



“Safety Manual”

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AKKILA

Akkila Company Limited



مقيلة
شركة عقيلة

Safety Manual for Staff

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Table of Contents:

1. Scope
2. Purpose
3. Reference
4. Definitions
5. Personnel
6. Medical
7. Handling Non-Emergency Accidents
8. Incident and Accident Reports
9. Radioactive Sources
10. General Health and Safety
11. First Aid
12. Painting and Blasting
13. Welding and Cutting
14. Hand Tools and Power Tools
15. Scaffolding, Staging and Ladders
16. Cranes, Forklift Trucks and Vehicle Operations
17. Hydrotest Safety Rules and Guidelines
18. Electrical
19. Working Around Gases and Handling Gas Cylinders
20. Avoiding Situations Of Oxygen Deficiency
21. Health Safety and Environment Manual on H2S Awareness, Escape And the Usage of Breathing Apparatus

Attachments:

- Figure #1 - Hand Signalling and Directing a Crane-Assisted Lift
- Table #1 - Sealed Source Register Log Record
- Table #2 - Exposure Device Inspection Report (Monthly)



1.0 SCOPE

This procedure covers safety factors to be considered while working in **AKKILA Company Limited** yard and related work sites. It also outlines the safe use of radioisotopes for industrial radiography.

2.0 PURPOSE

The purpose of this procedure is to protect and preserve the health of employees, as well as other members of the public who may be affected by our construction operations and other related jobs. It also aims to establish safe working practices for personnel using radioactive materials in order to ensure the safety of all **AKKILA Company Limited** personnel, contractors, clients, and members of the public also provides procedures and guidelines for the storage and use of radioactive isotopes by **AKKILA Company Limited** personnel which can lead to a competent and comprehensive safety management.

3.0 REFERENCES

ASME Section V / AWS D 1.1/ ASME/ANSI B31.3 / API-1104
AKKILA Company Limited Written Practice WI 0310 / 01

4.0 DEFINITIONS

- **ACL: *AKKILA Company Limited.***
- **Accident:** An event with measurable consequences like injury, damage or loss.
- **Incident:** Any event which had the potential for causing injury, illness, and/or damage to persons, property or the environment.
- **Radiography:** the examination of materials by non-destructive methods utilizing radioactive isotopes or X-rays generating equipment.
- **Sealed Source:** Any radioactive material encased in a capsule designed to prevent leakage or escape of any radioactive substance.
- **Safety:** The measures taken to prevent and or minimize injury or damage to persons, property, equipment and the environment.
- **Barrier:** Radiation warning boards, red and white marker tape, visual orange flash light which are used for cordoning radiographic sites at night time works.
- **Radiation Area:** Any area with levels of radiation in which human body could receive 2.5 milli rem (0.025m Sv) in any one hour, or dose in excess of 100 milli rem (1mSv) in a week.



5.0 PERSONNEL

- ACL Safety Officer is the designated competent person authorized to represent **AKKILA Company Limited** in matters concerning radiation safety.
- At the option of **AKKILA Company Limited's** Safety Officer, an authorized field representative may be designated for routine activities.

6.0 MEDICAL

6.1 Periodic Regular Medical Examination

Periodic medical examination of ACL personnel shall be arranged every year.

6.2 Special Medical Examination

A medical examination that shall be arranged in case of any radiation over exposure.

6.3 **AKKILA Company Limited** management shall maintain a record of all medical examination results.

6.4 Severe Injuries Requiring Urgent Medical Treatment

6.4.1 Never move and injured person unless he is in further danger.

6.4.2 If electrical power is involved, do not touch the injured person. Immediately switch off power, then offer assistance.

Any employee witnessing an accident which threatens human life or massive property damage is responsible for immediately notifying the area Foreman/ Supervisor and/or the Safety Officer on duty, who should:

- Proceed directly to the accident site.
- Assign someone to call for medical assistance. Dial local Emergency line for ambulance service and immediately report the following;
 - Location of accident
 - Number of injured persons
 - Brief description of injuries/ conditions of injured persons
 - Any further, relevant information
- Assign a second person to notify the Safety Supervisor.(Safety Officer)
- Assign a third person to notify the Operation's Manager.
- Station someone at the ACL gate entry to direct the ambulance to the accident site.
- Secure the accident area, leaving all equipment, materials and tools in position. This will assist in subsequent investigation of the accident.

6.5 Fire Emergencies

Upon witnessing a fire;

- Raise the alarm or shout "Fire".
- If practical, use the fire extinguishers available on the site to extinguish or attempt to contain the fire.



- For fires requiring professional firefighting assistance, dial local Emergency line and give full details.

6.6 Emergency Evacuation Procedures

In the event of a fire or other situation requiring emergency evacuation of premises,

- Immediately cease work and turn off any equipment you are currently using.
- Leave the building quickly by the nearest and safest exit – DO NOT RUN!
- Report to the designated Assembly Point – Stay there until you are instructed otherwise.

6.7 Duties Of Assembly Warden

Assembly Wardens, appointed by the Safety Supervisor, are responsible for following these procedures in an emergency evacuation:

- Make sure that the building is clear from persons other than firefighters.
- Go to your assembly area.
- Report all persons unaccounted for the HSE Supervisor.

7.0 HANDLING NON-EMERGENCY ACCIDENTS

Non-emergency accidents are *incidents in which human life is not perceived to be in immediate danger nor are massive property / environmental damages at risk*. These accidents range from very minor injuries to more severe injuries that do not appear to be an immediate threat to life.

Non-emergency accidents include both injuries to persons and damage to equipment, property, or the environment.

7.1 Accident Response Procedure

Upon occurrence of non-emergency accidents, immediately report the accident to the area Foreman /Supervisor and/or the Safety Officer on duty, who should;

- 7.1.1 Proceed to the accident site.
- 7.1.2 Assess the extent of injuries and/or damages.
 - For minor injuries not perceived to require professional medical treatment (such as minor cuts or burns), administer first aid using the supplies in the site first aid box. (The supplies available in their uses are discussed in the First Aid section of this manual). Notify the Safety Supervisor of the accident.
 - For injuries requiring professional medical treatment, appoint someone to immediately notify the Safety Supervisor. Your Safety Officer is trained in providing first aid and will arrange for transporting the injured person to a medical facility.
 - For property/environmental damages, call the Safety Supervisor after your assessment of damages has been made and report this assessment to him.



8.0 INCIDENT AND ACCIDENT REPORTS

In addition to the verbal notification of accidents, a formal file, written report must be made on all accidents as soon as practical after the accident.

Area Foremen or Supervisors are responsible for preparing and submitting the accident reports required for areas under their supervision.

An accident or incident in any event which causes injury, illness, and/or damage to person, property, or towards the environment. Any accidents occurring at the ACL yard or at the project worksite as well as any other work-related accident occurring offsite and involving ACL employees, equipments or properties must be reported in writing. This includes injuries/damages to ACL personnel and property, as well as injuries/damages to third party personnel/properties when ACL personnel or property are involved.

Written reports should be completed within 24 hours of the accident and distributed to both the Safety Supervisor and Operations Manager.

9.0 RADIOACTIVE SOURCES

Any person concerned with radiography and other work involving the use of ionizing radiation will be classed into one or more of the following categories;

- Competent Person – Persons falling within this category shall have sufficient technical knowledge to exercise special supervision with regards to the requirements.
- Authorized Person – Persons falling within this category shall carry written evidence of such authority.

The following regulations should be observed when working involving radioactive sources;

9.1 Permissible Exposure Limits

9.1.1 Exposure to ionizing radiation shall be kept AS LOW AS REASONABLY ACHIEVABLE (ALARA). Exposure limits given below are the maximum permissible and shall not be exceeded, except under certain emergency conditions.

9.1.2 Radiation worker's permissible dose:

2.5 mR/hr for 40 hours a week

The limits shall apply to person whose job routinely involves handling and use of radioactive isotopes / X-ray machines and who have been trained in the safe use of radiation. These personnel are covered by radiation monitoring.

9.1.3 Non-radiation worker (general public)

Permissible Dose:

0.75 mR/hr for 40 hours a week



Even though the above dose rates are permissible, developing safer working procedures/practices could reduce the dose level.

9.2 Source Storage

- 9.2.1 Radioactive isotope containers while not in use shall be stored in a remote and safe location.
- 9.2.2 **Isotope Pit:**
A pit shall be made in the ground at least 1 meter deep and 24” diameter. The base and sides of the pit shall be suitably prepared by concrete or by any other suitable means so that it is waterproof and free from condensation of any sort. The pit may be ground. The pit shall have a lid with locking facility.
- 9.2.3 **Pit Enclosure:**
A fenced area of suitable height with a lockable door shall be built around the source storage pit. Radiation warning sign shall be prominently displayed on all sides of this enclosure.
- 9.2.4 The person entering the source storage areas shall carry a personnel radiation alarm or survey meter.
- 9.2.5 At all times the storage pit and fenced off areas shall be locked and keys stored in the Radiation Safety Officer’s office.
- 9.2.6 During storage, all radiation containers shall be locked to prevent misuse of the hazardous radioactive materials.

9.3 Protection Sealed Sources

- 9.3.1 All radiographic exposure devices shall be provided with a lock designed to prevent unauthorized or accidental removal or exposure of a sealed source and shall be kept locked at all times except when use under the direct supervision of a radiographer.
- 9.3.2 All radiographic exposure devices shall be stored in an approval location.
- 9.3.3 A periodic survey shall be conducted on the outside surface of the storage area where radioactive exposure devices are stored.
- 9.3.4 Radioactive containers/exposure devices shall not be kept in any vehicle overnight.

9.4 Transportation Of Sealed Sources

- 9.4.1 Prior to loading any radioactive material into a transporting vehicle, one technician shall be responsible to take the device from its storage location to the vehicle.
- 9.4.2 During this operation a designated individual shall be responsible to fill in, as required, the “Sealed Source Register Log Record” – Attachment # 2.
- 9.4.3 While loading or unloading any radioactive material, it shall not be put down temporarily for any reason, but taken directly to the transporting vehicle.



- 9.4.4 Whenever a sealed source is transported, it must be secured in a storage compartment of the transporting vehicle to prevent the shifting or loss. The material and the compartment where it is stored must be posted on the outside with a sign bearing the radiation symbol.
- 9.4.5 The transporting vehicle must be posted with radiation warning sign stating “DANGER RADIATION”. The sign shall be visible to the front and rear of all vehicles transporting radioactive materials.
- 9.4.6 Vehicle transporting radioactive material shall not exceed 90 Km/hr at any time and shall be driven in a safe and responsible manner.
- 9.4.7 Emergency procedures to be followed in case of a road accident shall be those described in Section 9.6 of this procedure.

9.5 Procedure for Handling Sealed Sources

9.5.1 General

- All sealed sources used for industrial radiography by **AKKILA Company Limited** radiographic personnel shall be housed in an approved, remote operated type device called camera. Any available natural shielding shall be used whenever practical.
- When performing radiographic operations physical surveys shall be made after each exposure to determine the radiation source has been properly returned to its shielded position. The survey shall be accomplished as the radiographer approaches the projector, reading shall be taken at the rear and at the top of the projector to assure proper retraction. After the physical survey is completed the survey meter should be placed next to the projector until the next exposure is to be made.

9.5.2 Radiographic Equipment

- Each radiographer is responsible for checking his own radiographic equipment, prior to each day's assignment.
- Ensure that the survey meter is operating properly, prior to unloading the projector from its storage container.
- When the exposure device is in its work location, unlock the device and remove the cap exposing the pigtail.
- Connect the drive cable to the pigtail.
- Remove the safety plug from the front and connect the guide tube.
- Place the guide tube at the exposure location, making sure there are no sharp bends in the tube or driving cable.
- When the work is completed, turn the locking device to the locked position, disconnect the guide tube, driving unit and replace the safety plug.



9.5.3 Source Guide

The **AKKILA Company Limited** radiation Safety Officer or NDT Level II in-charge should be responsible for supervising or conducting radioactive source changes.
Changing of source shall be performed in accordance with the manufacture's approved procedures.

9.6 Emergency Procedures (Gamma)

The following situations shall cause work to cease immediately .

9.6.1 When a source is unable to retrieve due to failure of equipment or loss

9.6.2 When equipment is damaged or is suspected of being faulty e.g. camera, driving unit guide tube etc.

9.6.3 In the case of source being unable to be retrieve to its housing or lost the following action shall be taken.

9.6.3.1 Ensure area is secured, radiation levels and the unshielded source distance is of an acceptable level of 0.25 mR or less. A classified Level II technician must ensure that no person enters the area until a comprehensive recovery methods has been taken (demonstrated) and the company safety person has arrived on site to coordinate the recovery procedure and will patrol the barred area.

9.6.3.2 Ensure all recovery equipment is available such as Tongs, lead bags (at least 3 per isotope) and demonstrated/practice retrieval away from the radiation area to assess time and exposure expected. The person involved in this retrieval action shall wear film badge, pocket dosimeter of 200 mR or 1000 mR.

9.7 Emergency Equipment

The following Safety Equipment is to be available at any radiographic company designated site office where isotopes are utilized.

1. Radiation audible alarm meter or Fog horn alarm.
2. Pocket dosimeter 200 mR or 1000 mR
3. Tongs (1 meter or 2 meters)
4. Pliers, screwdriver
5. Adjustable spanner, rope, hand lamp.
6. Radiation barrier (Quick erect type)
7. Bags of lead shot (2 Kg each 3 bags per source for Iridium)
8. Lead Sheets
9. Emergency storage container
10. Pouring funnel to suit emergency storage container

9.8. Inspection Of Radiographic Equipment

9.8.1 All exposure devices (cameras, guide tubes, driving units) shall be inspected monthly or after heavy usage. A report shall be prepared after each inspection. (A typical Monthly Inspection Report is included as an attachment # 1).



9.8.2 Apart from that, radiographers shall inspect the exposure device at the beginning of each work day.

9.8.3 Daily inspection shall include but are not limited to the following equipment:

- Survey for excessive radiation levels
- Inspect guide tube, driving mechanism for loose hardware and damage.
- Inspect camera for any damage.

- Inspect lock for ease of operation. If not operating freely, do not use. Inform your supervisor for further instructions.
- Check connectors for proper operation.
- Check all labels for legibility.
- Make sure source tube end cap is secured.
- Check lock, shipping plug, the inside of the source tube and all connection parts should be free of any foreign materials that they may impair the operation of the device.

9.9. AUDIT:

AKKILA Company Limited safety officer in-charge shall jointly conduct the following checks.

9.9.1 Inspection to be carried out at the source storage area on a weekly basis. The checkpoints are as follows:

- Clear Access
- Good Lighting
- Fencing & lock in good condition
- Source container and pits are locked.
- Surface radiation level for containers.

9.9.2 Surprise radiation survey shall be conducted at intervals of no greater than every 60 days. The checkpoints are as follows:

- Proper set up radiation barriers
- Methods of source transportation
- Adequate placement and use of warning signs/warning lights in the barriers..
- A method of easing radiation does received by all concerned.

10.0 GENERAL HEALTH AND SAFETY

All yard personnel should be familiar with and observe the health and safety regulations described in this chapter.

10.1 Safety Helmets and Safety Footwear

Safety helmets (not metal type) and safety footwear must be worn at all times by all personnel within the work areas.



10.2 Heat Exhaustion and Sunstroke

Two serious illnesses can result from too much sun and heat. One is heat exhaustion, and the other, sunstroke. Because of the environment in which ACL employees work, they are likely to run into one or both of these illnesses, which can be very serious and even fatal.

10.2.1 Prevention

To prevent these things from occurring,

- Avoid ice cold drinks.
- Wear light clothing.
- Avoid getting too tired.
- Use salt tablets to replace the body salt lost through perspiration.

10.2.2 Symptoms

Symptoms of heatstroke and sunstroke are hot and dry skin, red and flushed face, and a high temperature. The person will normally experience some or all of the following: dizziness, nausea, strong headache, and/or rapid pulse. In severe cases, the victim may be unconscious.

See “First Aid” for information on rendering assistance to heat or sunstroke victims.

11.0 FIRST AID

This section covers first aid training, defines the first aid supplies available on site, describes their uses, and provides instructions for providing first aid treatment to heat and sunstroke victims.

11.1 First Aid Supplies:

First aid boxes are provided on ACL site office and should always be kept stocked with the supplies indicated in the table below.

Item	Notes
Small packs of white paper tissues	
Scissors, with blunt ends	
Tweezers, with blunt ends	
Selection of safety pins, including large ones	
Clinical thermometer or fever scan forehead thermometer	A clinical thermometer is more accurate, but a forehead thermometer can be quicker and easier to use in certain situations.
Adhesive dressing (plasters) in various shapes and sizes, some waterproof	
Pre-packed sterile dressing (with roller bandage attached), in a variety of different sizes	For use on open wounds
Pre-packed sterile gauze	For use on open wounds, for covering foreign bodies or protruding bones, and as an alternative to cotton wool for cleaning cuts and grazes



Roll of cotton wool	This can be used with soap and water for cleaning cuts and grazes; for making a cold compress for a sprain; for using on top of a dressing to soak up blood; for cushioning an injured arm when putting it in a sling; for protecting bones and joints when immobilizing an arm to the body or an injured leg to the other leg.
Rolled gauze bandage	Used to keep dressing in place
Adhesive tape	Used to keep dressing in place or to secure bandages
Rolled crepe bandages	For sprains
Several large linen or cotton triangular bandages	For making a sling or folded bandage to immobilize an injured arm against the body or an injured leg against the other leg. Store these, already folded so you can use them right away in an emergency.
Calamine lotion	For soothing bites, stings, or sunburn when the skin is not broken.
Witch hazel	For soothing, cuts, grazes, bruises, sprains, sunburn, and insect bites.
Antiseptic lotion or antiseptic wipes	An alternative to soap and water for cleaning dirty cuts and grazes.
Antiseptic cream	For splinters or infected wounds.
Antihistamine cream	To reduce swelling caused by sting

11.2 First Aid Treatment for Heat Exhaustion and Sunstroke

11.2.1 Symptoms

Symptoms of heatstroke and sunstroke are hot and dry skin, red and flushed face, and a high temperature. The person will normally experience some or all of the following: dizziness, nausea, strong headache, and/or rapid pulse. In severe cases, the victim may be unconscious.

11.2.2 Treatment

- The victim should be moved to a cool, shady place, stripped down to his underclothes, and laid on his back with something to raise his head and shoulders a bit.
- Next, apply ice packs or cold wet cloths to his head and body to cool him off gradually.
- If he is conscious, give him a cool, but not an ice, drink.
- Prepare to get him to a doctor or hospital.

11.3 First Aid Training (By Medical Services Division)

It is the Company's policy to provide efficient training to employees in First Aid techniques and practices. Company will conduct a seminar including theoretical, as well as practical and audio visual presentations focused on First Aid techniques, resuscitations, fire burn healing, broken bone treatment, as well as the treatment of other emergency cases such as poisoning, sunstroke, dehydration, shock, bleeding, heart failure and brain damage and also for patients handling while suffering from head or back injury.



12. PAINING AND BLASTING

12.1 Painting

When hazardous substances used in spray coating are in a combination of particulate matter and gases or vapors, the respirator must contain both a mechanical filter and an absorbent filter. When spray painting in an area where the contaminant concentrations are expected to be extremely high, craftsmen must wear an airline respirator or a fresh-air hood.

Any employee who enters or works in a spray painting area must wear appropriate respiratory protection.

Where operations involving paints/ solvents producing flammable vapours are carried out,

- Great care shall be taken when mixing, decanting and transferring paint/solvents.
- Naked flames and lighted cigarettes are not permitted in the area.
- Adequate ventilation must be provided.
- Empty or redundant paint and solvent containers should be disposed off in such a manner that they cannot give rise to risk, fire or hazard to the environment.
- All rags saturated with thinner or paint shall be removed from the jobsite daily and disposed off properly.

12.2 Abrasive / Grit Blasting

All craftsmen performing sand or grit blasting must wear an approved, properly fitted air hood, apron, and dust collar whenever working inside blast area. This includes working in areas where concentrations of the toxic dust dispensed by blasting is physically separated from the operator in an exhaust-ventilated enclosure.

An approved filter mask must be worn by ALL EMPLOYEES in the blasting area. This includes employees who are exposed to dust even for short, intermittent periods (i.e. during cleanup, dumping dust collectors, or moving shipments of abrasive at any point).

Peripheral equipment used in blasting operations (i.e. scaffolding, staging, ladders, work baskets, cranes, lighting and air movers) must be used in accordance with safety regulations and guidelines detailed in the relevant sections of this safety manual. When a crane is used as supporting medium, and no suitable life line tie point is available on the permanent structure, the crane hook should be used as the life line tie point.

13.0 WELDING AND CUTTING

Safety in the use of welding and cutting equipment is, to a large extent, a matter of personnel knowing their equipment and knowing how to use it. All welding and cutting operations are to follow the regulations specified in this section.

13.1 Pressure Regulators

- Before connecting the regulator, always crack open the valve to clean out any dust or dirt.
- Cylinders and line valves should always be opened gradually. When opened suddenly, the abrupt compression of the gas in the inlet passage will generate excessive heat. This heat



may actually be sufficient to ignite the seat materials and may also damage the high pressure gauge and valve seat.

- Cylinder or line valve should never be opened when pressure is exerted by the adjusting screw. This will allow the gas to rush in past the valve and build up pressure in the regulator body and delivery tubing.
- Upon completion of cylinder use, the cylinder valves should be closed and gas bled from the regulator by opening the blowpipe valve before slackening the adjusting screw and only gas is flowing from the blowpipe valve.

13.2 Rubber Hoses and Torches

- Hoses and torches should be inspected regularly to ensure they are in safe working condition.
- All torches must have “flash-back” arrestors fitted, and hoses should have hose check valve fitted.
- Use the BS 5120 color code standard for rubber hoses:
 - Blue for Oxygen
 - Red for Acetylene
 - Orange for Propane
- All hoses should be securely attached to the connections on the equipment.
- Hoses should be protected from sharp edges, trapping, and passing traffic.
- Torches should always be ignited with a “flint gun”. Never use matches or a lighter.
- Leak tests must always be carried out using soapy water only.
- Protective clothing / equipment of the correct type must be worn at all times during welding, cutting, or burning operations.
- Burning should never be carried out on or near concrete floors or structures. A build-up of heat can cause an explosive situation in the concrete.

13.3 Welding and Cutting in Confined Spaces

When welding or cutting in confined spaces;

- Do not take welding and cutting torches into a tank or vessel until you are ready to use them.
- Remove welding and cutting torches immediately after use.
- Turn off cylinder valves when the cylinder is not in use.

13.4 Electric Arc Welding Safety Precautions

The following safety measures should be observed during electric arc welding;

- All welders and helpers must wear the correct protective equipment.
- All power supply cables should be of adequate construction and correctly protected.
- All earth connections shall be clamped to the work.
- Electrode holders should be inspected regularly and maintained in good, safe conditions at all times.
- Electrode holders should never be placed on the ground. Wooden rests to support holders should be provided.
- For portable welding transformers, the central point of the low tension side must be bonded to the transformer before the transformer is connected up on the high tension side.
- The transformer should always be effectively earthed.



- All welding operations should be screened from adjacent personnel; where possible, by erecting portable, fireproof screens around the work site.

14.0 HAND TOOLS AND POWER TOOLS

Correct maintenance and use of tools will prevent injuries and lead to more efficient operation.

14.1 Hand Tools

- Hand tools should be in a safe condition when used.
- Before issuing tools from store, the store controller or storekeeper is responsible for inspecting the tools. Damaged or defective items should be repaired before issue. If repair is not possible, the tool should be removed from service and destroyed.
- Stores personnel should maintain an easy-to-follow procedure for inspection, repair, and replacement of tools.
- Use tools only for their intended purpose. Do not adapt or modify tools in any way.
- Do not hand-carry tools up or down ladders.
- Do not throw tools from one level to another.
- When not in use, tools should be correctly stored. Tools lying on the floor, scaffolds, and in walkways are accident hazards.

14.2 Power Tools

All power tools must be inspected, tested, serviced, and used in accordance with the manufacturer's instructions.

Route power leads and cables so as to prevent damage to the cable and avoid tripping hazards. In particular, never route cables.

- Over sharp edges or rough, abrasive surfaces.
- Through oil, water, caustic, corrosive, or other fluid.
- Over or in contact with hot surfaces
- Across or through doorways, passages, or corridors

Only personnel trained and authorized to do so are permitted to use power tools.

Where guards are required, they shall be securely fitted.

When working on scaffolds, operators should ensure a good, safe footing and use both hands to operate the tool.

15.0 SCAFFOLDING, STAGING AND LADDERS

Adequate scaffolding and ladders should be used to provide safe access to all parts of works 1.5 meters or more above ground.



15.1 Scaffolding

- All persons involved in the erection and dismantling of scaffolds and staging should be adequately trained and experienced in that work.
- Supervisors, adequate in number, training and experience should oversee erection and dismantling of scaffolds.
- Before using scaffolds for work, work supervisors should complete an inspection of the scaffold.
- Where persons may fall 2 meters or more, guard rails should be provided.
- Toe boards should be provided around all open sides of work platforms.

- All scaffolds (except tower scaffolds) should be provided with ties. These should be fitted at a minimum ratio of one tie for every 40 Msq. of scaffold area and evenly distributed throughout the scaffold.

15.2 Mobile Towers

In addition to the safety guidelines described above, use these additional precautions for mobile towers;

- Wheels should be fitted with locking devices and should be locked facing outwards.
- The work platform should be within the base dimension.
- The minimum base-to-height ratio is 1:3.5 (internal) and 1:3 (external).
- The access ladder should be securely lashed, clean of the ground.

15.3 Scaffolding Tubing and Boards

Scaffolding tubing should be at least 2” diameter pipe and should be free from cracks, surface flaws and other defects.

- Do not use boards with knots larger than 2” in diameter.
- Do not use a board with a split in it.
- Cut notched boards so that they are square.

Boards 1-1/2” thick and 8” wide are preferred size for scaffolding decking. If this size is not available, and you must use a board less than 1-2” thick, that board should never be wider than 6”.

16.0 CRANES, FORKLIFT TRUCKS, AND VEHICLES OPERATION

16.1 Crane –Assisted Lifts

All personnel involved in crane-assisted lifts should be fully familiar with the safety requirements outlined in this section.

Any defects or damages found to lifting equipments that could affect the safe working condition must be reported and corrected before putting the equipment back into service.



16.2 Before Beginning any Crane-Assisted Lift

Before beginning any crane-assisted lift, be sure you've chosen the correct crane for the job and have a planned method for carrying out the lift. Be sure to take into account each of the following when planning a lift.

- Weight of load to be lifted. (Keep in mind that although the capacity of a crane normally quoted is the maximum amount it may lift, this is only possible when the crane is suitably rigged and operated at minimum radius).
- Load, size, shape and center of gravity.
- Height to be lifted and final position of the load.
- Maximum radius at which the load can be lifted, carried and replaced.
- Restrictions caused by plant, buildings, power lines, etc.

16.3 Regulations To Observe During Crane-Assisted Lifts

The following practices shall be observed by all personnel involved in crane-assisted lifts:

- Only trained personnel authorized (in writing) to operate cranes are permitted to do so.
- Under no circumstances shall a crane be operated beyond its safe working load.
- Cranes must be kept in sound mechanical condition and withdrawn from use upon discovery of any defect affecting its safety.
- All safety devices fixed must be in good working order and correctly calibrated.
- All controls must be clearly marked as to their functions.
- The cab must be kept clean and free of obstructions to operating controls. (Any tools or materials carried must be stored so as not restrict these controls).
- Loads should be raised and lowered smoothly, avoiding sudden starts or stops which may impose a shock load.
- Personnel are not permitted to walk under the lifted work.
- Lifting/slinging equipment should be visually checked prior to use to ensure that it is in good condition.
- Wire rope should be well lubricated, in good condition, and free of twists, kinks, and broken wires.

16.3.1 Daily Inspection

Before each day's use and at shift changes, the crane operator is responsible for visually inspecting the crane to ensure that all the operating and safety functions are working correctly. The crane operator's supervisor must be satisfied that these checks have been carried out.

Because safety depends to a large extent on wire ropes, the crane operator must visually inspect ropes before each day's use. This inspection is done by running the block to its lowest point, then slowly running it back up, observing all parts of the cable for signs of damage, including:

- kinks or severe twists
- broken wires and nicks
- deformed, worn, or flattened wires
- corroded or pitted surfaces



16.3.2 Monthly Inspection

A competent mechanic, familiar with the equipment, must complete a detailed inspection of cranes on a monthly basis. Upon completion of inspection, he must sign and date an inspection report.

16.3.3 Annual Inspection

Each crane must have its loading and boom hoist lines fully inspected at least once a year in order to ensure the integrity of the wire rope.

16.3.4 Slings

Slings are used in conjunction with other material handling equipment or moving material by hoisting. To ensure safe operating conditions, take these precautions when using slings:

- Do not use damaged or defective sling.
- Do not shorten a sling with knots, bolts, or other makeshift devices.
- Do not use kinked sling legs.
- Do not load a sling in excess of its rated capacity.
- Attach a sling securely to its load.
- Pad or protect a sling from the sharp edges of its load.
- Ensure that all employees are kept clear of a load about to be lifted and of an already suspended load.
- Do not put hands or fingers between the sling and its load while the sling is being tightened around the load.
- Do not use shock loading.
- Do not pull a sling from under a load when the load is resting on the sling.
- Immediately remove a damaged or defective sling from service and destroy it to prevent further use.
- The manufacturer marks all slings with a metal identification tag located near one of the eyes. If a jobsite makes its own sling, the rigging foreman is responsible for attaching such a tag.

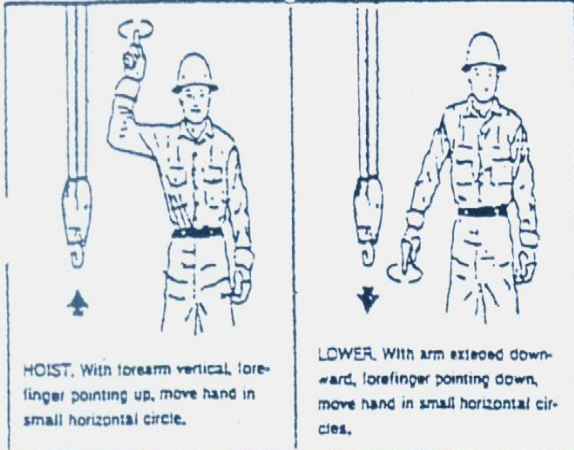
16.4 Lifts Involving Two Cranes

Before any lifts involving two cranes take place, the rigging foreman, in collaboration with the Safety Department, must satisfy himself that all precautions appertaining to the lift have been considered and taken care of.

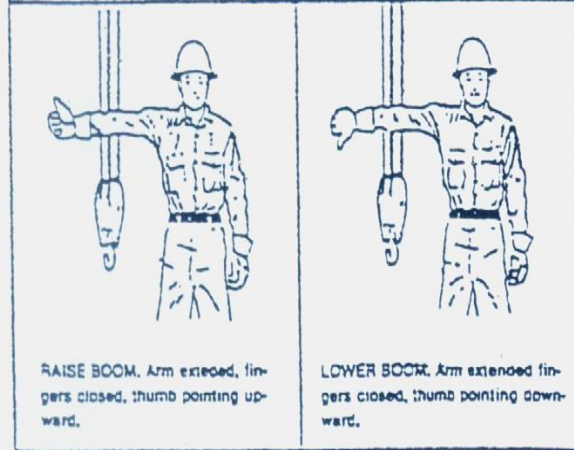
16.4.1 Hand Signalling and Directing a Crane-Assisted Lift

During a lift, only one person should be directing the crane operator. To ensure that this person is easily distinguishable from other personnel assisting the lift, he should wear a safety helmet of a different color than the other personnel on site.

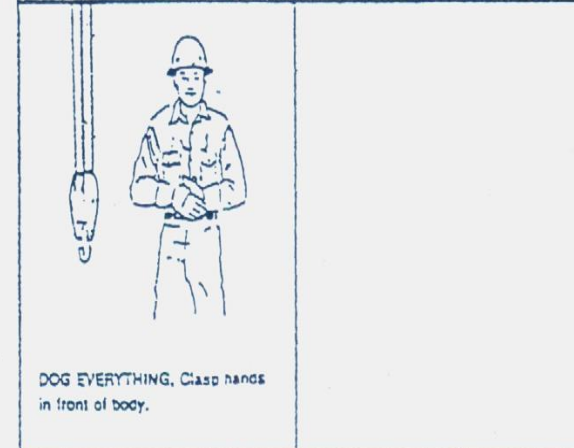
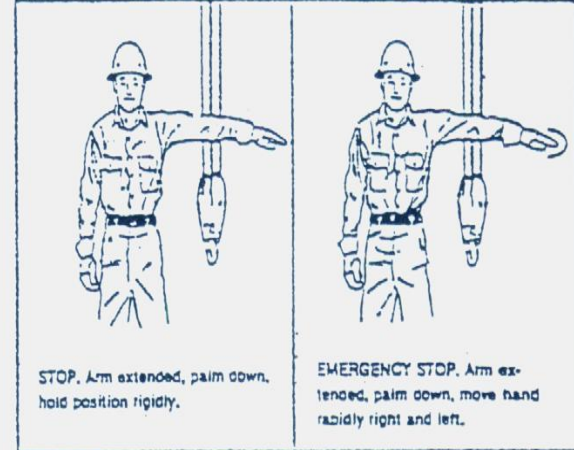
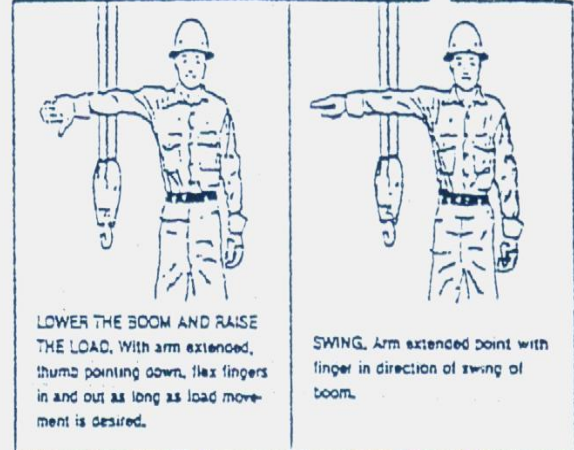
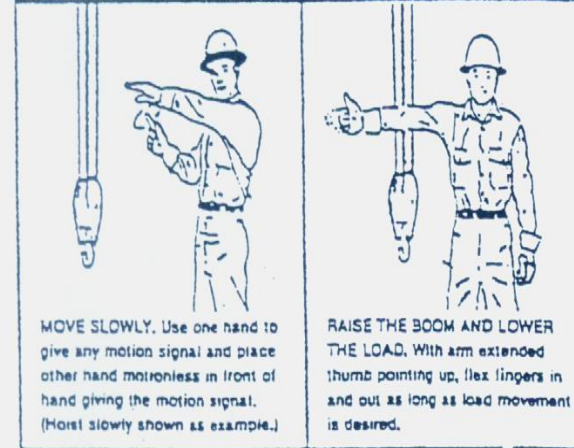
All riggers and crane operators should be familiar with the recognized code of signals shown on the following page.



LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circles.



LOWER BOOM. Arm extended, fingers closed, thumb pointing downward.



Hand Signalling and Directing a Crane-Assisted Lift



16.5 Forklift Trucks

Every year, thousands of lost-time injuries are traced to forklift operation. Fatal accidents involving forklifts are primarily caused by falling loads, overturned trucks, runover workers, workers struck by a moving forklift, and workers thrown off, falling off or jumping off a moving forklift.

The following safety rules outlined below can prevent forklift accidents;

- Do not travel with a load lifted high.
- Drive cautiously and slowly around corners.
- Avoid sudden stopping.
- Do not haul passengers.
- Carry only loads within the rated capacity.
- Do not carry unstable loads or piles.
- Lower loads slowly.

16.6 Vehicle Operation and Use

Passengers and/ or material should be transported in a safe and legal manner in accordance with the requirements of these safety regulations.

Regulations

- Only drivers holding the appropriate driving licenses are permitted to operate vehicles.
- Both drivers and passengers must wear seat belt at all times.
- Never carry passengers on the body of any motor vehicle or plant equipment.
- Never carry passengers in the load carrying section with heavy goods.
- Obey the lower speed limits (15 km/hr) while on ACL yard and at client facilities.
- Obey all the yard safety signs.

16.7 Recommended Hours of Work for Drivers /Operators

Drivers should not operate a vehicle more than 10 hours during any one work period. Any driver who experiences fatigue or loss of concentration should stop driving and take a minimum of 10 minutes rest.

Drivers should have at least eight clear hours or uninterrupted rest on completion of their work period.

Drivers of heavy vehicles and buses should take at least one hour of rest after a 4-hour period of driving.

Drivers should not undertake any other major task during rest breaks or before, during or after work periods.

17.0 HYDROTEST SAFETY RULES AND GUIDELINES

Isolate the test area (with tiger tape) and make sure that only concerned personnel are within the limits of the test area. Also attach signs stating "CAUTION – NO ENTRY". A distance of 20' must be provided between the system being tested and the caution barrier.



Never test against a closed valve that is a part of the system.

Ensure that the proper gasket / nut and stud bolt are used for testing.

Ensure that tubing used for pressurizing and monitoring of the equipment to be hydrotested is suitably rated for the maximum test pressure (i.e. external lines and equipment).

Maintain a minimum distance of three (3) meters between the vessel/miscellaneous fittings (flanges/couplings) and hydrotest personnel during build-up of test pressure.

Always wear complete safety attire (i.e. face shield) during inspection within test boundary.

When inspecting flanged nozzles for leaks, always face the blind. At no time should inspection be done from the side (in case gasket fails).

When inspecting coupling type nozzles (plugged), always inspect from the side (i.e. avoid standing in front of the plug).

On large volume vessels, consider use of a suitable wetting agent to reduce surface tension. This reduces air pockets.

The pressure shall be increased gradually in steps, providing sufficient time for all the piping to equalize strains during test.

Hydrotest safety procedures are to be on hand at the test site at all times and hydrotest supervisor should ensure that all personnel are aware of and adhere to these procedures.

18.0 ELECTRICAL

Safety from electric shock is achieved by isolation, insulation, grounding and limiting the current. If one of these safety measures becomes defective or is circumvented, we have an electric shock hazard.

18.1 General Rules

Only qualified personnel are to be used for work on electrical equipment.

Disconnect electrical equipment and remove from its power source before beginning electrical repair/ fault-finding work.

When working on a circuit, deactivate it and danger-tag it. Tags should be removed only by the person originally placing the tag.

Inspect extension cords regularly to eliminate any defects that may cause a short circuit in the wiring. Defective cords should be immediately repaired or discarded. All extension cords to electric lights and portable tools, unless adequately protected, must have a third wire which is connected to the ground when the tool is in use. To reduce the possibility of electric shock from extension cords in wet areas, special precautions, such as standing on a dry pad, should be exercised.

Do not hang extension cords over sharp objects or allow traffic to cross over them. Ensure that all electrical equipment, both stationary and portable, is properly grounded.



Do not overload circuits with multiple outlet adapters, and do not bypass circuit protection devices.

All electrical connections used in hazardous areas must be approved for such use.

Report unusual conditions like sparking, smoking or odors from electrical equipment to your supervisor.

Never load energized electrical equipment with wet or bleeding hands or while standing on a wet surface.

18.2 Insulation Testing

All equipment, systems, installations should be inspected when first installed. Following any repair, adjustment or modification, those parts of the installation which have been disturbed or altered should be checked.

18.3 Alterations to Equipment, Systems and Installations

No modification, addition or removal should be made to any approved electrical equipment, system or installation without the permission of the Safety Department.

No modifications should be made to the safety features of equipment which relies on the techniques of segregation, pressurizing, purging or other methods of ensuring safety, without the permission of the Safety Department.

18.4 Periodical Mechanical Inspection

During installation or inspection of electrical equipment, particular attention should be paid to the following;

- cracks in metal, cracked or broken glasses
- cracks or low insulation resistance on cables
- each connection (ensure that it is properly connected)
- electrical components are secured firmly
- stresses on cables which might cause fracture
- possible slackness of joints
- weatherproof integrity of enclosure and connection glands

18.5 Earthing and Bonding Protection

Earthing and bonding minimize the dangers arising from

- faults between electrically live conductors and non-current-carrying metal work
- atmospheric discharges (lightening)
- accumulation of electrostatic charge

Earthing is achieved by establishing an electrically continuous, low resistance path between a conducting body and the general mass of the earth. Earthing may occur inherently through intimate contact with ground or water, or it may be provided deliberately by means of an electrical connection between the body and the ground.

Bonding occurs where a suitable, electrically continuous path is established between conducting bodies. Bonding may be affected between two or more bodies without involving earthing, but more



commonly, earthing gives rise to bonding, with the general mass of the earth acting as the electrical continuity, or it may be affected by the provision of an additional bonding conductor between them.

The acceptable resistance in the earthing system depends on the type of hazard that the earthing is required to guard against. To protect electrical systems and equipment, the resistance value is chosen to ensure the correct operation of the protective device (e.g. cut-put or fuse) in the electrical circuit. For lightning protection, the value depends on national regulations and is typically in the range of 5 to 25 ohms. To avoid the accumulation of static electricity, the earth resistance value need not be less than 1 megaohms and in most cases, may be considerably higher.

18.6 Tag and Lockout Procedure

Precautions must be taken before servicing or repairing equipment under conditions in which unexpected energizing, startup, or release of stored equipment or process energy is likely to endanger the safety of employees.

These precautions include shutting off and locking out all electrical, mechanical, hydraulic, pneumatic and other energy sources, both input and output, as well as latent or residual energy which supplies particular items of equipment or processes. In addition, a DANGER (hold-off) tag must be applied at the power sources of the equipment being serviced.

18.6.1 Responsibility

Head of Section and Safety Department. The Site Supervisor of Fireman is responsible for the Tag and lockout Program and procedure. If the procedure is not adequate to cover a specific job, the head of section and Safety Department will develop further procedures to ensure safety during the operation.

18.6.2 Foreman

The Foreman is responsible for;

- Instructing personnel of the purpose, content and application of these procedures. This includes ensuring that personnel are able to recognize and apply adequate methods of isolating hazardous energy sources, and that they understand and are familiar with the procedures for safely re-energizing equipment when work has been completed.
- Ensuring that all personnel affected by the work have been notified.
- Providing locks, tags and keys specifically identified as one for the Tag and Lockout Program.
- Coordinating the continuation of tag and Lockout protection through shift and employee changes.

18.6.3 Craftsmen

All personnel involved in electrical works are responsible for knowing and following the established procedures applicable to the safe of his job.

18.6.4 Tag and Lockout Procedure Requirements

Locks must be painted to identify them as safety lock.

The supervisor provides the safety locks, keys and tags required for servicing and repairing equipment. When hookup or repair is completed, he returns these locks.



If controls are located so that the only one lock can be accommodated, a multiple lockout device must be used.

If an employee's shift ends before a task is completed, he should notify the supervisor, who will apply a lock.

18.6.5 Forceful Removal Procedure

Never cut or forcefully remove a padlock/ lockout device without the permission of the lock's owner or his supervisor.

Before forceful removal, the foreman will attempt to contact the individual who installed the lock, or his supervisor, to confirm that the employee is safe and the padlock can be removed.

If the individual or his supervisor cannot be contacted, the site manager may remove the lock and tag only after reviewing the equipment to be energized to ensure that personnel and facilities are safe from injury and/ or damage.

19.0 WORKING AROUND GASES AND HANDLING GAS CYLINDERS

All personnel working with of handling gases should be familiar with the various types of gases used at Akkila Co. Ltd. and with safety precautions for handling these gases.

19.1 General Precautions

- Do not smoke in the vicinity of flammable material (i.e. oil, diesel, batteries, gas cylinders etc.)
- Do not carry matches and cigarette lighters into areas where there may be an explosive atmosphere.
- If you are not positive that your immediate area is safe for smoking, DO NOT SMOKE.
- Smoking outside approved, designated areas is ground for disciplinary action.

19.2 Handling Gas Cylinders

Any personnel handling gas cylinders should observe the following handling procedures:

- Handle every cylinder as if it is full.
- Never handle cylinders with greasy or oily hands or gloves.
- Securely tie or block cylinders when they are to be transported
- Keep them standing upright at all times.
- Store cylinders securely so they don't fall.
- Do not slide cylinders off a truck; lift them.
- Handling cylinders is a two-man job; get help.
- When lifting cylinders by forklift or crane, use a cradle or carrier.
- Avoid exposing cylinders to the sun or heat.
- Do not place cylinders near flammable materials.
- Make sure that the valve protection cap is in place and closed.
- Never lift cylinders by caps or valves.



- To move a cylinder, tilt it then roll it along the bottom edge or use a hand truck. When using hand trucks, make sure cylinders are firmly secured. *Never roll a cylinder on its side.*
- Avoid dragging or sliding cylinders.
- Keep gas cylinders out of confined spaces.
- Do not use a damaged or defective cylinder.
- Never grease the valve.
- If gas leaks are discovered, immediately remove the bottle from the work area.

19.3 Storing Gas Cylinders

- Storing shelters for gas cylinders should be well ventilated and designed such that cylinders are shaded from direct rays of the sun.
- The shelter should be located as far as possible from-and always at least 20 meters from-flammable substances such as oil, gasoline, and waste.
- Cylinders should be stored in an upright position and secured so that they can not fall or be knocked over.
- Protective caps should be retained in place on all full and empty cylinders.
- Smoking is not allowed within the shelter or in the vicinity of stored cylinders. NO SMOKING notices should be prominently displayed around the perimeters of such areas.
- Combustible gas cylinder should always be stored separately from oxygen, and wherever possible, not closer than 6 meters.

19.4 Commonly-used Industrial Gases

GAS	CHARACTERISTICS	CYLINDER COLOR
Oxygen	No smell, non toxic. Will not burn, but supports and accelerates combustion. Materials not normally considered combustible may be ignited by sparks in oxygen-rich atmospheres.	Black
Nitrogen	No smell. Does not burn. Inert except at high temperatures. Non toxic but does not support life, so could cause asphyxiation in high concentrations.	Grey with black neck
Argon	No smell. Heavier than air. Does not burn. Will cause asphyxiation in the absence of sufficient oxygen to support life.	Blue
Acetylene	Distinctive garlic-like smell. Fire and explosive hazards are similar to those of propane. However, it is lighter than air and less likely to collect in low lying areas, gullies, drains, etc.	Maroon
Propane	Distinctive fish-like smell. Will ignite and burn instantly from a spark or piece of hot metal. Is heavier than air and <u>will collect</u> in low lying areas, ducts, drains, etc.	Bright red and bearing words: Propane & Highly Flammable
Hydrogen	No smell, non toxic. Much lighter than air. Will collect at highest point in any enclosed space unless ventilated. Fire hazard.	Bright Red

20.0 AVOIDING SITUATIONS OF OXYGEN DEFICIENCY

In certain working situations, the level of oxygen may fall below which requires to support life. You should be familiar with both the symptoms felt under such conditions and with precautionary methods to prevent these situations from occurring.



20.1 General

Danger occurs when the level of atmospheric oxygen falls below 20%. This can happen from chemical reactions occurring in confined spaces or when ambient air is displaced by heavier-than-air gases.

Oxygen deficiency may cause a feeling of euphoria leading to a feeling of well-being and over-confidence.

20.2 Precautions

Follow these precautions to avoid conditions of oxygen deficiency

- Monitor oxygen levels in situations where oxygen deficiency may be encountered.
- Ensure that ventilation is adequate to maintain a safe working level of oxygen.
- Whenever work is being carried out in a confined space, ensure that an observer, trained in spotting potential problems, is situated outside the workspace at all times.
- Ensure that no employees enter a confined space until it is “gas free”

21.0 HEALTH SAFETY AND ENVIRONMENT MANUAL ON H₂S AWARENESS, ESCAPE AND THE USAGE OF BREATHING APPARATUS :

As the work force are mostly involving the works at sites where oil, gas, waste water treatment and petrochemical plants new Projects and existing plant revamping works where the most dangerous toxic gas H₂S availability chances are more. Our company is providing an intensive training course regarding H₂S awareness and escape, and the usage of breathing apparatus at our workshop or at the client's HSE department section.

21.1 *H₂S is the one, which in one breath enough to kill.*

At very low concentrations when mixed with air, it smells of rotten eggs.

At slightly higher concentrations when mixed with air it will kill your sense of smell.

It is one of the most lethal gases from the family of hydrocarbon gases.

How is H₂S formed?

H₂S is a combination of hydrogen and sulphur atoms.

The process of combination takes place in several ways to either

- bacteria
- chemical reactions
- the decomposition or decaying
- process of organic matter, vegetation/ non-living animals

The aim of H₂S awareness and escape course.

H₂S, the name itself gives the message.

- H-How
- 2-To
- S-Save
- **Your life (first)**
- **The lives of others overcome by H₂S**
- **Hydrogen Sulphide is a Killer Gas!!!!!!!!!!**



What is meant by PPM?

-Parts per million

-If a million particles of air by volume contain one part of H_2S it is: **1PPM of H_2S**

-1 PPM	=	0.0001%
-10 PPM	=	0.001% (TLV)
-100 PPM	=	0.01%
-1000 PPM	=	0.1%
-10,000 PPM	=	1%

How does H_2S effect individuals?

- Breathing Cycle

H_2S goes directly to the lungs and into the blood stream and gets dissolved. The body's defense system operates. It oxidizes / breaks down H_2S as rapidly as possible into harmless compound.

With higher doses of H_2S the body's defense system will weaken. H_2S settles in the blood and the individual becomes poisoned.

Symptoms

- Giddiness, vomiting sensation (NAUSEA), coughing severely, irritation in nose, throat, beginning to loose consciousness.
- Nerve center in the brain is paralyzed
- Breathing stops
- Unconsciousness, Asphyxiation, *Death!!!!!!!!!!!!!!*

Toxicity Table

- 0.13 PPM	:	Minimum perceptible
- 10 PPM	:	(0.001 %) TLV- TWA
- 10-150 PPM	:	Irritation of Nose, Eye & Throat
- 150-300 PPM	:	Severe irritations loss of smell, paralysis of olfactory nerve.
- 300-500 PPM	:	Dangerous , Severe irritation, excitement , headaches, dizziness, severe coughing
- 500-1000 PM	:	Loss of consciousness, death if exposed too long.
- 2000 PPM	:	Lethal immediate <i>Death!!!!!!!!!!</i>

The effect of H_2S depends on 4 Factors

- Duration
- Frequency
- Intensity
- Individual Susceptibility
- Example
- Bronchial Asthma



TLV – Time Weighted Average

- This value is the maximum concentration of toxic gas that a worker can be exposed to day after day without suffering health problems.
- This TLV is an average taken over an 8-hour day, or a 40-hour week.
- Threshold limit value – Time weighted Average and is normally abbreviated as TLV – TWA
- H₂S has a TLV of 10 PPM

Essential Knowledge

It is essential to know the following when working in a H₂S environment

- Where the emergency exists are
- What the alarm sounds like
- Where the wind socks are
- Where the assembly point is
- How to raise an alarm

Where do you find H₂S?

Liquids & Gaseous Hydrocarbons contain “H₂S” in sufficient quantities is present a potential hazard

TO

- Personnel, Environment & Equipment
- Processing Stations
- Storage Facilities
- Refineries
- Sewerage Treatment Plants

Potential Exposure of H₂S in the Petroleum Industry

- Drilling Operations Tank gauging
- Field maintenance of wells
- Entry into confined spaces
- Leaks in pumps/valves/lines
- Gas Injection

Properties of H₂S

- It is deadly as hydrogen cyanide
- More deadly than carbon monoxide
- In high concentrations it can kill a person instantly
- It is a deadly extremely toxic gas remedy.
- Safety awareness programme
- Eliminate fear of H₂S but not respect it.
- H₂S is colorless
- Deadens the sense of smell
- At low concentrations gives rotten egg smell
- Higher levels sense of smell lost immediately



- Never depend on your nose to detect H₂S. Use a detector

WIND

- H₂S is readily dispersed by the wind/air currents
- So it is important to observe the wind socks
- Always more upwind or crosswind to escape from H₂S

H₂S is soluble in liquid/water

- Burning eyes-eye inflammation
- Respiratory tract irritation
- Sore throat
- Irritation/burning around neck
- To overcome this wash eyes in copious amounts of fresh water
- Remove clothing as required

Heavier than air

H₂S is heavier than air since it's vapor density is 1.19 and that of air is 1.

- It's commonly found in low lying areas
- Well cellars, sumps, wades, trenches, confined spaces (Tank bottoms)

Emergency situation without escape set

- Do not panic
- See the wind directions
- And escape (Do not run)
- Call for help

Emergency situation with escape set

- Do not panic
- Hold your breath
- Don the escape set
- See the wind direction
- Escape crosswind/upwind
- To the nearest assembly point or exit
- Watch out for your buddy, but do not attempt to rescue
- Report to the facility operator

First Aid

- If possible remove victim overcome by H₂S in a position of safety in clean air
- If victim is not breathing give Expired Air Respiration (Ear) immediately or use oxygen resuscitator
- Flush exposed skin and eyes with running water for at least 10 minutes
- Remove contaminated clothes
- Keep victim warm, comfortable and quiet.

**DO For working in H₂S areas**

- Training programme
- Knowledge of hazards of H₂S & SO₂
- Knowledge of H₂S detectors and personal monitors
- Making note of prevailing wind (Wind Socks)
- Familiarization of briefing areas, assembly, points, exit gates and warning system
- Evacuation procedures
- First Aid knowledge

DON'T

- Be overconfident
- Neglect H₂S safety procedures
- Work alone
- Get lazy to check personal monitor and "PPE"
- Enter the confined space without proper gas testing and wearing proper "PPE"
- Carry on work if you suspect some danger



ATTACHMENT # 2

EXPOSURE DEVICE INSPECTION REPORT (Monthly)

Exposure Device	
Model #	
Serial #	
Location	
Strength of the Source	
Shield Assembly	
Source Pig Tail Assembly	
Source Guide Tubes (End Extensions)	
Driving Unit	
Maximum leakage level at 5 cm from the surface of the camera	
Examination carried out by	
Date of Inspection	
Remarks:	