.

Safety Process 1: Hot Work Permit

The purpose of the Hot Work Permit process is to ensure proper initiation, review, approval, and execution of hot work activity. A Hot Work Permit (SA Form #924-2 RED) is required for the following operations:

- Open flames, welding, or torch cutting within facility restricted areas.
- Open flames, welding, or torch cutting within 30 m (100 ft) of a pipeline or facility containing hydrocarbons in nonrestricted areas.
- Work on live electrical equipment or use of unapproved electrical devices (e.g., computers, boroscopes, and cellular phones) in a *classified area.*
- Other operations that could present a fire hazard (e.g., internal combustion engines within facilities or welding/cutting inside office or warehouse facilities).

See "Cutting, Welding, and Brazing" section for additional precautions. For welding on lines in-service and hot tapping, see additional precautions below.

In-Service Welding and Hot Tapping

The following additional precautions shall apply to Hot Work Permits for *in-service welding* (welding of any kind on a hydrocarbon line in service, e.g., bracing or hot tap connection) or *hot tapping* (actual penetration of the flowing line for purposes of connection or stoppling):

- Preparation of a hot tap procedure including a complete design review and drawing review of the line to be welded (see Figure 1). The calculation sheet shall be attached to the Hot Work Permit.
- A field verification of minimum wall thickness and pipe conditions shall be conducted. Welding on wall thickness less than 0.64 cm (0.25 in.) shall not be allowed.
- No welding on pressurized lines with zero flow rates. A minimum flow rate shall be calculated and included in the hot tap procedure.

- The rating of the hot tap machine shall be greater than the maximum operating pressure of the line.
- A field travel distance check shall be made prior to beginning the hot tap.
- No welding on compressed air lines from a lubricated compressor.
- No welding on lines containing greater than 23.5% oxygen (O_2).

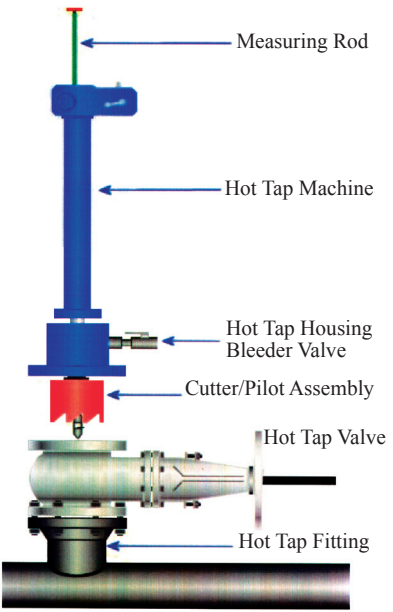


Figure 1. Example of a Typical Tapping Setup

Safety Process 2: Cold Work Permit

The purpose of the Cold Work Permit process is to control work activities that may not produce sufficient energy to ignite flammable atmospheres or combustible materials, but could contribute to injury. A Cold Work Permit (SA Form #924-3 BLUE) shall be used for such activities.

Examples include:

- Structural demolition or collapse of nonoperational buildings.
- Removal or disturbance of asbestos containing material (ACM).
- Work activities involving cryogenic materials.
- Movement of oversized loads on roadways.
- Maintenance work not involving open flame work at steam generating plants.
- Maintenance work not involving open flame work within sewage plants or lift stations.
- Repacking a gland.
- Maintenance work not involving arc welding or open flame in air conditioning (AC) plants and cooling towers.

Ask your Supervisor if you have questions on applications of the Cold Work Permit.

Safety Process 3: Confined Space Entry Permit

The purpose of the Confined Space Entry (CSE) Permit process is to ensure:

- Proper preparation of confined spaces/vessels to be entered.
- Safe entry by personnel, including plans for rescue.
- Restoration of confined spaces.

A CSE Permit (SA Form #924-4 GREEN) shall be used to protect personnel from CSE hazards. CSE is the entry of personnel into any space or structure (e.g., tank, vessel, duct, or vault) not normally intended for human occupancy, in which entry, movement within or exit is restricted. Any part of the body passing through the opening is considered entry. Examples include:

- Vessel cleaning.
- Tank internal inspection.
- Work in sewers, sump pits, or valve boxes.
- Excavations or trenches deeper than 1.2 m (4 ft) that meet the definition of a confined space.

Note: A Hot Work or Cold Work Permit may also be required depending on the type of work to be performed within the confined space.

A. Preparation

1. The confined space or vessel shall be properly isolated in accordance with Safety Process 6, “Isolation, Lockout, and Use of Hold Tags” (i.e., blinding). A sketch is recommended to assist in isolation of all sources.
2. The space shall be purged, steam washed, and cleaned as necessary to sufficiently free the space of all possible contaminants (e.g., hazardous materials; iron sulfide deposits).
3. Mechanical ventilation (e.g., air movers) shall be used to ensure positive ventilation and remove all hazardous airborne contaminants.
4. Mechanical ventilation shall be stopped during atmospheric testing.

5. Atmospheric tests for O_2, and explosive and toxic gases and vapors shall be performed and recorded immediately prior to entry, after breaks, or interruptions in the work procedure and at periodic intervals by a certified gas tester. If other atmospheric hazards, such as carbon monoxide (CO) and naturally occurring radioactive material (NORM), are suspected to exist, appropriate air monitoring shall be conducted by a qualified person.
6. O_2 concentration shall be 20% minimum; flammables shall be *zero;* and the concentration of hydrogen sulfide (H_2S) shall not exceed 10 parts per million (ppm).
7. All sources of ignition shall be eliminated or controlled. If ignition sources are present (e.g., sparks or open flames), a Hot Work Permit shall be completed in accordance with Safety Process 1, "Hot Work Permit."
8. All equipment, including air movers, shall be properly grounded or bonded. Lighting equipment shall be explosion proof.
9. Physical hazards, including falling objects and contact with hot surfaces, shall be controlled.
10. A fall protection plan for external access to the vessel/confined space shall be developed by the person-in-charge if the entry point exceeds 1.8 m (6 ft) vertically (e.g., proper harnesses or scaffolding).
11. A fall protection plan for internal access to the vessel/confined space shall also be developed when confined space entry requires internal work heights exceeding 1.8 m (6 ft) vertically.
12. All required PPE, including respiratory protection, shall be worn during confined space entries.
13. A means of egress and communication shall be identified and emergency/rescue phone numbers shall be recorded on the permit.
14. The permit and signs and/or barricades shall be posted outside confined spaces to notify personnel that entry is in progress and to prohibit unauthorized entry.

15. Trained and designated standby men for confined space entry rescue shall be properly equipped (e.g., PPE, radio, or retrieval line) and stationed outside the space to remain in direct communication with the workers inside.
16. Proper rescue equipment including lifelines, harnesses, and hoists shall be used when entering confined spaces 1.8 m (6 ft) or deeper (e.g., vessels or towers).

B. Entry

1. The CSE Permit checklist shall be completed, signed, and issued before entry may begin.
2. Only authorized personnel shall enter the confined space.
3. All authorized personnel entering the confined space shall sign a log sheet upon entering and exiting the confined space to account for all personnel.
4. The atmosphere shall be rechecked periodically while personnel are present in the confined space to ensure a safe work environment. Continuous monitoring shall be used when atmospheric conditions are subject to change in the confined space.
5. If the confined space entry is suspended, the entrance shall be blocked and a "NO ENTRY" sign posted.

C. Restoration

When work is complete and the confined space is ready to be returned to service, the permit shall be used as a checklist for proper restoration of the space. In addition to items listed on the permit, ensure that:

1. All personnel are out of the space.
2. All equipment and tools are removed.
3. All man ways and flanges are closed and sealed. All vessels and relief valves are restored to operating condition.
4. All blinds are removed using the Blind List as required by Safety Process 6, "Isolation, Lockout, and Use of Hold Tags."
5. All startup procedures are followed.

Safety Process 4: Release Permit

The purpose of the Release of Hazardous Liquids or Gases Permit process is to ensure proper planning and precautions during work activities where the potential release of hazardous liquids or gases may occur. A Release Permit (SA Form #924-1 YELLOW) is required for potential releases and includes the actual or possible release of low flash point (below 54 °C/130 °F) liquids, liquids at or above their flash point, or injurious materials in amounts that could create a hazard. This permit is not intended to authorize a release but to ensure proper precautions are in place for a potential release.

Examples of work activities requiring a Release Permit include:

- Opening oil or gas lines (line entry) or systems.
- Opening of all steam and condensate lines or systems.
- Opening of all lines or systems containing H_2S.
- Opening of all lines or systems containing nitrogen (N_2).
- Opening of all lines or systems containing hazardous material (e.g., caustic or sulfuric acid).

In addition to proper *line entry* steps, Release Permit requirements include:

- Proper PPE for all personnel.
- Proper isolation prior to opening the line in accordance with Safety Process 6, “Isolation, Lockout, and Use of Hold Tags.”
- Proper containment of anticipated liquids or gases.
- Proper communication with operations personnel.
- Immediate notification of unanticipated leaks or releases.

Safety Process 5: Excavation and Trenching

The purpose of the Excavation and Trenching process is to ensure proper planning and design of excavation and trenching operations, including entry of personnel. An Excavation Safety Checklist is required for:

- All excavations 1.2 m (4 ft) and deeper.
- Excavations deeper than 30 cm (1 ft) where buried pipelines or cables may be present.

Note: Excavations 1.2 m (4 ft) and deeper may also require a CSE Permit as outlined in Safety Process 3, "Confined Space Entry Permit."

Requirements for Excavation Design

A qualified person shall design the excavation. A qualified person is one who is capable of identifying existing and predictable hazards, soil types, or working conditions that are unsanitary, hazardous, or dangerous to personnel. The qualified person shall:

- Determine the appropriate method of excavation – benching, shoring or sloping, or combination of methods depending on space available, nature of operations, and soil type.
- Determine soil type prior to entry (i.e., stable rock, or Type A, B, or C soil) as described in Table 1.
- Decide whether to guard the walls by benching, shoring, sloping, or a combination. If sloping is used, it shall be per Table 1.

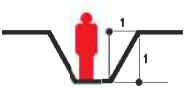
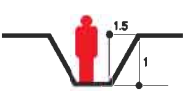
Soil Type	Cross Section
Stable Rock – Natural solid mineral matter.	
Type A Soil – A cohesive (tight) soil, such as clay or rock. Previously disturbed Type A soil becomes Type B or Type C soil.	
Type B Soil – A less cohesive soil such as a mix of sand, rocks, and clay. Previously disturbed Type B soil becomes Type C soil.	
Type C Soil – The least cohesive soil, such as gravel, sand, muddy or freely seeping soils, and submerged rock that is not stable.	

Table 1. Maximum Allowable Slopes for Height (h) < 6 m (20 ft)

Sloping or benching for excavations greater than 6 m (20 ft) deep shall be designed by a qualified engineer.

Requirements for Excavation Construction

- All utilities and lines shall be properly identified and appropriate parties notified before beginning any digging or cleanup work.
- Spoil piles shall be at least 0.6 m (2 ft) from the edge of the excavation.
- Scaffold bases shall be at least 1.5 times the depth of an excavation away from the edges of the excavation (including trenches).
- Mechanical excavators shall not be used within 3 m (10 ft) of any pipes, cables, or other obstructions.
- Heavy equipment shall not be operated within 1.8 m (6 ft) of any excavation.
- Cranes shall not be operated closer than the depth of the excavation.
- A qualified person shall make daily inspections of excavations prior to the start of the work shift.
- Guardrails or barricades, as necessary, shall be established a safe distance from the excavation to protect individuals and mobile operating equipment above the excavation, or if the excavation is left unattended overnight.
- No personnel are permitted in the excavation or trench when power equipment is being used to perform the excavation.
- Blinking warning lights shall be used at excavations at night where there are personnel or vehicle movement.

Requirements for Personnel in Excavation

- Only authorized personnel shall enter the excavation.
- Ensure there is no water seepage into the excavation.
- Qualified personnel shall test and monitor the atmosphere while personnel are present (e.g., combustibles, toxic gases, or low O_2).
- Ladders or other means of access shall be provided every 7.5 m (25 ft) in all occupied excavations, extending a minimum of 1 m (3 ft) above the top of excavation wall.
- Emergency rescue equipment shall be immediately available for excavations considered as confined spaces.

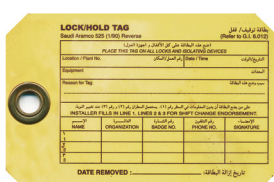
The purpose of the Isolation, Lockout, and Use of Hold Tag process is to prevent injury or loss from the release of stored energy. This process applies to electrical sources of energy as well as other sources of potentially stored energy described below.

Electrical isolation, lockout, and use of hold tag procedures shall be used before and during any activity requiring personnel to work on or near de-energized circuit parts or where there is danger of injury due to unexpected startup of equipment (i.e., a motor driven pump).

Other energy sources such as pressurized gas, process fluids, and hydraulic, pneumatic, thermal, chemical, and mechanical systems shall be isolated by lockout and tag procedures, such as chaining, blinding, or disconnecting. Additionally:

- Detailed written isolation, lock, and tag procedures for primary equipment, such as compressors, shall be developed and reviewed by local organizations.
- Detailed written lockout and tag procedures shall be developed by local organizations for unusual modifications requiring isolation of piping and equipment.
- Locked equipment shall be tagged using SA Form 525 (Figure 2).

Lock/Hold Tag (Front)



Lock/Hold Tag (Back)

Figure 2. SA Form 525, Lock/Hold Tag.

Electrical Lockout and Tag Procedure

The following procedures for electrical lockout and tag (**Lock, Tag, Clear, Try)** shall be followed when exposed to electrical hazards:

1. Operations shall identify isolating locations and types of isolating devices required in determining potential exposure.
2. Qualified personnel doing the work shall notify affected personnel and properly shut down/de-energize the equipment. Isolation is complete only when no associated control device is capable of energizing equipment.
3. SA operations employees or the controlling organization shall always be the first to install an approved **Lock**.
4. The person doing the work shall lock out a device using his approved **Lock**. Remember to lock open the circuit breaker(s). If the device cannot be physically locked out, it shall, at a minimum, be de-energized and tagged.
5. **Tag** the lock with a "DANGER, DO NOT OPERATE" tag. The tag shall contain date, time, organization, name, badge number, equipment name, phone contact and signature of the installer, and reason for installation.
6. Other organizations or individuals working on equipment shall also install their locks and tags at locations identified by operations. Multiple lockout clips (hasps) shall be used if necessary. A *crew lockout* is acceptable only when the key(s) of the person designated to lock out is properly secured and locked by all parties involved.
7. Each lock shall be identifiable. Each organization shall have a system of uniquely identifying locks (e.g., stamping or engraving).
8. Each lock shall be keyed separately with no duplicate key available to ensure removal only by the installer.
9. **Clear** the area of personnel and tools prior to trying to start the equipment.
10. Before starting work, **Try** to start or energize the equipment locally. Verify the equipment cannot be energized.
11. Only the person(s) originally attaching the lock and tag are authorized to remove the lock and tag. Incoming shifts may attach their own locks and tags and/or transfer keys after

approval by supervision. If person(s) are unavailable, the Division Head can assume responsibility for removing the lock and tag and notifying all parties.

12. SA operations employees shall remove locks and tags when equipment is safe to energize.
13. When work is complete, affected personnel shall be notified and equipment placed back in service.

Mechanical Energy Lockout and Tag Procedures

Chains, blocking, locking pins, or other hardware shall be used for isolating, securing, or blocking of machines or equipment from mechanical energy sources.

Process, Hydraulic, and Pneumatic Energy Sources Lockout and Tag Procedures

At least one of the following lockout and tag methods shall be used to safely isolate other types of stored energy sources such as process piping with gas pressure. Generally, these four methods of isolation reflect an increasing order of preference, depending on the nature of work activity, materials involved, and piping arrangement.

Single block valves

Single block valves closed, locked, and tagged shall be used as a minimum isolation procedure for certain routine maintenance operations where no open flame work is required (e.g., changing a gauge or sock filters).

Double block and bleed

Double block and bleed process piping where block valves are closed, locked (chained), and tagged with a *bleed* or vent valve locked and tagged open in between (see Figure 3). While superior to a single locked and tagged valve situation (described above) for open flame work or long-term construction or maintenance activity, a *double block and bleed* setup may not always guarantee total isolation and safety. For example, the *bleed* valve may be plugged and/or typically cannot handle the flow or pressure that may be "passing" through the upstream valve. Also, for nearby work

that requires permitting, flammable or toxic gases or liquids potentially vented through the *bleed* valve shall be securely piped or hosed away to a safe point.

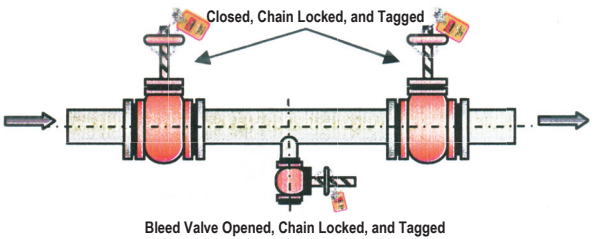


Figure 3. Example of Double Block and Bleed Isolation

Disconnection of piping

Disconnection of piping is the less frequent physical disconnection of the piping where allowed by valving and/or flanges (e.g., *dropping a spool piece*). This isolation method is also superior to a single locked and tagged valve for open flame work or long-term construction work, or maintenance activity. However, steps shall be taken to ensure no hazardous materials can leak or be discharged from the open ends of piping, for example, blind flanging (described below) and tagging.

Blinding

Blinding of process piping, vessels, and equipment is the fourth method of isolation for stored process energy with requirements described on the following page.

Blinding

As another method of isolation of process piping, blinds shall be installed to prevent the release of combustible and toxic liquids, vapors, and gases into the work area during maintenance or construction. Wherever possible, blinds shall be installed at vessels scheduled for entry as outlined in Safety Process 3, "Confined Space Entry Permit." Additional requirements for blinding follow.

Procedure:

- A full-rated blind shall be installed with three considerations:
  a) Rating – Properly manufactured, preferably purchased, blinds shall be in accordance with Table 2.
  b) Location – Will the blind effectively isolate? Is it accessible?
  c) Size – Does the blind match line size?
- A Blind List shall be prepared where blinds are used to ensure proper installation and removal. The Blind List shall include the blind number, location, date installed, date removed, and appropriate signatures.
- Isolation valves shall be properly locked and tagged prior to line entry (opening of flanges) for installation of blinds.
- Proper line entry procedures shall be followed in opening flanges for installation of blinds.
- Proper rigging practices shall be used during installation of blinds.
- Blinds shall be installed as close as possible to the vessel or equipment to be isolated and using the required number of bolts.
- Blinds shall be tagged for identification as an isolation device.
- All blinds shall be removed when work is completed.
- Types of blinds are shown below in Figure 4.

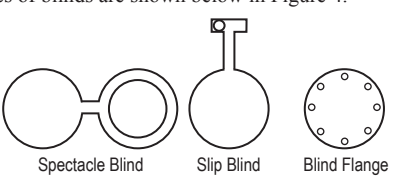


Figure 4. Types of Blinds

Pipe Size	Pipe Rating (#) and Corresponding Blind Thicknesses (Inches)			
Inches	**150#**	**300#**	**600#**	**900#**
1	1/4	1/4	1/4	1/4
1 1/2	1/4	1/4	1/4	5/16
2	1/4	1/4	5/16	3/8
3	1/4	3/8	7/16	9/16
4	1/4	1/2	9/16	11/16
6	1/2	5/8	13/16	1
8	1/2	3/4	1-1/16	1-5/16
10	5/8	1	1-3/16	1-5/8
12	3/4	1-1/8	1-9/16	1-15/16
14	3/4	1-1/4	1-3/4	2-1/8
16	7/8	1-3/8	2	2-3/8
18	1	1-9/16	2-1/8	2-5/8
20	1-1/16	1-3/4	2-1/2	2-7/8
24	1-1/4	2	2-7/8	3
26	1-1/4	2-1/8	2-7/8	3-1/2
28	1-3/8	2-1/4	3-1/8	3-3/4
30	1-1/2	2-3/8	3-3/8	4-1/8
32	1-5/8	2-1/2	3-1/2	4-3/8
34	1-3/4	2-5/8	3-3/4	4-5/8
36	1-3/4	2-7/8	4	4-7/8

Table 2. Blind Rating Selection Chart per ANSI B31.3
(Material ASTM A36)

Safety Topics

This section contains rules and precautions for specific safety topics and hazards. While not all topics may relate to your specific job and the safety hazards you may face, apply the ones that do, such as "Vehicle Safety" or "Office Safety."

These eighteen (18) safety topics are arranged in alphabetical order for your use.

Abrasive Blasting and Coating

The following precautions shall be followed during abrasive blasting and coating operations:

- Only qualified and SA certified individuals shall operate abrasive blasting and coating equipment.
- All personnel in the area affected by abrasive blasting and coating shall wear proper PPE and respiratory protection (e.g., ventilated hoods).
- Supplied air for hoods or respirators shall be of the proper type (grade D) and the delivery system per the manufacturer's specifications.
- Operators shall inspect compressors and the air delivery system on a regular basis.
- Operators shall perform mechanical integrity testing (i.e., wall thickness measurement) on equipment that will undergo abrasive blasting.
- Only approved abrasive blasting materials shall be used. Silica sand is prohibited as an abrasive blasting material.
- Abrasive blasting and coating equipment shall be properly grounded/bonded.
- *A deadman's switch* (automatic shut-off) is required on the abrasive blasting nozzle.
- Proper safety pins and connecting lines shall be in place at all potential disconnect points.
- Fall protection is required for heights above 1.8 m (6 ft) (e.g., proper scaffolding, work platforms, and harnesses).
- Abrasive blasting and coating areas shall be properly contained.
- Proper barricades and warning signs shall be in place.
- Air compressors used to supply breathing air shall be third-party certified, quarterly by a SA recognized testing agency.

Aviation Safety

The following precautions are for SA aviation passengers. Most importantly, follow commands from trained aviation employees at all times while on the ramp or inside the aircraft.

Fixed-Wing Aircraft

Aviation ramp safety for passengers

- Smoking is prohibited on the aviation ramp.
- Follow directions from ramp supervisor to and from aircraft.
- Follow instructions posted in the ramp area and pathways.
- Turn off cellular phones when boarding/disembarking.
- Do not wear personal headphones on the aviation ramp.

Baggage

- Do not transport dangerous goods or prohibited items.
- Observe weight limitations for checked and carry-on baggage.
- Observe the proper number of pieces of baggage per person.
- Store carry-on baggage only in approved compartments.

Safety Procedures for Takeoff and Landing

- No smoking.
- Turn off cellular phones during flight.
- Fasten seat belts at all times while seated.
- Remain seated in the upright position during takeoff and landing.
- Remain seated at all times when the seat belt sign is illuminated.
- Do not obstruct aisles, galleys, or lavatories.

Safety Procedures after Landing

- Remain seated until the aircraft comes to a complete stop.
- Do not attempt to retrieve cabin baggage while aircraft is in motion.

Helicopters

In addition to the helicopter safety precautions listed below, the helicopter pilot shall always provide an additional safety briefing prior to takeoff. The pilot is in complete charge of the helicopter and its passengers. Follow his instructions at all times.

- Each passenger traveling over or near water shall carry a valid SA Helicopter Passenger Safety Certificate.
- Keep clear of the helipad until the helicopter has landed.
- Approach or depart the helicopter only on signal or command from the helicopter pilot.
- Remove hats and keep a firm grip on all hand-carried articles when walking to and from the helicopter. Carry long objects horizontally and below the waist.
- No object shall be loaded in the passenger cabin. Load your luggage in the baggage compartments.
- Contact the Aviation Department to declare any potential hazardous materials.
- Proper hearing protection shall be worn on all helicopter flights.
- Never throw objects from a helicopter.
- Seat belts shall be worn at all times.
- SA Aviation approved personal flotation devices shall be worn when traveling over water.
- Bend over when approaching or departing the helicopter.
- Approach or depart the helicopter from either side quadrant to avoid the main and tail rotors. **Never** approach from the front quadrant or walk under the tail rotor (see Figure 5).

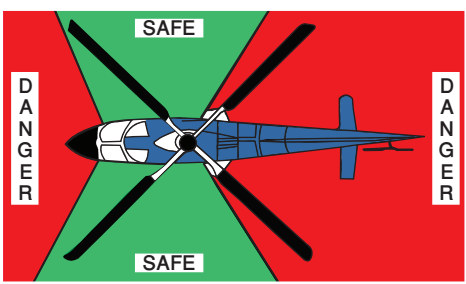


Figure 5. Helicopter Approach Zones, Top View

Chemical Safety

Labeling of Chemicals

- Chemicals shall be properly labeled.
- Chemical Hazard Bulletins (CHBs) or Material Safety Data Sheets (MSDSs) shall be readily available for each chemical on-site.

Use of Chemicals

- Use appropriate PPE/respiratory equipment as set out in the relevant MSDS/CHB.
- Do not smell or taste chemicals or eat, drink, smoke, or chew gum in areas where chemicals are present.
- Wash hands thoroughly after handling chemicals.
- Do not mix incompatible chemicals.
- When mixing chemicals, use proper lab equipment.
- In case of eye or skin contact, promptly flush affected areas with clean water for a prolonged period (15 minutes minimum), remove contaminated clothing, and seek medical attention.
- Promptly clean spills while wearing appropriate PPE, and properly dispose of all contaminated materials.

Storing Chemicals

- Indoor storage of flammable and combustible materials shall be in approved metal cabinets.
- Users shall periodically examine chemical containers for integrity.
- Chemical storage shall be minimized. Storage on bench tops or at high levels is not recommended.
- Incompatible chemicals shall not be stored near each other.
- Toxic substances shall be segregated in a well-identified area with local exhaust ventilation.
- Highly toxic chemicals, whose containers have been opened, shall be in secondary containment.

Compressed Gas Cylinders

Handling Cylinders

- Secure protective caps on all cylinders not in use.
- Properly secure cylinders in an upright position during movement.
- Do not use slings or ropes for moving cylinders.
- All cylinders shall be properly labeled.
- Only rely on the supplier's tag to determine the contents of a compressed gas cylinder.
- Do not strike cylinders together.
- Keep valves on *empty* cylinders closed at all times.
- Use cylinder trolleys, material baskets, cylinder racks, and other proper types of equipment to transport cylinders.

Using Cylinders

- Use approved pressure-reducing regulators with a check valve connected to the cylinder valve on all cylinders.
- Always close the cylinder valve before attempting to stop leaks.
- Do not use oil or grease as a lubricant on valves or attachments.
- Threads on fittings shall correspond to cylinder valve outlets.
- Inspect cylinders for safe condition before use.
- Protect cylinders from direct flame, sunlight, and other heat sources.
- Inspect all gauges, regulators, hoses, and cylinders for damage and current hydrotest date.
- Place flashback arrestors at O_2/acetylene cylinder regulators (See "Cutting, Welding, and Brazing" section).

Storing Cylinders

- Store cylinders in an upright, secured position; use bottle/cylinder racks wherever possible.
- Keep stored O_2 cylinders separated from fuel gas cylinders by a 6.1 m (20 ft) or by a 1.5 m (5 ft) high, noncombustible barrier.
- Keep cylinders from direct flame, sunlight, and other heat sources.
- Do not store cylinders at temperatures exceeding 54 °C (130 °F).
- Properly identify empty and full cylinders.

Crane Operations

This section applies to all types of cranes including mobile and fixed cranes (e.g., overhead and gantry cranes). See "Rigging Safety" section for rigging precautions.

Inspection

- All SA, contractor, or third-party mobile or fixed cranes shall be inspected by the operator prior to use with the SA Crane Operator Daily Inspection Checklist.
- All cranes shall have a valid inspection sticker from SA or an SA approved third party. Supplemental lifting equipment used below the hook (e.g., spreader bars, crane suspended personnel platforms, and manbaskets) shall have a valid inspection sticker from a SA certified inspector.

Operations

- Only the following personnel shall operate cranes:
  1. SA certified crane operators for the type of mobile crane, fixed crane, or extensions/attachments indicated on his certificate.
  2. Trainees under the direct supervision of a qualified trainer.
  3. Crane maintenance personnel and inspectors in the performance of their duties.
- Details of crane lifts shall be communicated to the affected personnel in the area.
- A designated signal man and crane operator shall use universal hand and/or radio signals.
- The crane operator's line of sight to the designated signal man shall not be obstructed.
- All cab glass shall be safety glass and kept clean without obstructions or damage.
- *Tag-lines* shall be used on all lifts, except when their use may create a greater hazard.
- Do not side load.
- Avoid load swings over personnel or traffic areas.
- Know the accurate weight of all loads and lifting gear prior to the lift.
- Personnel shall only be transferred by approved personnel transfer equipment.

- In positioned lifts, outriggers shall be used with appropriate pads and mats. Booms shall not be swung without outriggers being extended in accordance with the manufacturer's specification.
- Crane operator shall not leave the crane cab while the crane is attached to a load.
- Position (lower) hydraulic crane booms and secure hook while traveling.
- SA certified riggers shall inspect slings, fittings, and shackles prior to use.
- All crane loads shall be rigged by a SA certified rigger.
- Crane lifts shall not be allowed at wind speeds above 32 km/h (20 mph) unless otherwise specified by the manufacturer.
- Crane suspended manbasket operations shall not be allowed at wind speeds greater than 25 km/h (15 mph).
- Cranes shall not be operated any closer than the depth of an excavation.
- Cranes shall be operated around power lines in accordance with the distances provided in the "Electrical Safety" section.
- Mats shall not be permanently affixed to the crane outrigger pads.
- Critical Lift Plans are required for certain conditions and activities including:
    - Cranes operating around power lines.
    - Operating around hydrocarbons and above-ground pressurized piping areas, populated/traffic areas, and railroads.
    - All loads of 40 tons or greater.
    - All loads exceeding 85% of the rated load capacity of the crane for that specific lift.
    - Tandem, multiple, or tailing lifts (any lift requiring two or more cranes to lift one load).
    - Crane suspended personnel platforms (manbaskets). A Crane Suspended Personnel Platform (Manbasket) Permit is required.
    - High level and/or long reach crane lifts.
    - Nighttime crane lifts (except as approved during a *turnaround and inspection [T&I]* or shut down).
    - Other lifts as determined by SA management.

General Safety Precautions

- All welders and brazers shall be SA certified.
- All welders and brazers including helpers, shall use proper PPE.
- Equipment shall be visually inspected by the user daily.
- Defective equipment shall be removed and replaced.
- All welding and brazing operations shall have proper ventilation.
- All unsecured work pieces shall be properly clamped.
- All equipment shall be turned off when not in use.
- A portable fire extinguisher shall be available within 3 m (10 ft).
- Combustibles around the work area shall be removed/protected.
- All sewers within 23 m (75 ft) shall be covered prior to work.
- A qualified fire watch shall be maintained during operations and for 30 minutes afterwards.
- Cutting, welding, and brazing are not allowed in O_2 enriched environments (i.e., O_2 concentration greater than 23.5%).

Electric Arc Welding Operations

Also see "Electrical Safety" section.

- Electric welding machines shall be properly bonded and grounded and shall comply with SA electrical requirements.
- Electric welding machine electrical outlets shall be the 110 volt (V), 3-pronged type with ground fault protection device; 220 V electrical outlets are not permitted.
- Welding cables shall be continuous within 3 m (10 ft) of the electrode holder.
- All damaged welding cables shall be removed from service; temporary repairs and taped joints are prohibited.
- Proper welding screens shall be used near other personnel.

Gas Welding, Cutting, and Brazing Operations

Also see "Compressed Gas Cylinders" section.

- Lighted torches shall not be left unattended.
- Compressed type fittings shall be utilized on hose connections.
- All connections/equipment shall be checked for leaks before use (e.g., soap solution).
- Gas regulators shall be turned off and hoses bled off at the end of shift or task.

- Hoses shall be protected from potential damage during operations.
- Flashback arrestors shall be placed at O_2/acetylene cylinder regulators as shown below in Figure 6.

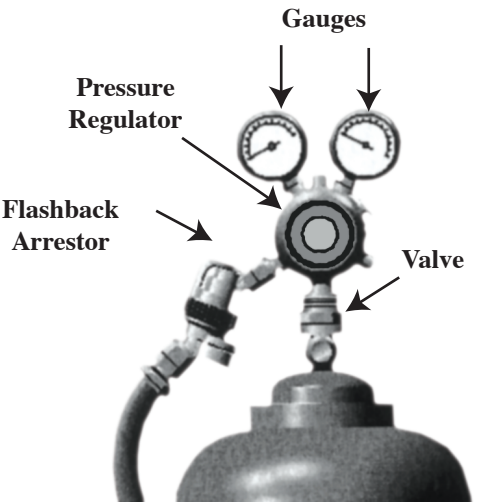


Figure 6. Flashback Arrestor Position on O_2/Acetylene Cylinders

- Only strikers shall be used to light a torch; never light a torch with matches or a lighter.
- When opening an O_2 or fuel cylinder valve, always crack it open first.
- Stand to the side of a regulator, not in front of it when opening cylinder valves.
- Acetylene cylinders in use shall have a handle or valve wrench in place at all times.

General Safety

- Signs shall be posted at the entrance to drilling and well servicing locations to indicate special hazards (e.g., H_2S).
- Bridges, overhead lines, and site soil conditions shall be surveyed for safety issues prior to move in.
- Anchors and guy lines shall be set and tested according to industry recommended practices.
- Guy lines shall be flagged with high visibility material.
- A separate *Geronimo* escape line and anchor shall be installed with the line length two times the derrick height from ground level. The escape line and carrier shall be inspected with each rig up.
- A full-opening safety valve, in full open position, for all sizes of drill pipe shall be readily available on the rig floor.
- *Blowout Preventers* (BOPs) shall be tested after initial rig up and then periodically during drilling/well servicing operations as required.
- Documented well control drills shall be held weekly.
- A fusible cap or other device shall be placed on remotely operated surface safety valves during well servicing operations.
- All connections on the wellhead and tubing shall have a pressure rating greater than the maximum treating pressure, otherwise a *tree saver* shall be used.
- Service vehicles and equipment shall not be located closer than 15 m (50 ft) from the wellhead or processing equipment. A Hot Work Permit may be required for certain types of equipment in accordance with Safety Process 1, “Hot Work Permit.”
- Cranes shall not be allowed to lift loads across high pressure lines, or perforating wireline and coil tubing operations.
- The layout of equipment shall allow safe access/egress for personnel.
- Nonessential personnel shall be restricted from the rig floor during perforating wireline and coil tubing operations.
- Simultaneous operations for drilling and production locations or platforms shall be reviewed and approved on a case-by-case basis.

Perforating

- When a lubricator is required, it shall be properly rated and tested for the anticipated operating pressure, or 1.2 times the expected wellhead pressure, whichever is greater.
- Never perform pressure testing with an armed perforating gun inside the lubricator.
- Perforating operations shall not commence after dark.
- Signs prohibiting radio use shall be posted at location entrance(s) when perforating operations are in progress.
- Disable two-way radios and telephones while rigging up and loading perforating guns unless the gun is at least 152 m (500 ft) down hole.
- Welding on location is prohibited during perforating.
- Personnel not essential to the operation shall not be on the rig floor or in the area during perforating operations.
- All equipment shall be properly grounded and bonded before operations begin.

Wireline Operations

- Lubricators shall be pressure tested on original rig up and periodically as required.
- Wireline derricks/masts shall be adequately secured.
- Welding or burning during wireline operations shall be conducted in accordance with Safety Process 1, “Hot Work Permit.”
- Approved wireline power packs shall be used in classified areas.

Coil Tubing Operations

- Properly secure coil tubing injector heads with continuous tension from crane or draw works.
- Use lifting equipment or SA certified cranes, capable of lifting all equipment, for lifting coil tubing packages.
- Coil tubing and BOP stacks shall be inspected and pressure tested prior to use for the anticipated operational pressure.

Qualifications

- Only individuals qualified for the type of electrical work to be undertaken shall repair or install electrical equipment, or work around live circuits (e.g., switchman).
- Individuals who need to identify and possibly de-energize an electrical circuit shall attend electrical hazard recognition training.
- Qualified personnel authorized to work on electrical circuits shall be trained in First Aid and Basic Life Support (BLS).

Work Practices

- All electrical conductors shall be considered energized unless properly **Locked**, **Tagged**, **Cleared,** and **Tried.**
- De-energize all circuits before beginning work. Use Safety Process 6, "Isolation, Lockout, and Use of Hold Tags" to prevent the electrical circuits from being inadvertently energized.
- Use proper PPE including insulated rubber gloves for high voltage work. Additionally, mats and blankets may be required to provide insulation from other elements that are energized or grounded.
- Personnel shall not wear rings, wristwatches, other jewelry, glasses with metal frames, or other similar metallic objects while working within arm's length of energized electrical equipment.
- Do not cause electrical interlocks to be inoperative by removing, modifying, or destroying them.
- Blown fuses shall be removed with approved fuse pullers and replaced only with the proper type and rated fuses.
- Metal ladders shall not be used when working on or near electrical equipment or conductors; use only nonconductive ladders.
- Never use defective electrical equipment, defective extension cords, or shop-made extension cords.
- When opening or closing a disconnect switch, personnel shall stand to the side, turn head away from switch, and throw switch with a quick upward or downward single motion.

- Extension cords shall not be used in place of permanent wiring.
- Ground fault circuit interrupters (GFCIs) or ground isolation systems shall be used for all portable electrical tools, temporary wiring, and in potentially damp areas.
- Maximum voltage for portable electrical hand tools shall not exceed 125 V.
- Frequently update the electrical panel board breaker list for proper isolation in case of emergency.
- Do not use electrical rooms as storage or resting areas.
- Battery rooms shall be properly ventilated.

Energized Overhead Power Lines

All power lines shall be considered energized unless proper measures have been taken for de-energizing. When cranes or heavy equipment are used near energized overhead power lines, no part of the crane, boom, mast, gin poles, or machinery shall be permitted within the distances shown below in Table 3.

Line Voltage	Minimum Approach Limit
Up to 50,000 V	3 m (10 ft)
50,000 to 250,000 V	6 m (20 ft)
Over 250,000 V	7.6 m (25 ft)

Table 3. Minimum Safe Distance from Overhead Power Lines

Fall Protection

Approved fall protection measures (e.g., personal fall arrest systems and scaffolding) shall be used if the working height is greater than 1.8 m (6 ft) from floor or platform level.

Personal Fall Arrest Systems

- Fall arrest system components shall be properly rated, mutually compatible, and consist of the following:
  1. Connectors including a shock-absorbing lanyard as shown in Figure 7.
  2. Full-body harness as shown in Figures 8 and 9.

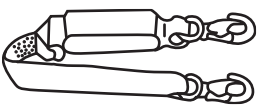


Figure 7. Shock-absorbing Lanyard

- Users shall inspect fall arrest systems prior to each use.
- Remove defective components from service.
- Fall arrest system components shall be protected against cuts or abrasions.
- Fall arrest systems and components shall *not* be used to hoist materials.
- When using full-body harnesses with shock-absorbing lanyards, they shall be properly secured at least 5.6 m (18 ft) above impact surface and shall not be reused after stopping a fall.
- Waist belts and manual locking or non-self-locking snap hooks are prohibited for use as part of a fall arrest system.

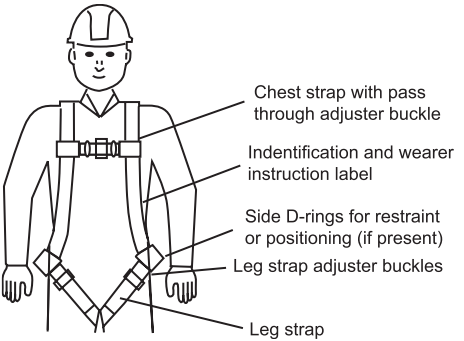


Figure 8. Fall Arrest System (Front)

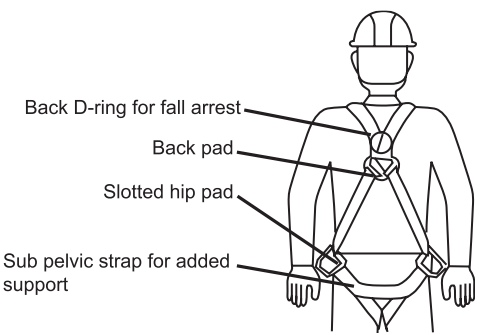


Figure 9. Fall Arrest System (Back)

Ladder Safety

- Users shall inspect all ladders before use and remove defective ladders.
- Ensure ladders extend a minimum of 1 m (3 ft) above the top landing point. In general, set ladders at a 4:1 slope.
- Properly secure ladders at the top and provide stable footing.
- Only one person shall be on a ladder at a time.
- Never work off the top step of a stepladder or stand on its non-step side.
- Do not use temporary work platforms, such as scaffolds, to support a ladder.
- Metal ladders shall not be used when working on or near electrical equipment or conductors; use only nonconductive ladders.
- Personal fall arrest systems shall be used on any fixed ladder that is over 6 m (20 ft) and not equipped with a cage.
- If the work is over 1.8 m (6 ft) above the ground or working surface, long-term in nature, or requires heavy physical exertion, other methods such as scaffolds or personnel lifts shall be used instead of ladders.
- When climbing up or down any ladder, face the ladder and maintain three points of contact with hands free of materials (see Figure 10).

Figure 10. Maintaining Three Points of Contact on Ladder

Fall Protection

Fixed Elevated Work Surfaces

- Personnel shall inspect all fixed elevated work surfaces prior to use (i.e., gratings clips).
- Personnel shall guard/barricade floor openings including open vaults, excavations, and grating that have been removed.
- Standing on a guardrail or ladder in close proximity to the edge of an elevated platform is prohibited.

Elevating Work Platforms

- Only qualified personnel shall operate elevating work platforms (manlifts – hydraulic/scissor/telescoping).
- Personnel lifts shall have a current SA inspection sticker.
- A second person shall be used to guide the operator while moving the lift from one location to the other.
- Appropriate clearance from overhead obstructions while raising or lowering the platform shall be maintained.
- Modification of personnel lifts is prohibited without written consent from the lifting manufacturer.
- Never use personnel lifts designed for indoor use outdoors.
- Outriggers shall be used on lifts equipped with outriggers.
- Personnel shall wear a full-body harness with lanyard attached to an anchor point on the lift.
- All entrance gates or chains shall be in their fully closed position and secured shut before moving or raising the lift.
- Equipment and tools shall not be carried on personnel lifts designed only for personnel transfer.

Scaffold Safety

When scaffolds are required, they shall be properly designed, erected, and inspected by SA certified supervisors/inspectors using the appropriate inspection checklist. Refer to Table 4 for requirements.

Design and Review	Special scaffolds or scaffolds taller than 12.2 m (40 ft) require scaffold plans and review by the proponent and the Area Loss Prevention Division.
	Special scaffolds or scaffolds taller than 38 m (125 ft) require additional review by SA Consulting Services Department and/or an approved third party.
Erection	Scaffolds shorter than 12.2 m (40 ft) shall be erected by a qualified scaffold erector.
	Special scaffolds or scaffolds taller than 12.2 m (40 ft) shall be erected by an approved specialized scaffolding contractor.
Field Inspection and Tagging	Checklist for scaffolds shorter than 6 m (20 ft) shall be filled and tags signed by Scaffold Supervisor.
	Checklist for special scaffolds and scaffolds taller than 6 m (20 ft) shall be filled and tags signed by Scaffold Supervisor and Scaffold Inspector.

Table 4. Scaffold Review, Erection, and Inspection Requirements

Scaffold inspection tags shall be visible (Red, Green, and Yellow) to indicate the status of the scaffold. Refer to Figure 11.

Figure 11. Scaffold Inspection Tags (Red, Green, and Yellow)

- SA certified supervisors/inspectors shall reinspect scaffolds every two weeks and after any alteration.

Response Procedures in Case of Fire

1. **Summon Help/Sound Alarm.**
2. Only trained personnel shall operate fire extinguishers and equipment.
3. Ensure that all personnel are evacuated per the local emergency response plan.
4. Isolate all fuel sources and/or threatened facilities and close doors; do not attempt to extinguish gas fires.
5. Do not fight fires beyond the incipient (initial) stage or beyond your level of training. Locate the fire fighting equipment and approach the fire from the upwind side.
6. Never operate an extinguisher in such a manner that any part of the body is located directly above the fill cap.
7. Test the extinguisher before attempting to extinguish fire.
8. After the fire is extinguished, stand by to ensure that there is no reignition.

Fire Prevention Guidelines

- Class A fire materials (e.g., paper and wood) storage shall be minimized in process and electrical areas.
- Trained personnel shall visually inspect all fire equipment monthly.
- Report and repair all hydrocarbon liquid or gas leaks immediately.
- In the event of a hydrocarbon liquid or gas leak, remove sources of ignition immediately (e.g., shut down engines).
- Do not use gasoline as a cleaning agent.
- Always fill portable gasoline containers on the ground and never place gasoline containers inside vehicle passenger compartments.
- When transferring hydrocarbons (flammable liquids) from a line or vessel to another container, the source container and the receiving container shall be electrically bonded to prevent ignition due to static electricity.
- Plastic cups/buckets shall not be used for collection of hydrocarbon samples.
- Do not smoke, use cellular phones, other electrical devices while refueling or within electrically classified areas.

- Only SA certified forklift operators shall operate forklifts.
- Rollover protective structures (ROPS) shall not be removed.
- Seat belts shall be worn when operating forklifts.
- Personnel other than the operator shall be prohibited from riding.
- Forks shall not be used to lift personnel or used as a work platform unless used with a SA certified platform.
- Operators shall inspect forklifts before and after use, including the backup warning and safety devices. Report any deficiency to their supervisor.
- Brakes shall be set and the wheels blocked on the trailer or truck being loaded or unloaded.
- Do not allow any person to stand or walk under elevated forks, whether loaded or empty.
- Move all drums in the upright position, using a drum containment pallet, drum rack, basket, or with a drum handling extension. No drums shall be moved by *sandwiching* them between forks.
- Forks shall not be used to tow or push equipment or objects.
- Forklifts shall not be used beyond their rated capacity.
- Forks shall not be left in the up position while forklift is unattended.
- Forklifts shall not be left running while unattended.
- Forklifts shall not be operated on uneven or unstable surfaces.
- Load forklifts only when moving on a level surface or uphill on an incline.
- Keep all parts of the body inside the forklift cabin.
- Carry loads low, with forks just off the ground and tilted back (see Figure 12).

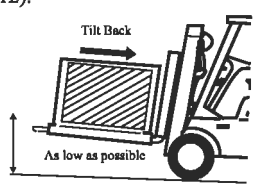


Figure 12. Proper Forklift Load Movement

Heavy Equipment

The following safety precautions apply to mobile heavy equipment such as, but not limited to, front end loaders, backhoes, excavators, boom trucks, scrapers, and roller compactors.

Safe Operation

- Only SA or Saudi Arab Government certified operators shall operate heavy equipment.
- Identify all utilities and lines and notify appropriate parties before beginning any digging or cleanup work.
- Heavy equipment shall be operated around power lines in accordance with the distances provided in the "Electrical Safety" section.
- Ground personnel shall maintain a safe distance from operating equipment and establish eye contact with the operator before approaching.
- The operator shall not jump from the equipment to the ground. Maintain three points of contact during entry/exit.
- Personnel shall not be allowed to ride in or work off any part of the equipment unless specifically designed for personnel.
- The operator shall designate a spotter (or a signal person) when visibility is obstructed.
- Heavy equipment shall not be left running unattended.
- Sleeping or resting under or near heavy equipment is prohibited.
- All boom trucks shall be loaded/unloaded by a SA certified rigger.

Equipment Condition

- All heavy equipment shall have an audible backup alarm.
- Heavy equipment shall be maintained in operable condition, including seat belts.
- All cab glass shall be safety glass and kept clean without obstructions or damage.

Rollover Protective Structure (ROPS)

- All material handling equipment designed to include ROPS (e.g., bulldozers, loaders, and scrapers) shall be equipped with them.

Hydrogen Sulfide

Hydrogen sulfide (H_2S) may be encountered in many SA operations areas. SA has developed written contingency plans for working in areas where H_2S is present. The physical effects of H_2S in high concentrations may result in death (see Table 5 for physical effects of H_2S). Contact your supervisor for additional information concerning H_2S procedures and/or emergency response plans.

Precautions

- All personnel who work in areas that contain H_2S shall have current H_2S safety training and First Aid/BLS training.
- Upon hearing an H_2S alarm, personnel shall leave the area in an upwind or crosswind direction.
- Do not open any line, vessel, tank, or equipment that may contain H_2S without proper notification of all concerned parties, properly worn respiratory protection, and H_2S detection equipment.
- H_2S is a highly flammable, colorless, and transparent gas.
- It is heavier than air and may accumulate in low places.
- **Do not rely on your sense of smell to detect H_2S.**
- Personal monitors shall be worn as required by local operations' procedures in areas where H_2S concentrations have been detected at 10 ppm or greater.
- All personnel performing work in areas where H_2S concentrations have been detected at 10 ppm shall wear approved respiratory equipment.
- Where concentrations have been detected at 10 ppm or greater, H_2S warning signs and wind direction indicators shall be displayed warning of the potential presence of H_2S in the areas.
- No entry shall be allowed in atmospheres of 100 ppm (immediately dangerous to life or health [IDLH]) or above.
- Never attempt to rescue an H_2S victim without proper respiratory protection in the form of a self-contained breathing apparatus (SCBA).
- Iron sulfide deposits may be found in tanks, vessels, and piping where H_2S has been present. Iron sulfide scale (pyrophoric

material) open to air can ignite and shall always be kept wet to prevent ignition.

ppm	Effects
0.10	Odor threshold (similar to rotten eggs).
10	Eye irritation and threshold limit value (TLV) – time weighted average (TWA).
25	Strong odor. Pulmonary irritation begins.
50	Severe conjunctivitis with prolonged exposure.
100	Severe eye irritation and coughing. Loss of sense of smell in 1 to 5 minutes. Immediately dangerous to life or health (IDLH).
250	Pulmonary edema and gastrointestinal disturbance.
500	Dizziness and loss of consciousness possible within 30 minutes.
1000	Immediate unconsciousness and death within minutes.

Table 5. Physical Effects of Hydrogen Sulfide

Office Safety

The following checklist is recommended to be used in SA office areas to maintain a high level of safety. Quarterly inspections of offices shall be conducted as a minimum.

Office Safety Checklist

Individual Workstations	**Y/N**
Sufficient ventilation	
Open floor space	

Workstation Behaviors	**Y/N**
1) Maintain neutral posture	
2) Keep elbows in	
3) Keep arms level	
4) Take regular breaks	
5) Avoid extended reaches	

Walking Surfaces	**Y/N**
Aisles correctly established with 76 cm (30 in.) clear width	
Tripping hazards cleared (carpets/mats secure)	
Mats available to prevent slipping hazards	
Floors dry – not slippery	
Caution signs present during cleaning	

Halls, Ramps, Lighting	**Y/N**
Emergency lighting in working condition	
Adequate lighting, suitable for work	
Ramps have nonslip surface	
Handrails installed and in good condition	
Halls kept clear of equipment and supplies	

Storage Areas	**Y/N**
Shelves and file drawers safely locked	

Heavy items stored at waist level	
Heavy storage shelves/files secured	
No storage within 0.6 m (2 ft) of ceiling	
Noisy equipment isolated (e.g., paper shredder)	

Office Equipment and Tools	**Y/N**
Chairs (springs, casters, hydraulics) in good condition	
Fans guarded and secured from falling or tipping	
Paper cutter blade down and functional	
Safety stepladders available	
Chemicals properly labeled/stored	
Paper supplies and material safely stacked	
Scissors, sharp tools stored safely	
Mechanical equipment properly guarded	

Electrical Hazards	**Y/N**
Machines and equipment grounded or double insulated	
Proper multi-outlet devices used	
Circuits properly loaded	
Extension cords – maximum length 3 m (10 ft)	
Power cords, plugs, and wall outlets free from defects	
Electrical switch panels clear 1 m (3 ft)	
Portable heaters prohibited	

Fire Prevention	**Y/N**
Fire extinguishers properly identified/installed	
Fire extinguishers tagged with current inspection	
Fire extinguishers hydrostatically tested	
Fire extinguishers and fire hoses unobstructed	

Fire escapes and routes clear	
Stairwell fire doors closed	
Exits properly marked	
Sprinkler heads unobstructed	
Excess paper and trash removed	

Common Areas	**Y/N**
External corridors in good repair	
Stairways clear – uncluttered	
Restroom in safe/sanitary condition	
Caution barricade and mats available	
First aid supplies available	
Escape notices and plans posted	
Floors dry – not slippery	

- The Captain/Master of a marine vessel or barge is responsible for all safety onboard at all times.
- The Rig Foreman of a mobile offshore drilling unit is responsible for all safety onboard at all times.
- All visitors to marine vessels/barges/offshore drilling rigs shall first report directly to the person-in-charge. Provide the person-in-charge with all information requested at the time of boarding, including swimming ability.
- The person-in-charge shall provide all passengers with orientation of the vessel, barge, or mobile offshore drilling rig including life raft and fire station. A personal flotation device (PFD) shall be worn when boarding, traveling, or disembarking a boat/vessel/barge.
- When boarding a vessel/barge from a shore/pier facility ensure that you have safe access to the vessel/barge.
- When boarding a vessel/barge from an offshore platform/boat landing, do not board until the person-in-charge has given permission.
- When disembarking from a vessel/barge to an offshore platform/boat landing, do not disembark until the person-in-charge has given permission to do so.
- Never go outside the *ship's rail* unless authorized by the person-in-charge. The *ship's rail* goes around the outside deck of the vessel/barge.
- In the event that a person falls in the water, immediately shout "**man overboard.**" Assist in the rescue as directed by the person-in-charge.
- Be aware of slippery surfaces, newly painted decks, and wet decks, especially in rough weather, and decks with oily patches.
- Be aware of mooring ropes and wires. Many ropes and wires are under tension and can cause serious injury.
- During crane operations, be aware that the vessel is affected by wave action and passing vessels; this will affect the control of crane loads to be lifted.

Transfer by Personnel Basket

- Personnel shall wear a Type-I life jacket, snugly fitted and securely fastened during transfer by personnel basket.
- Position yourself on the deck of the boat as directed by the boat crew.
- Place your luggage in the bottom center of the basket. Only personal articles shall be transferred in personnel basket; no heavy equipment or tools.
- Place one foot on the outside rim of the basket and grasp the basket ropes securely. Keep your knees slightly bent or flexed.
- Prepare for unexpected moves, particularly in rough seas.
- As the basket is lifted off the boat deck, step onto outside rim of basket with the other foot. Do not lean in or out, but stand straight.
- Personnel baskets shall not be permitted to transfer personnel when the wind speed exceeds 25 km/h (14 knots) or in rough weather.

Transfer from Boat-to-Boat Landing

Only personnel trained in swing rope transfer shall be allowed to transfer. The following general procedure shall be followed:

- PFDs shall be properly worn.
- Face where the boat is against the platform.
- Have both hands and arms free.
- Do not carry luggage while transferring by swing rope.
- Catch the knotted rope when the boat is on top of a swell and swing to the platform by pushing off the boat with your feet.
- Assist others in transfer by swing rope.

Work Over Water

- PFDs shall be properly worn.
- Personnel shall be fitted with a safety harness and safety line.
- Safety lines shall be tended by standby personnel.
- Life rings shall be available for rescue.
- Never work alone; use the buddy system.

Rigging Safety

Rigging Practices

- Personnel shall use accepted rigging techniques.
- All crane loads shall be rigged by a SA certified rigger. See "Crane Operations" section for additional information.
- All rigging equipment shall be rated for the load being lifted.
- Avoid sharp bends in slings; protect slings from sharp edges and abrasions.
- Do not stand or walk under suspended loads.
- Do not leave suspended loads unattended, unless the load is properly secured to a load bearing structural member.
- Rigging from process piping is prohibited. Rig loads off load-bearing structural members only after prior approval.
- Shackles and other connecting devices shall be completely closed/bolted.

Inspection

- Users shall visually inspect all rigging hardware before each use.
- Users shall properly maintain all rigging hardware. All defective components shall be removed from service.
- Slings shall have their rated capacity indicated on a tag or stamp.
- All "A-Frames" shall be inspected and certified by a SA certified inspector prior to attaching rigging equipment.

Tubular Goods

The following precautions shall be applied when transporting and handling tubular goods (e.g., drill pipe, casing, and line pipe):

- All personnel not assisting in the operation shall stand clear of the loading/unloading area.
- Conduct land-based loading/unloading on level ground wherever possible.
- Drivers shall check in with the person-in-charge upon entering the facility, work area, or well location.
- Properly secure all loads during any truck trailer movement at the loading/unloading location.
- The carrier is responsible for providing sufficient load securing equipment (e.g., chains, straps, and stakes).
- The driver is responsible for positioning the load on the trailer and *breaking* the load.
- Follow proper guidelines for loading, checking, and unloading *pyramid* or *stripped* loads.
- For pipe removed in bundles, the pipe shall be bundled/slung in approximately equal loads.
- For pipe removed with *S hooks*, caution shall be taken to ensure the *S hooks* remain engaged. No more than four joints shall be picked up at any one time.
- The loading and unloading practices for onshore operations are applicable to offshore operations. The Captain of the marine vessel is responsible for the positioning, space, and weight conditions of the vessel.

Vehicle Safety

The following safety rules apply to drivers of vehicles supplied by SA and also vehicles operated by contractors or others at SA premises. Drivers of vehicles are responsible for the safe operation of their vehicles, particularly in relation to speed.

Before You Can Drive

- All drivers shall hold a valid (Saudi Arab) driver's license.
- All drivers shall immediately report any changes in license status or ability to drive to their supervisor.
- Drivers who operate SA vehicles shall have current Driver Improvement Program certification.
- Drivers who operate vehicles in remote locations shall attend off-road driver training.

Preparing to Drive

- Drivers shall perform a 360 degree walk-around before getting into the vehicle.
- Drivers shall inspect the vehicle's safety equipment (e.g., spare tires) before using the vehicle.
- Driver shall ensure vehicles have a valid inspection sticker and are maintained in a safe operating condition.
- Drivers shall report any unsafe conditions immediately.
- Drivers shall regularly inspect and maintain tire pressure per the manufacturer's specifications.
- Drivers shall ensure adequate supplies and communication equipment are available for remote area driving.

While Driving

- Drivers shall comply with all applicable laws.
- Drivers shall observe speeds in accordance with posted speed limits and driving conditions.
- The use or being under influence of intoxicants or medications which cause impairment while operating a vehicle is prohibited.
- Using a cell phone, eating, or drinking is prohibited.
- Only authorized personnel shall drive or ride in SA vehicles.
- All occupants shall wear seat belts.
- Drivers shall not leave vehicles unattended while the engine is running.

Vehicle Safety

- Vehicles shall only be operated or parked in designated operations areas, unless authorized by a Hot Work Permit.
- Vehicles shall not be fueled with the engine running or during use of any electrical device.
- Drivers shall report all vehicle collisions and moving violations immediately, no matter how minor.

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Conversion Tables

Temperature

-18	-10	0	10	21	32	38	43	49	54	60	66	71	77	82	88	93	100	°C
0	14	32	50	70	90	100	110	120	130	140	150	160	170	180	190	200	212	°F

$C = \frac{5}{9}(F - 32)$

$F = \frac{9}{5}C + 32$

English Measures and Equivalents

Length		
1 inch (in)		= 2.54 cm
1 foot (ft)	= 12 in	= 0.3048 m
1 yard (yd)	= 3 ft	= 0.9144 m
1 mile	= 1760 yd	= 1.6093 km
1 int nautical mile	= 2025.37 yd	= 1.852 km
Area		
1 sq inch (in^2)		= 6.4516 cm^2
1 sq yd (yd^2)	= 9 ft2	= 0.8361 m^2
1 acre	= 4840 yd^2	= 4046.9 m^2
1 sq mile ($mile^2$)	= 640 acres	= 2.59 km^2
Volume/Capacity		
1 cu inch (in^3)		= 16.387 cm^3
1 cu foot (ft^3)	= 1728 in^3	= 0.0283 m
1 fluid ounce (ft oz)		= 29.57 ml
1 pint (pt)	= 16 fl oz	= 0.4732 l
1 gallon (gal)	= 8 pt	= 3.785 l
Mass (Weight)		
1 ounce (oz)	= 437.5 grains	= 28.35 g
1 pound (lb)	= 16 oz	= 0.4536 kg
1 hundredweight (cwt)	= 112 lbs	= 50.802 kg
1 ton	= 20 cwt	= 0.907 t

Metric Measures and Equivalents

Length		
1 millimeter (mm)		= 0.0394 in
1 centimeter (cm)	= 10 mm	= 0.3937 in
1 meter (m)	= 100 cm	= 1.0936 yd
1 kilometer (km)	= 1000 m	= 0.6214 mile
Area		
1 sq cm (cm^2)	= 100 mm^2	= 0.1550 in^2
1 sq meter (m^2)	= 10,000 cm^2	= 1.1960 yd^2
1 hectare (ha)	= 10,000 m^2	= 2.4711 acres
1 sq km (km^2)	= 100 ha	= 0.3861 $mile^2$
Volume/Capacity		
1 cu cm (cm^2)	= 1000 cm^3	= 0.0610 in^3
1 cu decimeter (dm^2)	= 1000 dm^3	= 0.0353 ft^3
1 cu meter (m^2)	= 1 dm3	= 1.3080 yd^3
1 liter (l)	= 1 dm3	= 0.2642 gal
1 hectoliter (hl)	= 100 l	= 26.42 gal
Mass (Weight)		
1 milligram (mg)		= 0.0154 grain
1 gram (g)	= 1000 mg	= 0.0353 oz
1 kilogram (kg)	= 1000 g	= 2.2046 lb
1 ton (t)	= 1000 kg	= 0.9842 ton