OILFIELD SAFETY: INHERENT HAZARDS, EFFECTS AND MANAGEMENT

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CERTIFICATION

I hereby certify that this work was carried out by Ademolu Tosin, ADEDIRAN in pursuance of membership status of Institute of Safety Professional of Nigeria (ISPON).

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DEDICATION

I dedicate this project work to God Almighty, the ultimate giver of life, wisdom, knowledge and understanding.

ABSTRACT

Oilfields are deemed to be high risk work environments in terms of health and safety. Workers face more risks on an oilfields than in most other fields. Interest in developing stringent regulations and minimum Health and Safety requirements in the offshore oil and gas industry is increasing due to highly potential hazards faced when working on an oil rig.

The paper highlights the different concepts of recognizing and abating inherent hazards in the industry, from physical hazards associated to heavy machinery used to dangerous vapors and gases. It also looks at various strategies used by management to implement safety programmes and audit performance, communication lines, employee training, accident reporting and investigation as well emergency preparedness and response.

The paper is rounded up with health program elements that keep workers in great shape by paying attention to how they approach their work, and through exercises which are important due to the highly physical and mental demands of working in oilfields.

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CHAPTER ONE

INTRODUCTION

This paper is concerned with safety in the oilfield, not the mechanical aspects of oilfield work. The orientation includes:

- Safety Programs
- Inspections/Audits
- Safety Meetings
- Hazard Awareness
- Hazard Abatement
- Accident Investigation
- Accident Reporting
- Personal Protective Equipment

Discussions include: Inspection techniques, hazard recognition, hazard awareness, hazard abatement, lockout-tagout, hazard-communications, general H_2S (hydrogen sulphide) information, and investigations. This orientation is aimed at helping acquaint rig personnel and general public with oilfield safety rules, regulations and/or procedures.

Safety is part of everyday living. It is an important consideration for everyone in everything he or she does, in the home, at work or play, on streets and highways, and wherever he or she goes.

Safe operating practices and procedures are vital in the drilling business because the work is highly hazardous, involving massive machinery, heavy tools and great physical strength.

When accidents do occur, the work can be a serious peril to life and limb. Drilling personnel must know how to work safely on a rig in order to protect themselves, costly rig equipment, and the expensive hole being drilled.

Everyone loses from an accident. Injuries result in pain and suffering and may leave a person disabled or handicapped for life. Even minor injuries may cause loss of time from work and lost

pay. Insurance benefits are helpful, but compensation payments cannot restore a life, hand, eye or leg. Damaged machinery and equipment can usually be repaired but almost always at considerable cost, particularly if down time is taken into account.

An expensive well may be lost because of the oversight of the incompetence of one person. Blowouts and fires cause losses of life and equipment and waste precious oil and gas from underground reservoirs.

More than 90% of all accidents are avoidable, being caused by human error rather than by mechanical failure. It is therefore extremely important that every person on a drilling rig develop a sense of safety in drilling operations. That person must use this sense in combination with the kind of good judgment it takes to drive a car safely, or to do anything else in a safe manner.

CHAPTER TWO

INHERENT HAZARDS IN OIL AND GAS INDUSTRY

2.1 HAZARD RECOGNITION

For the purpose of this paper, hazards will be grouped into two (2) broad categories:

1. Safety and Injury Hazards: They usually are short-term and acute, their causes and effects are located within the same time and space. Their outcomes cannot be influenced.

2. Health and Illnesses Hazards: They are long-term, can be defined by acute and chronic phase, causes and effects may not be co-located in the same environment, time and location. The outcomes can be influenced by actions such as immunization, nutrition etc.

However, it is worthy to include hazards that involve property and environmental damage.

To contain hazards, unsafe acts and conditions are identified, after which the corrective actions are determined and implemented.

Some of the unique hazards inherent in the oil and gas industry are:

- **Catheads**: catheads are extremely hazardous unless they are handled correctly and with respect. The cathead should be keyed with the key being covered with a counter-sunk cap screw. No projection whatsoever should be present to catch the loose clothing of any employee unwise enough to wear such apparels as drill floor tools hands could be jerked into cathead or caught beneath catlines.

  The catline should be used only on a slowly revolving cathead. Loads requiring more than six turns around the cathead should not be lifted by this means. Wire rope should not be used on cathead as the metal strands could get weakened or broken, thereby making the line hazardous to use. When catlines are not in use, they should receive care giving to any rope equipment. They should be neatly coiled and placed aside where they will not constitute a tripping hazard. Every effort should be made to keep them free of oil and grease as it causes them to deteriorate quickly. See Fig. 2.3, 2.8, 2.9

- **Poor machine guarding**: guards are safety feature on engineering equipment consisting of a shield or device covering hazardous areas of the machine to prevent contact with body parts or hazards like chips or sparks from exiting the machine. See Fig. 2.41, 2.42, 2.43

- **Rotary Tables, Tongs**: Highest frequency of accidents in drilling occurs on the rig floor, and more specifically around rotary tables. The high frequency is due to most of the rig crew's activity centered around the rotary making a trip of connection. It is essential to follow precautions such as:

    1. Ensuring rotary table and surrounding work area has a mat or covering to prevent slips and falls
    2. Keeping the rotary table surface as clean and dry as possible
    3. Check all tong discs to ensure they are sharp and properly screwed. Inspect snub lines, pull back lines, elevators, mud buckets to make sure they are in good shape
    4. Take extreme care when placing hands on pipe, collars and tongs, be alert to watch coworkers and driller for signal
    5. Avoid loose fitting clothing and use all required PPE
    6. Never step or stand on the rotary. Also coordination between driller and rotary helpers is very essential
    7. Keep hoisting cables clear of rotary table and/or Kelly when it is rotating
    8. Never stand under elevators: do not get inside of tong line when driller is making up a connection
    9. Use extreme care when locking and unlocking rotary table. See Fig. 2.1, 2.2, 2.9

- **Falls, Slips and Trips**: Oil workers often have to climb elevated equipment like drilling and service rigs. These employees face high risk of taking a fall. Derrickhands in particular need to be aware of fall hazards they encounter.

  Derrickhands work from heights anywhere from 30 to 100 feet or more. They work from small platform that has open holes and exposed edges. It is therefore they are trained and can use fall protection equipment effectively. Fall protection equipment include anchors, body harness and connectors. Common causes of falls are unprotected sides and edges,

slips and trips, improper ladder use, improper use of fall arrest systems, unstable working surfaces.

- **Gases**: when working on an oil rig, workers can come across natural gases which can be harmful during the drilling and production stages of production. A common example of such gases is hydrogen sulphide, which will be further discussed in this paper.

- **Explosions and fires**: oil and gas workers face the risk of fires and explosions every day. There's an endless amount of flammable gases and vapors everywhere you go. All it takes is for something to spark and ignite the worker, and a deadly fire is created.

  It is never a pleasant experience to have a fire break out on or near an oil rig. Workers need to act quickly if they want to prevent the fire from spreading or getting any worse. But, their number one priority should be getting themselves to safety.

  Here are some ways to prevent fire from developing near an oil rig:

  1. Provide spark arrestors for internal-combustion engines
  2. Post 'NO SMOKING' signs wherever a flammable gas or vapor hazard exists
  3. Locate 'spark producing' equipment or facilities well away from potential hazard areas
  4. Prohibit vehicles with catalytic converters from entering the immediate vicinity of the rig
  5. Prohibit open flames in the vicinity of the rig

  Oil and gas industry workers also need to wear flame-resistant clothing. This will help protect them in the event that a fire does occur. Fire-fighting equipment such as smoke detectors, fire extinguishers should also be readily available.

- **High pressure hoses and equipment**: workers might be exposed to hazards from compressed gases or from high-pressure lines. Internal erosion of lines might result in leaks or line bursts, exposing workers to high-pressure hazards from compressed gases or from high-pressure lines. If connections securing high-pressure lines fail, struck-by hazards might be created.

- **Struck By Hazards**: struck by hazards are one of the top killers in the oil and gas industry. In fact three out of every five fatalities are caused by struck-by or caught-in hazards. Employees need to prevent tools and other objects from falling down to lower levels. Here are some ways to prevent falling objects from striking another:

    1. Attach tools to a worker's belt or the platform structure
    2. Use toe boards, screens, or guardrail systems to prevent objects and materials from falling down to lower levels
    3. Barricade areas below elevated work zones
    4. Wear hard hats and other necessary PPE
    5. Maintain all hoisting, lifting, and rigging equipment
    6. Use tag lines to maneuver suspended loads
    7. Never stand underneath a suspended load
    8. Perform daily inspections and replace any damaged or frayed lines

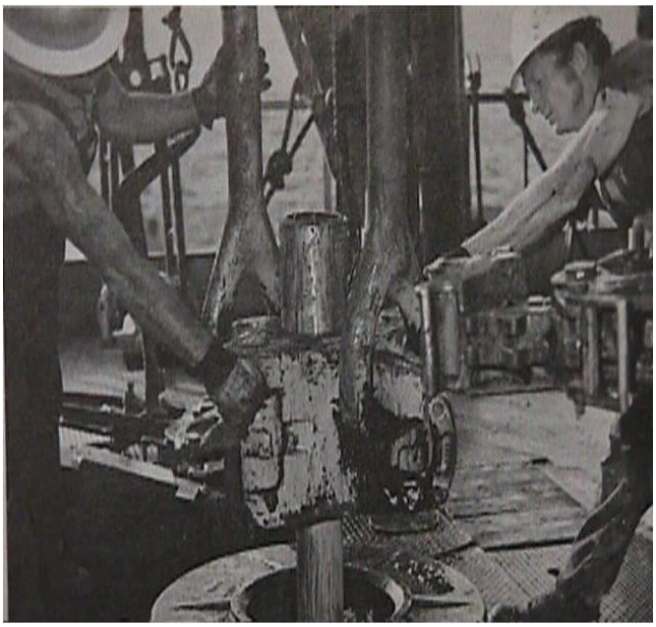
    Struck by hazards can also result from moving vehicles or equipment, falling equipment, and high-pressure lines. It is important to take this into consideration when getting to and from oil rig. Often times, heavy equipment is operating nearby and can present many dangerous risks.

2.1.1 IDENTIFYING HAZARDS

Hazards are identified by observing and asking questions. The following are examples of such questions critical to hazard identification:

- Is there danger of striking against, being struck by, or making contact with an object?
- Are rotating equipment or other projections exposed?
- Nip points, such as a belt, sheave, chain, gear?
- Is there reciprocating movement to be caught on or between?
- Hand/arm contact with moving parts at the point of operation?
- Is there material kick back or ejection from the point of operation?
- Machine controls safeguarded?

- Do machines vibrate, move, or walk while in operation?
- Parts to become loose or lodged during operation?
- Guards positioned or adjusted?
- Bypass guard or lockout device?
- Machines/equipment receive regular maintenance?
- Machines operations sufficient for safe work?
- Room for maintenance operations?
- Are materials being handled adequately for work?
- Are tools, jigs, work fixtures stored not to interfere with work?
- Work area well illuminated?
- Is ventilation adequate?
- PPE used?
- Housekeeping satisfactory?
- Energy sources controlled for maintenance?



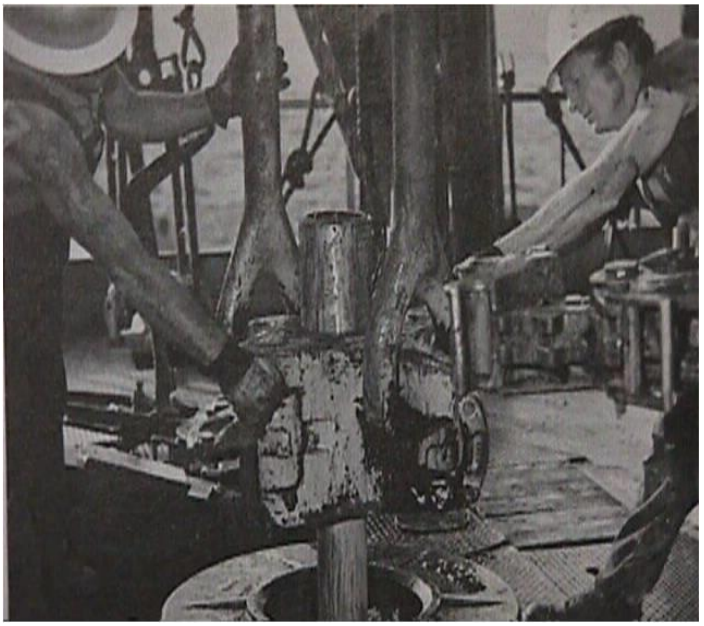


Fig. 2.1, 2.2: TONGS – SPINNING CHAINS: Cut off fingers, thumbs. Smashed fingers, hands etc

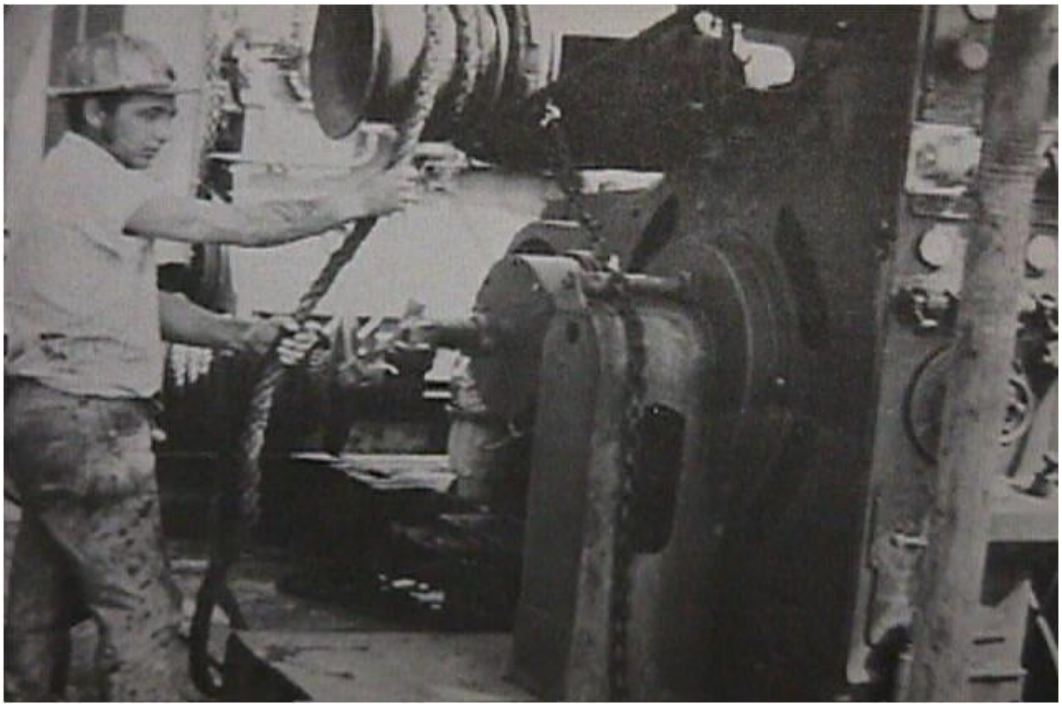


Fig. 2.3: CATHEAD = Pinchpoint

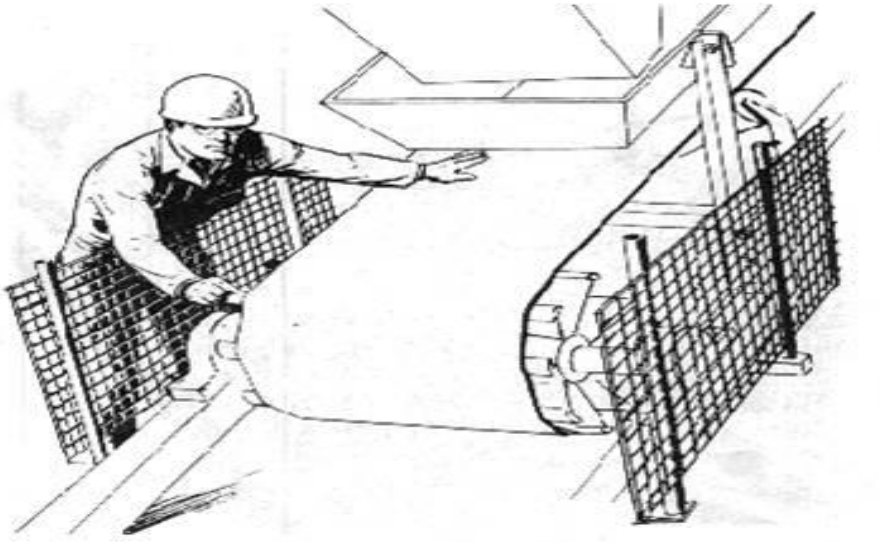
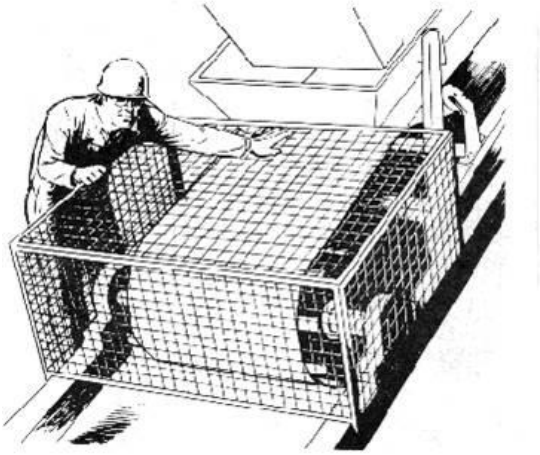


Fig 2.41: Machine guarding- a poorly guarded machine



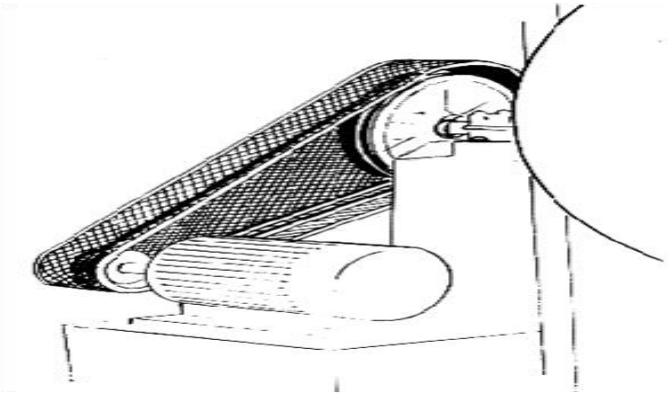


Plate 2.42, 2.43: Machine guarding- well guarded machine

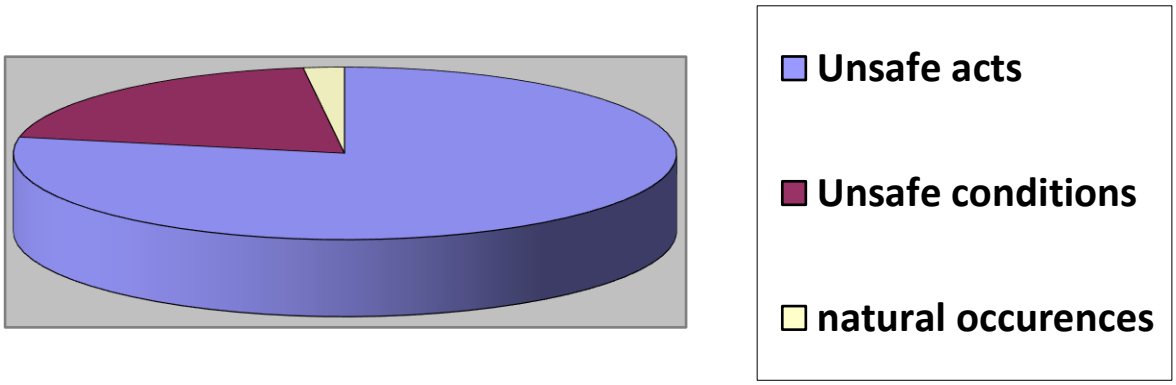


Fig. 2.5: Causes of Accidents

2.2 HAZARD ABATEMENT

2.2.1 How Hazards Are Controlled

At its source

It is the means of controlling hazard at the point it emanates from. Controlling a hazard at its source is the best way to protect workers/employees. It could be through means of elimination, substitution or isolation, or enclosure guards, or reduction of inventory. Examples are use of interlock guards, machine guarding on rotary blades or points electric sparks could emanate from, insulation of materials to avoid electric shock, use of fuses etc.

Along its path

It is the process of erecting a barricade between the hazard and the worker. Examples include grounding, ventilation, acoustic mufflers.

At the worker

It is the means of removing the worker from the exposure, such as automated/remote controls, worker rotation, providing PPE when all options have been exhausted, education and training of workers.

Monitoring activities: It is the means of locating new hazards and assessing the effectiveness of existing controls.

2.2.2 Preventative and Corrective Measures

The implementation of control measures are mainly three in number:

Administrative Control Measures

Controls through policy, personnel, management, monitoring, limiting worker exposure, measuring performance, training and education, housekeeping and maintenance, purchasing for influencing the course of work and reduce probability of incidents occurring.

Engineering Control Measures

The most effective controls are engineering controls that physically change a machine or work environment to prevent employee exposure to the hazard. Examples include isolation of source, lockout procedure, design, process or procedural changes, monitoring and warning equipment, chemical or material substitution.

Personal Protective Equipment

When engineering and administrative controls are not feasible or do not provide sufficient protection, personal protective equipment (PPE) must be provided to employees and its use must be ensured. Personal Protective Equipment, commonly referred to as 'PPE', is equipment to minimize exposure to variety of hazards. Examples of PPE include items such as hand gloves, foot and eye protection, protective hearing devices (earplugs, muffs), hard hats, respirators and full body suits.

Fig. 2.6: Hazard Awareness

2.3 GENERAL H_2S INFORMATION

Hydrogen sulfide is highly toxic, colorless, and heavier than air. It has the odor of rotten eggs, initially. It is most frequently encountered in the production and refining of high sulfur petroleum and in natural gas. It burns with a blue flame and produces sulfur dioxide.

It forms an explosive mixture with air. The LFL is 4.3% and the UFL is 45.5%. Hydrogen sulfide is characterized by an odor of rotten eggs. A very small concentration can be fatal. When encountered, employees must wear approved type masks when their work requires them to be exposed to the gas in any way.

Its odor is not usually a reliable warning signal because high concentrations of the gas temporarily impairs the sense of smell. This is the primary reason for employees not detecting the presence of H_2S and consequently inhaling a lethal amount. The only positive means is by testing with an approved H_2S detector. It is dangerous to rely solely on the sense of smell.

In some states of the USA, it is the law that all persons working in the oil field where H_2S concentrations are known must complete a H_2S certification course annually. The objective is to educate employees about the physical and chemical properties, toxicity, concentration levels, personal protective equipment use, detection measures, rescue and first aid.

The best way to reduce the chance of employee exposure to H_2S is to provide the best possible training, provide appropriate personal protective equipment, and ensure employees follow the correct work procedures, rules and requirements.

2.3.1 Common Sources

- The gas exists naturally in nature at oil fields, mines, volcanoes, and points of geothermal exploration.
- Through decay of organic matter: fishing industry, tanneries, manure processing, municipal sewers, brewery industry, landfills
- Chemical processes: as by-products, catalyst, felt making, asphalt roofing

2.3.2 General Procedures

In any area where H_2S has been reported or encountered, or where there is insufficient oxygen, there should be no entry until sufficient tests have been made to determine the extent of the hazard and the area is purged to reduce the hazard to allowable concentrations.

In toxic atmospheres, the employer should require proper respiratory equipment to be used by a trained employee, required to enter the area.

Employees required to enter should be should be made to wear a safety harness with tail line for emergency retrieval. A rescue watch, stationed outside of the hazard area with proper rescue equipment is also required to assist in case of emergency. Canister-type filter masks should not be used.

Employees should be required to wear self contained respirators (SCBA) in those atmospheres where tests indicated oxygen content is less than necessary to sustain life. All employees should be trained and periodically refreshed in the use and operation of breathing equipment available on the job.

Medical personnel should be readily available for consult on matters of occupational health. Emergency numbers should be conspicuously posted. At least one employee, if not more, per shift trained in First aid and CPR should be on-site.

Where harmful chemicals are being used, readily accessible facilities should be available for rapid flushing of the eyes and/or skin areas.

2.3.3 General First Aid Considerations

The first step is to ensure the victim gets fresh air (Rescuers must exercise caution)

- If unconscious/not breathing – immediately provide rescue breathing
- Summons a doctor as soon as possible
- Give oxygen after cleaning oil from the injured employee's face

Never forget that hydrogen sulfide is a deadly gas, take no chances with it. Know what concentration of the gas is present before doing any work in it.

2.3.4 Emergency Rescue

In an emergency, the first thing to remember is to get to a safe place, then:

1. Call for emergency services
2. Put on the proper rescue personal protective equipment
3. Locate victims and move to safe fresh air areas. Always move upwind or crosswind to safe areas
4. Administer rescue breathing or CPR if necessary
5. Seek medical attention immediately

2.4 LOCKOUT/TAGOUT: The Control of Hazardous Energy

Lockout/tagout procedures are for employee safety. They are designed to prevent accidents and injuries caused by the accidental release of energy. These procedures prevent workers from being accidentally exposed to injuries and even life threatening situations with energized equipment.

The Occupational Safety and Health Administration (OSHA) regulates lockout/tagout through the Control of Hazardous Energy standard, found at 29 CFR 1910.147. Before the standard went into effect in 1984, OSHA estimated the failure to control hazardous energy sources caused:

- 10 percent of serious industrial accidents
- 33,000 lost workdays each year
- Loss of about 140 lives each year

2.4.1 Scope and Application

It applies to general industry employees covering the servicing and maintenance of machines and equipment in which the unexpected start-up or the release of stored energy could cause injury to employees. (If employees are performing service or maintenance tasks that do not expose them to the unexpected release of hazardous energy, the standard does not apply.)

The standard does not apply in the situation where servicing or maintaining is being carried out while cord and plug are to connected electrical equipment. *(The hazards must be controlled by unplugging the equipment from the energy source; the plug must be under the exclusive control of the employee performing the service and/or maintenance.)*

Normal Production Operations

The lockout/tagout rule may apply during normal operations in some instances. If a servicing activity - such as lubricating, cleaning, or un-jamming the production equipment - takes place during production, employees performing the servicing are covered by lockout/tagout when any of the following conditions occurs:

- The employee must either remove or bypass machine guards or other safety devices
- The employee is required to place any part of his or her body in contact with the point of operation of the operational machine or piece of equipment; or
- The employee is required to place any part of his or her body into a danger zone associated with a machines' operating cycle.

In the above situations, the equipment must be de-energized and locks or tags must be applied to the energy- isolation devices.

What is lockout?

It is the process of preventing the flow of energy from a power source to a piece of equipment, and keeping it from operating. It is accomplished by installing the lockout device at the power source so that equipment powered by the source cannot be operated.

What is tagout?

It is the placement of a tag on the power source. It acts as a warning, not to restore energy. It is not a physical restraint. Tags must clearly state: 'DO NOT OPERATE' or the like, and must be applied by hand.

2.4.2 Energy-Isolating Device

This is a mechanical device that physically prevents the transmission or release of energy. Such as manually-operated electrical circuit breakers, disconnect switches, line valves, and blocks. They are guards against accidental machine or equipment start-up or the unexpected re-energizing of equipment during servicing or maintenance. These include things such as, manually operated electrical circuit breakers, disconnect switches, line valves, and blocks.

When the energy-isolating device cannot be locked out, the employer must use tagout or modify or replace the device to make it capable of being locked. When using tagout, employers must train their employees in the limitations of tags.

Whenever major replacement, repair, renovation or modification of machines or equipment is performed and whenever new machines or equipment are installed or purchased, the energy-isolating devices for such machines or equipment must be lockable.

2.4.3 Authorized Employees

Authorized employees physically lock or tag out equipment for servicing or maintenance. Note that these individuals are not necessarily the people who normally operate the equipment.

2.4.4 Affected Employees

Are those workers whose job requires them to operate equipment subject to lockout/tagout, or those employees who work in areas where lockout/tagout is used. Your employer will inform you if you are an affected employee.

An affected employee becomes an “authorized” employee whenever he or she performs servicing or maintenance functions on machines or equipment that must be locked or tagged.

Some of the energy sources that require Lockout/Tagout:

Electrical, Mechanical, Pneumatic (involving gases, especially air), Hydraulic (involving fluids, especially water), Chemical, Thermal, Water under Pressure (or steam), Gravity, Potential

2.4.5 Employee Training and Other Concerns

The employer must provide effective initial training and retraining as necessary and must certify that such training has been given to all employees covered by the standard. The certification must contain each employee's name and dates of training.

The employer's training program for authorized employees (those who are charged with the responsibility for implementing the energy control procedures and performing the service and maintenance) must cover, at minimum, the following areas;

- The details about the type and magnitude of the hazardous energy sources present in the workplace
- The methods and means necessary to isolate and control those energy sources (that is, the elements of the energy control procedure)

Affected employees (usually the machine operators or users) and all other employees need only be able to

(1) Recognize when the control procedure is being implemented, and

(2) Understand the purpose of the procedure and the importance of not attempting to start up or use equipment that has been locked or tagged out

Every training program must ensure that all employees understand the purpose, function and restrictions of the energy control program and that authorized employees possess the knowledge and skills necessary for the safe application, use and removal of energy controls. Retraining must be provided, as required, whenever there is a change in job assignments, a change in machines, equipment or processes that present a new hazard, or a change in energy control procedures.

Additional retraining must be conducted whenever a periodic inspection reveals, or whenever the employer has reason to believe, that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedure.

Other concerns

Outside Contractors must be informed of your lockout/tagout procedure in full detail so that their employees understand the meaning of locks or tags that they may come across during the course

of their work. In addition, if the contractor will be using locks or tags, they should inform your employer so that everyone affected may be notified.

Shift and personnel changes - In general, if a piece of equipment is locked out at shift change, the person on the next shift must apply his/her lock before the employee who is leaving can remove his/her lock.

Group Lockout/Tagout - Procedures used must be as effective as that provided by utilizing a personal lockout/tagout device. Your employer can assign one person primary responsibility for the group servicing or maintenance operation. This person will verify shutdown and isolation application of member lockout/tagout devices, completion of group member job assignments prior to removal of lockout/tagout devices, etc.

2.5 HAZARD COMMUNICATION AND SAFETY INSPECTION POINTS

In maintaining an effective hazard communication program, it is important to have a written list of all the hazardous chemicals present in the workplace and be prepared to update hazardous chemical list. Other important points and questions to ask in check-listing the hazard communications are as follows:

- Do you have up-to-date MSDS for those materials on your hazardous chemicals list
- Is the list of hazardous chemicals cross-referenced or indexed so that identifies on the list refer to the MSDS and warning labels?
- Have you developed a system to ensure that all incoming hazardous chemicals are received with proper labels and MSDS?
- Do you have procedures in your workplace to ensure proper labeling or warning signs for building storage or secondary usage containers that hold hazardous chemicals?
- Do you have a complete list of the chemicals hazards and precautions that you can give to outside contractors?
- Have your employees been informed of the hazards associated with performing non-routine tasks?

- On multi-employer work-sites, are all employees with potential exposure to chemicals provided with information on labeling systems and precautionary measures?
- Do you have a written procedure on how you will inform your employees of the chemical hazards associated with unlabeled pipes?
- Is your hazard communication program in writing and available to your employees and their designated representatives?
- Does the training cover all types of harmful chemicals with which the employee may come into contact under normal usage and unforeseeable emergencies?
- Are your workers familiar with the different types of chemicals and the major hazards associated with them?
- Are your employees aware of the specific requirements in the Hazard Communication Program?
- Does your program train employees in (a) operations where hazardous chemicals are present; (b) location, and availability of your written hazard communication program including lists of chemicals and MSDS?
- Does your training program include the explanation of labels and warnings that have been established in their work areas? Is it posted at proper locations?
- Do your employees understand methods to detect presence or release of chemicals in the workplace?
- Does your training program provide information on the appropriate first aid procedures in the event of an emergency?
- Are employees trained in the proper work practices and personal protective equipment in relation to the hazardous chemicals in the work area?
- Does the training include explanation of the labeling system and MSDS the employees can obtain and use?
- Have you worked out a system to ensure that new employees are trained?
- Do you use the references in the appendices to the Hazard Communication Standard, 29 CFR 1910.1200, to evaluate new chemicals in question?
- Have you developed a system with purchasing or other staff to make sure that additional training is provided if a new hazardous substance is introduced in the work area?

- Do you have a system to ensure that the current (up to date) MSDS are in work areas where the chemicals are used?
- If you become aware of new hazards relating to the chemical in use, do you have a system for informing the employees?

And for the sake of administrative inspection points:

- Have job specific safety rules been established?
- Are monthly safety meetings completed?
- Are daily tailgate safety briefings completed at the field site?
- Are employees required to attend producer/customer sponsored safety meetings?
- Is Hydrogen Sulfide training completed annually?
- Is the rig equipped with a fixed Hydrogen Sulfide monitor & audible alarm?
- Does procedure call for the SCBA units to be placed diagonally outside the guy wires of the rig?
- Is each rig or dog house equipped with a wind sock & appropriate warning signs?
- Hazard Communication program in place and MSDS maintained?
- Lock-out/Tag-out procedures established and utilized?
- Are weekly rig safety inspections completed & documented?
- Is each rig equipped with multiple SCBA units & Fire Extinguishers?
- Fall protection requirements established & training completed?
- Rescue procedures established to address derrick climbing activities?
- Is the work-over rig and its components inspected annually by a certified vendor?
- Is a First Aid kit provided in the dog house?
- Is the Hydrogen Sulfide monitor calibrated on a monthly basis?
- Is CPR & First Aid training completed?

Well-planned safety inspections help in detecting hazards before an accident occurs. Before an inspection, analyze past accidents to determine specific causes and high hazard areas or operations. Both unsafe conditions and unsafe acts are contributing factors in most industrial accidents. An unsafe condition, in addition to being a direct cause of accident itself, often requires, or suggests, an unsafe act.

Removing hazards increases operating efficiency, because safety and efficiency go hand in hand. A documented self inspection of all facilities/equipment allows you to detect or identify unsafe conditions or hazards, initiate corrective actions as soon as possible and control hazards on an ongoing basis. All inspections should be conducted on an ongoing basis, without interruption.

Special attention should be paid to the following points

- Management must allocate adequate time and resources to perform the surveys
- Each location should develop and maintain an inspection checklist specific to their operation
- Lists should be developed utilizing a general inspection checklist, and be evaluated and updated with hazards that are identified during the inspections and other pertinent data as it is acquired
- Each checklist should indicate the location or specific site or areas surveyed, name and title of the inspector, date of inspection, corrective action taken for identified hazards, or violations. *The inspection report will be used in trend analysis and recordkeeping*
- Employees must be notified of hazards that pose an immediate threat of physical harm or property damage
- Informed of measures or steps that will be taken to eliminate, correct or control the hazards

Fig. 2.7: Hazard communications

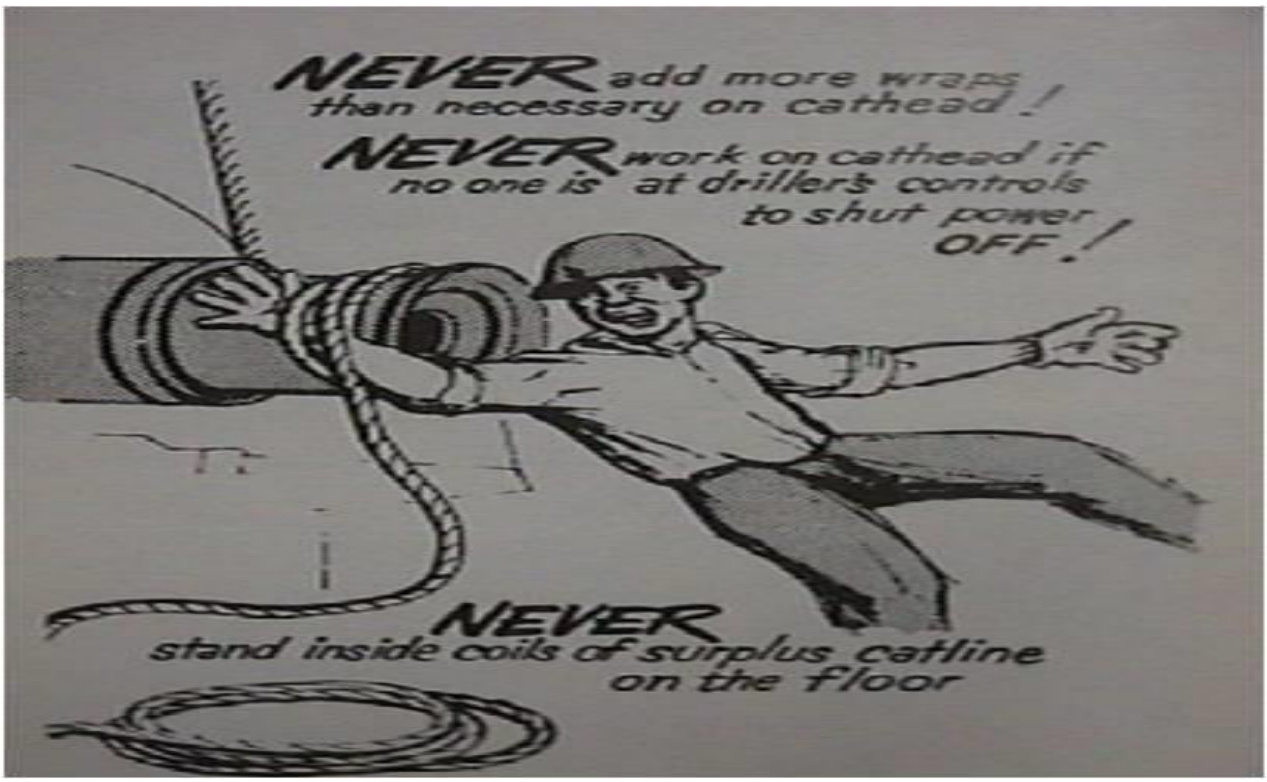


Fig. 2.8: Reckless catline/cathead operations could lead to serious injuries

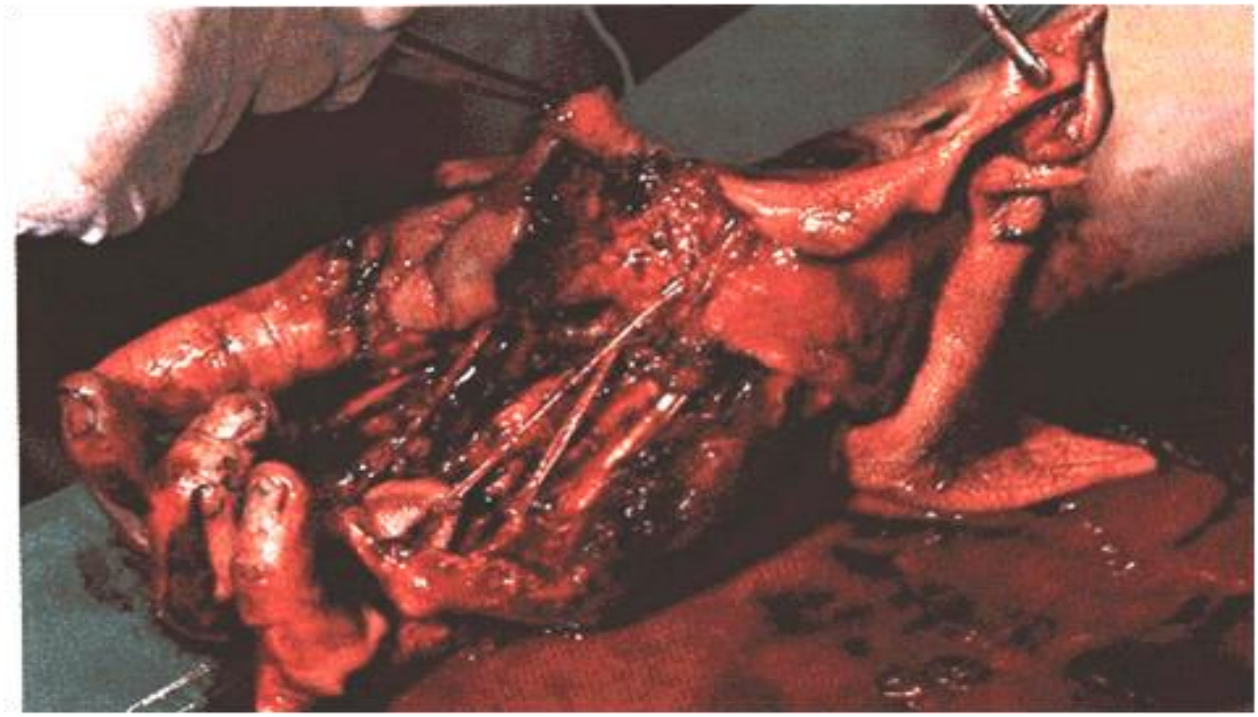


Fig. 2.9: Injury as a result of reckless cathead/ rotary table operations

CHAPTER THREE

PERSONAL PROTECTIVE EQUIPMENT (PPE)

3.1 BACKGROUND

Personal Protective Equipment, commonly referred to as 'PPE', is equipment to minimize exposure to variety of hazards. OSHA requires certain PPE based on the hazards employees are exposed to. OSHA also requires training for employees in the proper selection, use, and maintenance of PPE.

Personal protective equipment should not be used as a substitute for engineering, work practice, and/or administrative controls. Personal protective equipment should be used in conjunction with these controls to provide for employee safety and health in the workplace.

Personal protective equipment includes all clothing and other work accessories designed to create a barrier against workplace hazards. Selection of the proper personal protective equipment for a job is important.

Employers and employees must understand the equipment's purpose and its limitations. The equipment must not be altered or removed even though an employee may find it uncomfortable. *(Sometimes equipment may be uncomfortable simply because it does not fit properly.)*

The basic element of any management program for personal protective equipment should be an in depth evaluation of the equipment needed to protect against the hazards at the workplace.

Management dedicated to the safety and health of employees should use that evaluation to set a standard operating procedure for personnel, then train employees on the protective limitations of personal protective equipment, and on its proper use and maintenance.

Using personal protective equipment requires hazard awareness and training on the part of the user.

Employees must be aware that the equipment does not eliminate the hazard. If the equipment fails, exposure will occur. To reduce the possibility of failure, equipment must be properly fitted and maintained in a clean and serviceable condition.

This discussion is about those types of equipment most commonly used for protection of the head, including eyes and ears, and the torso, arms, hands, and feet. The use of equipment to protect against life threatening hazards also is discussed.

3.2 TRAINING

Before doing work requiring use of personal protective equipment, employees must be trained to know; when personal protective equipment is necessary; what type is necessary: how it is to be worn; and what its limitations are, as well as know its proper care, maintenance, useful life, and disposal.

In many cases more than one type of personal protective equipment will provide adequate protection. In those instances employees should be given a choice.

Employers are required to certify in writing that training has been carried out and that employees understand it. Each written certification shall contain the name of each employee trained, the date(s) of training, and identify the subject of the certification.

3.3 EYE PROTECTION

Eye protection comes in different types. Goggles are designed for solid or liquid hazards that are airborne and in a quantity that there is a greater likelihood of contact with or near the eye. Safety eyeglasses with protective side shields are designed for eye protection when the hazard is more casual by nature and the hazard(s) is of low quantity and likelihood. See Fig. 3.1

Eyes may need protection from hazards other than those that include a physical contact with the eye. For example, UV light can cause permanent damage to vision. See Fig. 3.1.1

For more severe hazards, full face protection is needed. Examples of this are heavy grinding and heavy spraying or splashing. The full face shield not only protects the eyes, but the entire facial area as well. The face shield affords extra protection against hazards involving temperature extremes or hazardous chemicals. Due to the wide opening on the sides and bottom of the face shield, protective eyewear must be worn along with the face shield. See Fig. 3.1.2

Common eye / face hazards include:

- IMPACT

Chipping, grinding machining, masonry work, woodworking, sawing, drilling, chiseling, powered fastening, riveting, and sanding

- HEAT

Furnace operations, pouring, casting, hot dipping, welding, chemicals

- LIGHT AND/OR RADIATION

Electric arc welding, gas welding, gas cutting, and soldering

- NUISANCE

Irritating mists, dusts

3.4 HEAD PROTECTION

Hard hats are necessary to protect workers against hazards that include falling objects and overhead hazards in general. There are different types of hard hats. Some hats are designed to protect only against bumps (low overhead hazards), while others afford protection against falling objects. Metal hard hats should not be worn when there is a potential for contact with anything electrical. Hard hats must conform with the requirements of ANSI Z89.1-1986. Check the label on the hat for compliance with this standard.

Types of head protection include:

CLASS "A" HELMETS: for impact, penetration, and electrical protection from low-voltage conductors (tested to 2,200 volts).

CLASS "B" HELMETS: for impact, penetration, and electrical protection from high-voltage conductors (tested to 20,000 volts).

CLASS "C" HELMETS: for impact and penetration hazards only. They usually are made of aluminum, which conducts electricity, and should not be worn around electrical hazards.

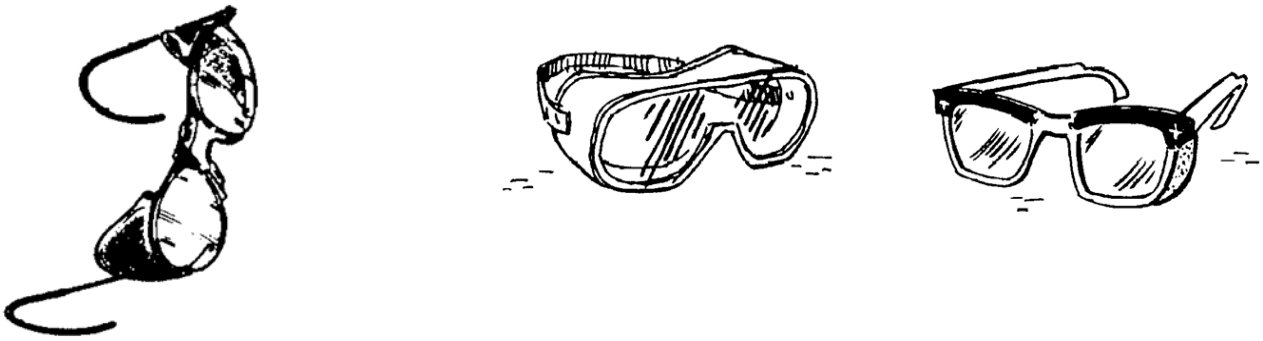


Fig. 3.1: Eye goggles

Fig. 3.1.1: Eye protection against UV lights

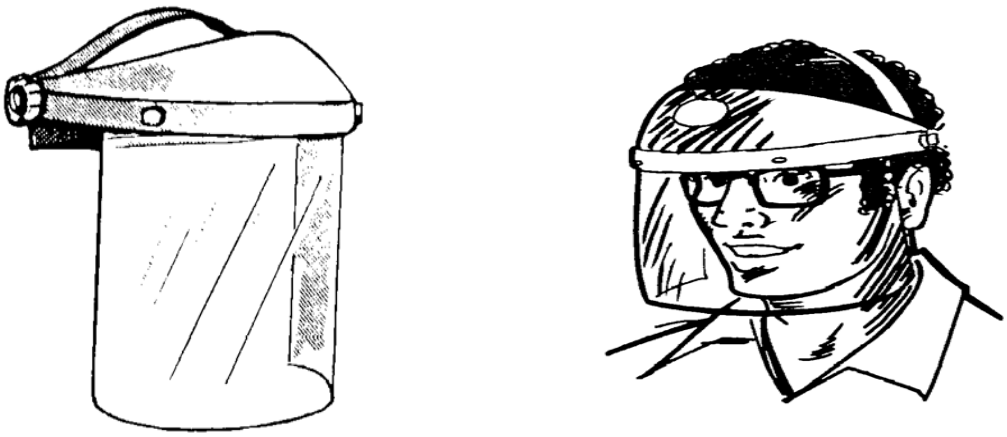


Fig. 3.1.2: Full eye protection

3.5 FOOT PROTECTION

Proper footwear can afford a level of protection for the feet and toes. Steel-toed boots or shoes protect toes against the crushing hazard of falling objects, such involved with pipe moving or heavy material handling. Rubber boots protect the feet against chemical hazards. For chemical hazards, check with your MSDS'.

Footwear should also be selected based on protection from the walking/working surface. Construction sites with nails, or rough terrain including sharp rocks will require shoes or boots with sturdy, puncture-resistant soles.

The following are some hazardous conditions requiring foot protection.

- IMPACT

Carrying or handling materials such as packages, objects, parts or heavy tools which could be dropped

- COMPRESSION

Work activities involving skid trucks (manual material handling carts, around bulk rolls, around heavy pipes

- PUNCTURE

Sharp object hazards such as nails, wire, tacks, screws, large staples, scrap metal, etc.

- CHEMICAL

Check with MSDS for proper protection.

3.6 HAND AND OTHER PROTECTION

Gloves should be selected according to the hazard. Handling hot materials usually requires leather gloves. Heavy cotton glove usually afford ample protection against scratch and abrasive hazards. Rubber gloves are usually necessary for electrical and chemical hazards. There are

gloves designed to protect against cut hazards, as in the meat industry. Check with your MSDS' and/or your glove supplier for more information.

Other PPE may be required to protect against chemicals, cuts, abrasions, heat, etc.

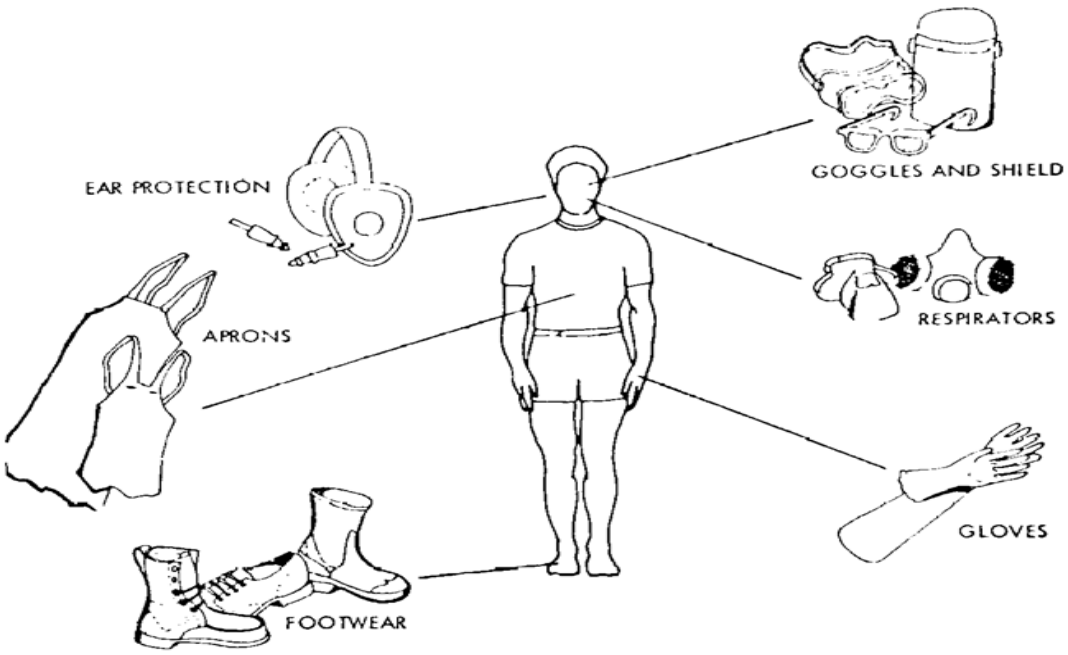


Fig. 3.2: Personal protective equipments

CHAPTER FOUR

ACCIDENT REPORTING AND INVESTIGATION

As a general rule, all accidents, no matter how minor, should be reported immediately and investigated as soon as possible.

Employees must be made aware of their responsibility, to report the incident as soon as possible after it occurs. They must also be aware that when/if they report an incident, the incident will be discussed with them, as to When-Where-Who-What-Why-How. They will be expected to cooperate with the investigation, as the goal is to develop the root cause of the incident and abate it so it does not occur again.

It is important to orientate employees that failure to comply with a company policy, such as the requirement to report any/all accidents/incidents equals violating company policy, and that could result in disciplinary actions up to and including termination. However, since companies are different, check your company policies to be sure.

In numerous businesses, when there is an incident, there is also a drug test as part of policy. Employees should know this and expect this as a routine occurrence.

4.1 ACCIDENT REPORTING PROCEDURES

In case of life threatening situation, affected persons should go to the nearest emergency room for proper medical attention (where the doctor will be available or details of the doctors used will be available). The main office should then be notified as soon as possible.

In non-life threatening situations,

1. Notify your supervisor
2. Call and make arrangements with our company doctor
3. Assist your supervisor with details to fill out the “First Report of Injury”
4. All accidents must be reported and investigated. It is compulsory to report all accidents or incidents (near misses) without regard to severity

Emergency phone numbers should also be available for First Aid procedures as listed below:

Safety Coordinator: 912-442-1356 (Dudley DoRight III)

Poison Control: 512-555-1212

First Aid: 221-113-1415 ext. 7112

Fire Department: 911 0r 441-228-1532

Ambulance: 911 or 441-228-1565

Police: 911 or 441-228-1000

Medical Clinic: 441-228-2020 (Dr, John Bones)

Clinic Address: 1330 Donkeys Avenue, Ikoyi, Lagos.

4.1.1 Emergency Medical Treatment

If you sustain a severe injury requiring emergency treatment:

- Call for help and seek assistance from a co-worker
- Use the emergency telephone numbers and instructions posted next to the telephone in your work area to request assistance and transportation to the local hospital emergency room/clinic etc
- Provide details for the completion of the accident investigation report

4.1.2 Non-Emergency Medical Treatment

For non-emergency work-related injuries requiring professional medical assistance, management must first authorize treatment. If you sustain an injury requiring treatment other than, first aid:

- Inform your supervisor
- Proceed to the posted medical facility. Your supervisor will assist with transportation, if necessary
- Provide details for the completion of the accident investigation report

4.1.3 Minor First-Aid Treatment

If you sustain an injury or are involved in an accident requiring minor first aid treatment:

- Inform your supervisor
- Administer first aid treatment to the injury or wound
- If a first aid kit is used, indicate usage on the accident investigation report
- Access to a first aid kit is not intended to be a substitute for medical attention
- Provide details for the completion of the accident investigation report

4.2 ACCIDENT INVESTIGATION

Accidents are unplanned, undesired events, not necessarily resulting in injury, but damaging to property, workers, environment and/.or interrupting the activity in process. Incidents on the others hand are undesired events that may not cause personal harm or other damage. (OSHA specifies incidents of a certain severity be recorded). With proper hazard identification and evaluation, management commitment and support, preventive and corrective procedures, monitoring, evaluation and training, unwanted events can be prevented.

Accidents are caused by unsafe acts and conditions, most accidents are caused by both. An unsafe condition is a physical condition or circumstance that permits, or is likely to cause an accident while an unsafe act is any violation of (or departure from) an accepted normal, or correct, procedure or practice.

The ultimate purpose of investigations is to prevent future incidents. Investigations must produce factual information leading to corrective actions that prevent or reduce the number of incidents. Investigations must be fact finding not fault finding and the investigation concentrates on the fact surrounding the incident. After the incident is fully investigated, responsibility will be fixed where personal fault has caused the injury.

No person should be excused from the consequences of their actions. Disciplinary actions must not be from the investigating individual or committee, but from management, for violating company policies/procedures.

The purpose of an incident investigation is twofold.

1. Identify facts about each injury and the incident that produced it and to record those facts
2. Determine a course of action to eliminate a recurrence

The investigation includes the entire sequence of events leading to the injury, as far back in time as the investigator feels is relevant.

As a rule of thumb, use the "5-W" principle is used by simply asking "Why" five (5) times:

1. Why did you slip and Fall in the hall by the water cooler?

   Because the floor was wet

2. Why was the floor wet?

   Because there was water on it

3. Why was their water on the floor?

   I don't know. It was coming out from underneath the water cooler

4. Why was water coming out from under the water cooler?

   I don't know. Let's look. There is a hole in the drain pipe

5. Why is there a hole in the drain pipe?

   It appears as if it rusted out

- Was this an unsafe activity or unsafe condition?

  It was an Unsafe Condition, caused by an Unsafe Activity. The rusted pipe was caused by lack of preventative maintenance, which was an unsafe activity. If there is "blame" where does it lie? Was there a preventative maintenance program? Who was in charge of it? Why was it not checked? Should this be subject to disciplinary actions?

Critical Steps to Incident Investigation

- Manage the Incident Site
    - Assist the Injured Employee(s)
    - Eliminate or Control the Risk of Further Injury
    - Preserve the Accident Scene

✓ shut down equipment

✓ barricade the site

- Collect Information
    - Who, What, When, Where, Why, and How
    - Physical Evidence: Photographs, Physical Conditions of Equipment and the Environment, Sketch of Site, Records, Witness Statements
    - Witness Statements: Explain the Purpose of the Investigation, Listen Attentively, Ask Open Ended Questions, Safely Reenact the Incident, Get Signed Witness Statements, Solicit Recommendations
    - Documentation: Training Records, Maintenance Records, Job Descriptions, Job Safety Requirements
- Analyze the Facts
    - Purpose: Find the Underlying Causes. Examples are environment, personnel, methods, equipment
- Recommend Corrective Action
    - Identify corrective actions
    - Assign responsibility
    - Establish deadline for actions and follow-up
    - Obtain management approval
    - Communicate results
- Corrective Action Follow-up

4.3 RECORD KEEPING

According to OSHA, all work-related deaths and illnesses, and those work-related injuries which result in loss of consciousness, restriction of work or motion, transfer to another job, require medical treatment beyond first aid are recordable accidents.

Occupational illnesses according to OSHA are any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment.

Occupational injury according to OSHA is any injury such as a severe laceration, fracture, sprain, amputation, etc. which results from a work accident or from a single instantaneous exposure in the work environment.

The OSHA 300 log is used for recording and classifying occupational injuries and illnesses and for noting the extent of each case. The log shows when an injury occurs, to whom, their regular job, the nature of the injury or illness, and if it resulted in death, lost time from work, or restricted work activity.

Good record keeping provides data to evaluate incident problems and safety program effectiveness, identify high incident rate areas, create interest in safety, enable the company to concentrate efforts on the more serious problems and measure effectiveness of countermeasures against hazards and unsafe practices.

OSHA incident rates help companies compare their safety performance with the performance of previous years or of the entire industry to evaluate their safety programs. OSHA records are to be maintained for no less than 5 years. All OSHA records should be available to federal and state governments for inspection and copying. Employees, former employees and their representatives are allowed access only to the log.

CHAPTER FIVE

WORKPLACE HEALTH PROGRAM ELEMENTS

5.1 BACK SAFETY AND LIFTING

The forces involved:

The amount of force you place on your back in lifting may surprise you.

Think of your back as a lever. With the fulcrum in the center, it only takes ten pounds of pressure to lift a ten pound object. If you shift the fulcrum to one side, it takes much more force to lift the same object. Your waist acts like the fulcrum in a lever system, on a 10:1 ratio.

Lifting a ten pound object puts 100 pounds of pressure on your lower back. When you add in the 105 pounds of the average human upper torso, you see that lifting a ten pound object actually puts 1,150 pounds of pressure on the lower back.

If you were 25 pounds overweight, it would add an additional 250 pounds of pressure on your back every time you bend over.

5.1.1 Common causes of back injuries

- Heavy lifting, especially repetitive lifting over a long period of time
- Twisting the waist while lifting or holding a heavy load, this frequently happens when using a shovel
- Reaching and lifting over your head, across a table, or out the back of a truck
- Lifting or carrying objects with awkward or odd shapes
- Working in awkward, uncomfortable positions
- Sitting or standing too long in one position ... Sitting can be very hard on the lower back
- It is also possible to injure your back slipping on a wet floor or ice

5.1.2 Preventing Back Injuries

- Avoid lifting and bending whenever you can
- Place objects up off the floor

- Raise/lower shelves
- Use carts and dollies
- Use cranes, hoists, lift tables, and other lift-assist devices whenever you can
- Test the weight of an object before lifting by picking up a corner
- Get help if it's too heavy for you to lift it alone
- Use proper lift procedures. Follow these steps when lifting

✓ Take a balanced stance, feet shoulder-width apart

✓ Squat down to lift, get as close as you can

- Get a secure grip, hug the load
- Lift gradually using your legs, keep load close to you, keep back and neck straight
- Once standing, change directions by pointing your feet and turn your whole body. Avoid twisting at your waist
- To put load down, use these guidelines in reverse

To help the back, minimize problems with your back by exercises that tone the muscles in your back, hips and thighs.

Exercise regularly, every other day. Warm up slowly, a brisk walk is a good way to warm up, inhale deeply before each repetition of an exercise and exhale when performing each repetition.

5.1.3 Exercises to help the back

- Wall slides to strengthen your muscles

Stand with your back against a wall, feet shoulder-width apart. Slide down into a crouch with knees bent to 90 degrees. Count to 5 and slide back up the wall. Repeat 5 times. See Fig. 5.1

- Leg raises to strengthen back and hip muscles

- ✓ Lie on your stomach. Tighten muscles in one leg and raise leg from floor. Hold for count of 10, and return leg to floor. Do the same with your other leg. Repeat five times with each leg
- ✓ Lie on back, arms at your sides. Lift one leg off floor and hold for count of ten. Do the same with the other leg. Repeat 5 times with each leg. If this is too difficult, keep one knee bent and the foot flat on the floor while raising the other leg. See Fig. 5.3

- Leg raises while seated

Sit upright, legs straight and extended at an angle to floor. Lift one leg waist high. Slowly return to floor. Do the same with the other leg. Repeat 5 times with each leg. See Fig. 5.2

- Partial sit-ups to strengthen stomach muscles

Lie on back, knees bent and feet flat on floor.

Slowly raise head and shoulders off floor and reach both hands toward your knees. Count to 10. Repeat 5 times. See Fig. 5.4

- Back leg swing to strengthen hip and back muscles

Stand behind chair, hands on chair. Lift one leg back and up, keeping the knee straight. Return slowly. Raise other leg and return. Repeat 5 times with each leg.

In conclusion, take care of your back and it will take care of you.

- ➢ Exercise daily
- ➢ Avoid Heavy Lifting
- ➢ Get Help with heavy or bulky objects
- ➢ If you must bend over, do it properly
- ➢ Avoid twisting at the waist when carrying objects
- ➢ Always watch where you're going

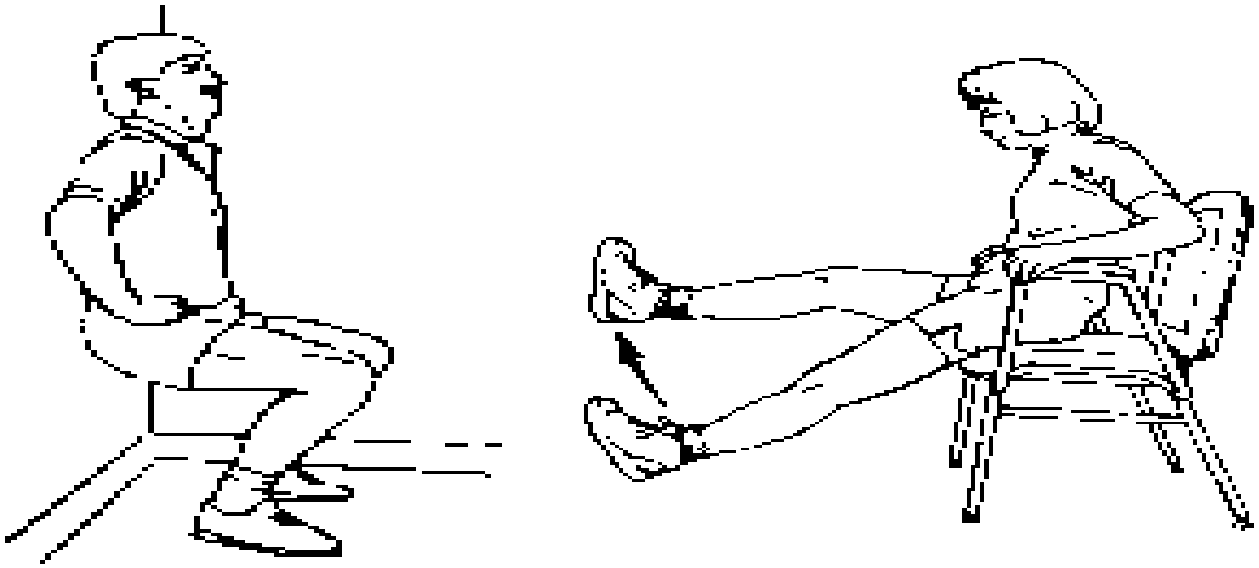


Fig. 5.1, 5.2: Wall slides, Leg raises while seated

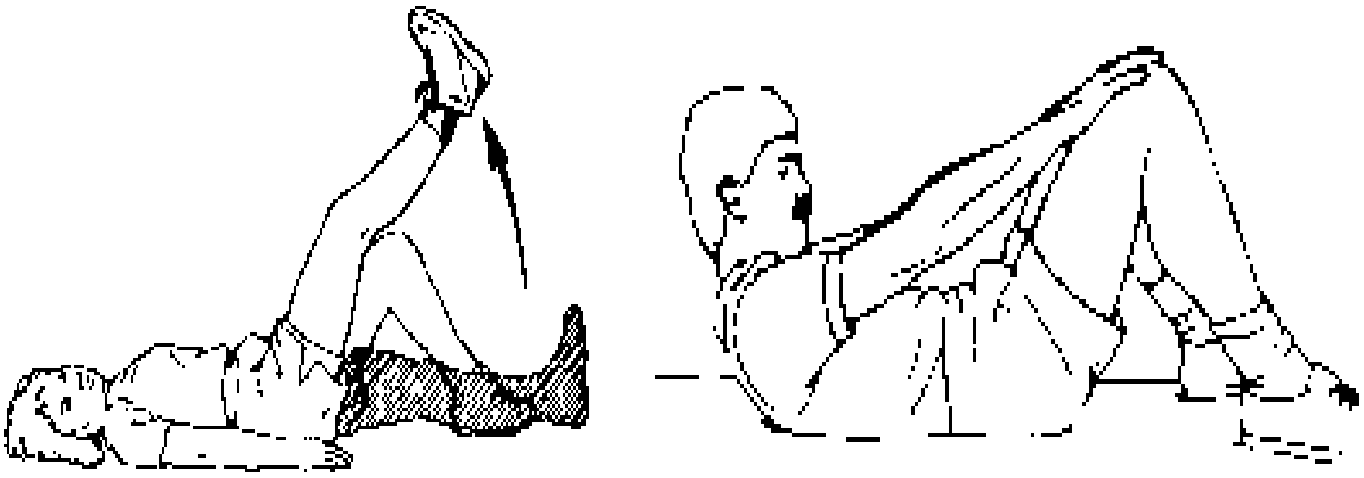


Fig. 5.3, 5.4: Leg raises for back and hip muscle, Partial sit-ups

CHAPTER SIX

CONCLUSION

Oilfield safety is not very different from safety anywhere else. There are different tools and equipment, but the similar safety principles.

It is important to look for hazards associated with the various tasks in all work areas, protect oneself and everybody else on board from the effects of such hazards and implementation of a good safety program. Identifying the hazards, developing a plan to fix it and then fixing it is of utmost important. When hazards are fixed accident do not occur.

It is also important to get everyone interested in safety. It is for the good of everyone onboard. Training employees on how to carry out behavior based safety and encouraging them to audit colleagues in their spare time is a good strategy to this end.

Finally, it is important to always have in mind that over 90% of accidents are avoidable. Workplaces do not cause accidents; people do. Safety is everyone's responsibility.

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