Safety in Drilling Operation

INTRODUCTION …..

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

- Safe operating practices and procedures are vital in the drilling business because the work is 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 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.

OBJECTIVE...

- The key objective of safety in drilling is to provide new employees with a basic orientation of rig operations and safe work practices. Ideally, this should occur before the employee begins work at the rig.

- To improve the safety performance of the Service Contractor and the E & P Operator and drilling to assist both in satisfying federal, state and industry regulations and recommended practices.

REMEMBER…

- No job is so important and No service is so urgent – that we cannot take time to perform our work safely.

I. General Safety ;

A. Principles:

All workers and contractors, and other persons associated with drilling work shall:

1 Share responsibility to make sure co-workers work within the safety and health rules, and according to safe operational procedures.
2 Work within the rules of operating safely, each type of machine/equipment they may be required to operate.
3 Report immediately to the Manager, all substandard practices and conditions that are likely to cause injury or damage.
4 Report and record, immediately to the Manager, all incidents, injuries and accidents, whether minor or serious, so these can be investigated.
5 Wear proper and appropriate protective equipment, and ensure that such protective equipment is maintained in good condition.
6 Comply with any additional site specific safety regulations

- ✓ **SAFETY POLICY:**

- It is the policy of the Company to conduct business without risk to all persons directly or indirectly associated with the drilling and to place health and safety equal in importance to productivity, efficiency and cost control.

- The company is committed to taking all practicable steps to maintain a healthy working environment and safe working conditions and to define, teach and maintain a safe working environment in compliance with all statutory requirements.

- Health, safety and loss control is **EVERYONE'S** business and every individual associated with the any job is expected to share in the commitment to avoid all accidents/incidents which may cause personal injury, property damage or loss of any kind. **All individuals associated with the job are expected** to act safely at all times for their own welfare and that of their co-workers and others associated with the work.

✓ RESPONSIBILITIES:

1 The Manager, and all contractors, is to ensure that:

a) All persons associated with the work obey the health and safety rules and comply with policy and procedures at all times;

b) All hazard identification and control procedures are undertaken as prescribed in the Health and Safety in Employment Act 1992;

c) That emergency procedures are in place;

d) Ensure that all planned inspections cover all hazardous situations, plant and procedures under their control;

e) Ensure that all contractors associated with the project have the opportunity to be involved in the development and conduct of items (b), (c) and (d) above;

f) Ensure that all persons associated with the work have been provided with, and understand, information on:

- Hazards they may encounter
- Safety clothing and equipment
- Emergency procedures
- Obligations under the Act.

2 All persons associated with the work, are required to ensure that they:

a) Comply with the health and safety rules, practices and procedures.

b) Take all practicable steps to ensure their own safety and the safety of others associated with the job.

✓ DRUG AND ALCOHOL PROGRAM

a. Any employee caught possessing or using drugs or coming to work under the influence of drugs will be discharged with prejudice or severely disciplined.

b. Any employee who uses drugs on the job or works under the influence of drugs endangers himself/herself and other workers. This company will not tolerate drug use on the job.

c. Drug use is the direct cause of thousands of deaths every year. Drug use causes permanent brain damage and birth defects and usually leads to

addiction. Intravenous drug use transmits AIDS, which is incurable and invariably fatal, as well as other serious diseases.

d. Possession of drugs, no matter how small an amount, is a crime, punishable by incarceration. Sales of drugs or possession of a significant quantity of drugs is a felony.

- ✓ **Jobsite Safety Meeting**

Tool box talks of 5 to 10 minutes must be held by superintendents and/or foreman each week. Employees never receive too much training, and therefore our company relies upon jobsite management to provide ongoing and continuous employee training.

The subject to each training talk should be chosen to relate to the type of work that is being performed.

Some examples include:

- The use of safety glasses when using circular saws, grinders, table saws, radial arm saws, jack hammers, power actuated tools, etc.
- The proper set up and use of ladders.
- Hard hats and why they are necessary.
- A discussion of a recent accident and its cause(s).
- A discussion of an old accident.
- A discussion of disciplinary procedures for failure to comply with safety policies

A log of Tool Box Talks must be kept in accordance with the form that follows. One copy should be kept by jobsite management and the other kept on the file in the home office by jobsite location.

- ✓ **TOOLS**

1. Tool Casings In Safe Condition
2. Wiring for All Power Tools in Safe Condition
3. Electric Tools Grounded (Unless Double Insulated)
4. Extension Cords Grounded and In Safe Condition
5. Hands Tools in Safe Condition
6. Tools Stored In Designated Location
7. Ladders Free Of Cracks & Damage

✓ HOUSEKEEPING

1. Aisles, Stairs & Floor Free Of Obstructions
2. Materials Supplies Stored and Piled In Designated Areas
3. Regular Removal of Trash & Debris
4. Are All Work Areas Lighted
5. Work Areas Neat & Orderly

✓ HAZARD COMMUNICATION

1. Written Program on Site
2. Chemical Inventory List Posted
3. MSDS Sheets on File
4. All Drums & Containers Labeled
5. Employees Trained

✓ HAZARD IDENTIFICATION AND CONTROL:

Each area, job and process within the work is to be examined to:

- identify all hazards, to be subsequently assessed;
- identify significant hazards.

Significant hazards to be evaluated for elimination, isolation, or minimizing

B and All existing and/or new equipment/plant/procedures to be assessed initially then systematically and regularly reviewed.

C Procedures the hazard identification and control process as follows:

1 Identify all hazards;

2 Assess to identify significant hazards;

3 Evaluate if significant hazards can be eliminated, if not

4 Evaluate if significant hazards can be isolated, if not

5 Evaluate if significant hazards can be minimized and if appropriate what health monitoring must be undertaken.

Note: Where elimination and isolation cannot be undertaken reasons must be recorded.

D Controls in place to eliminate, isolate or minimize hazards to be identified and regularly inspected to ensure that they remain effective.

- ✓ **ACCIDENTS/INCIDENTS INVESTIGATION:**

All accidents/incidents to be reported/recorded/investigated as detailed

a) All accidents/incidents which harmed, or might have harmed any person will be recorded in the accident/incident register.

b) Where serious harm to any person associated with the job occurs as a result of any hazard.

c) All accidents/incidents must be investigated regardless of the extent of the injury or damage.

d) Employees will never be allowed to fill out their own accident investigation report

Drill Pipe / Collar Slips and Elevators

A. Rig supervisors should instruct personnel in the proper use and maintenance of slips and elevators on the rig.
B. Slips and elevators should not be modified or welded on.
C. Keys, pins, dies, handles and bodies on all pipe and collar slips should be checked frequently for wear or damage.
D. Rig personnel should keep their hands and feet, as well as chains, ropes, etc., away from slip handles when rotary or top drive is in motion.
E. Slips should be properly positioned out of the way when not in use.
F. Slip handles should be used to raise and lower slips. Handles should be grasped with palm up. *Slips should NOT be kicked into the rotary bushing.*
G. Using proper lifting techniques, at least two employees should pull slips.
H. Latches, latch springs, hinge pins and elevator shoulders should be inspected periodically and maintained as necessary. These areas should be checked for cracks and deformities.
I. Riding the elevators as a means of personnel transport should be prohibited.
J. The elevator ear locks should be fitted with proper size steel bolts as recommended by the manufacturer. Bolts should be checked often to ensure tightness.
K. The elevators or bales should **not** be grasped in the area of the link eyes.
L. Only the elevator horns or rear handle or the elevator links (bails) at approximately 18” up on the elevator links (bails), should be used to control the elevator.
M. The load bearing areas of elevators and links (bails) should be inspected for wear as per company policies and procedures developed in consideration of the manufacturer’s recommendations.

Spinning / Cathead Chains, Breakout Tong Cable (line)

A. Rig supervisors should instruct personnel in the proper use and maintenance of the spinning chain.
B. The spinning chain should be connected to the cathead chain by a connecting link of equal strength of the lighter chain. Soft malleable connectors should not be used.
C. When not in use, spinning chains should be safely stored away from the rotary. The spinning chain should not be wrapped around the drill pipe in the mousehole while the rotary is turning.
D. To control the end of the spinning chain, an 8” to 12” tail rope should be attached.
E. Guideposts and chain trough should be checked prior to each trip to ensure that they are secure.

F. Chain and cable roller guides should be smooth and move easily.
G. The spinning chain and cathead chain should be inspected regularly and prior to each trip. A chain that has a bent or distorted link or is worn to less than 90% of its original cross section should be removed from service and discarded in such a way that it cannot be used for other purposes.
H. The breakout cable should be inspected regularly and prior to each trip. Follow the cable manufacturer's recommendation for rejecting a breakout cable.

Lifting Slings

The following are lifting sling requirements:

A. Inspect sling (chain, cable and attachments) before use, as indicated by the manufacturer. In addition, look for evidence of link stretching and the appearance of cracks on lifting chain. Chain and cable slings including hardware must be tagged by the manufacturer with the proof-tested maximum weight capacity.
B. Thorough inspections of alloy steel chain slings should be done at least once a year. Check for wear, defective welds, deformation and increase in length. Items to check the chain and attachments for are:
1. Hook throat opening greater than 15%.
2. Hook tip bent or twisted greater than 10%.
3. Hook eye bent or twisted.
4. Cracked hook body.
5. Shackles with chemical, corrosion, or heat (welding on or in a fire) damage.
6. Shackles deformed or incorrect pin.
7. Cracked or deformed master link.
8. Chain link wear, bent, gouged or stretching exceeding the manufacturers specifications.
9. Chain (links) that may have been heated to 1000 degrees F should be immediately removed from service.
C. Cable slings should be thoroughly inspected on a regular basis, at a minimum of every six months. A record of inspection should be maintained. Items that should be checked for:
1. Two or more broken wires at the socket end of the cable.
2. Ten or more broken wires in one length of lay or five or more broken wires in one strand in one length of lay.
3. Cable found with kinking, crushing, un-stranding, birdcaging, main strand displacement, core protrusion or any other distortion of wire rope structure should be removed from service immediately.
4. Cable with evidence of heat damage as indicated by blue or brown in an area, weld slag on five or more clustered wires should be removed from service.
5. Cable with abrasive reduction of one-third of the original diameter of outside individual wires should be removed from service.
6. Hook throat opening greater than 15%.
7. Hook tip bent or twisted greater than 10%.
8. Hook eye bent or twisted.

9. Cracked hook body.
10. Cracked or deformed master link.
11. Shackles with chemical, corrosion, or heat(welding on or in a fire) damage.
12. Shackles deformed or incorrect pin.
D. Maintain a record of the most recent month in which each sling was thoroughly inspected.
E. Alloy chain or cable slings should be used when making overhead lifts. One exception may be for attaching to catlines. The manufacturer should tag such chain, cable, and hardware with permanently affixed durable identification tag with applicable.
F. Use only alloy chain and attachments for making repairs to alloy chain slings.
G. Ensure that hooks, rings, oblong links, pear shaped links, welded or mechanical coupling links or other attachments have a rated capacity at least equal to that of the alloy chain with which they are used.
H. Chain sling capacity must be reduced to that of the weakest component(s) in the chain

system.
I. Never exceed the safe working limit of lifting chain, cable or attachments.
J. Lift and lower loads slowly and smoothly. Avoid shock loading.
K. Know the center of gravity and angle of the lift.
L. Twisting, knotting and kinking decreases the safe working load limits. Free all twists, knots and kinks before using.
M. Do not point-load hooks. The load should rest on the bowl of the hook.
N. Protect chain with padding when lifting sharp edged loads.
O. Use transport chains as safety chains on vehicles being towed and as tie-down chains.

Catheads

A. Rig supervisors should instruct personnel in the proper use and maintenance of catheads. Only a qualified person should operate the cathead.
B. When in operation, a qualified person should be at the driller's console to disengage the cathead if necessary.
C. Repair or replace worn, damaged or grooved catheads and worn dividers.
D. Catheads should have anti-fouling devices in use at all times. The manufacturer's recommended tolerance should be maintained between the rope divider guard and the surface of the cathead spool.
E. Cathead operator should have the cathead in view at all times while lifting or holding a load.
F. A swivel and safety hook attached to a lifting cap should be used when catlines are used to pull pipe through the V-door.
G. Only hemp or manila rope should be used as a catline.
H. Use only the amount of wraps necessary to raise the load, but never more than four wraps.
I. Objects should be raised and lowered at a safe pace and the wraps removed after the load is landed. The locking device should not be used to suspend a load.
J. The rope or line should not be left wrapped on or in contact with the cathead while it is not in use. The rope should be safely stored when not in use.
K. Rig personnel should not be hoisted by use of the catline.
L. The rope should not be wrapped around the operator's hand when in use. The operator must not stand inside the rope coiled on the floor when in use.
M. A splice that will feed onto the cathead spool should not be used.
N. Use a flagman or two-way communication device when the cathead operator cannot see the object being raised or lowered.

Hoists (Winches / Tuggers)

A. Rig supervisors should ensure that personnel are trained in the proper use and maintenance of hoisting devices.
B. Only those personnel, who through experience and training, are determined by the rig supervisor to be competent should be allowed to operate the rig floor hoist(s).
C. All hoists should be equipped with a drum guard and line guide.
D. The hoist operator should check the hoist mechanism, brake, drum guard, and line guard to ensure proper working order prior to each lift.
E. All hoisting lines should be inspected periodically. (See 3.5 C for inspection of lines.)
F. The hoisting line should not be in contact with any derrick member.
G. Loads lifted by the hoist and wire rope should not exceed the manufacturer's recommendation. The rated load capacity of the hoist should be posted on or near the hoist.
H. Rig personnel should stand clear of suspended loads.
I. The hoist operator should set the drum brake anytime a load is in suspension. The operator should not leave the hoist unattended.
J. The hoist-operating lever should return to the neutral locked position when the operator releases it.
K. The hoist should not be used to lift personnel until the procedures laid out in Section 19 are carried out.
L. The hoist should be equipped with an emergency shut-off valve within easy reach of the operator.

M. The hoist operator should raise the load at a slow, steady rate and stay alert to the situation and flagman at all times.
N. Continuous communications should be maintained either through direct sight, through a flagman or via two-way radio. Should communications fail, the operation should be stopped immediately and not resumed until communications has been re-established.

Pipe Tongs and Lines

A. Rig supervisors should ensure that personnel are trained in the proper use and maintenance of pipe tongs and lines around the rig.
B. Snub lines should be installed on makeup and breakout tongs and secured to a structural part of the rig floor or derrick. The snub lines should be of sufficient size and length as based on the rig floor design and anticipated pull on the line. Identification tags should be in place on the snub lines.
C. Tong counterbalance and components should be restrained, guarded or located so as to prevent them from falling on or striking crewmembers. Refer to 3.5 C for inspection of support cable. Sheaves in the derrick should be secured and a safety line should be attached.
D. Makeshift weights such as tools, pipe protectors, bits, etc. should not be added to the counterbalance weights or tongs.
E. Tong die slots should be properly maintained.
F. Tongs should be provided with sharp dies at all times and properly pinned in die slots. Die drives should be used to remove tong dies. Proper personal protective equipment should be worn when changing tong dies.
G. Tongs should be properly secured when not in use.
H. The rotary table should not be used for final making up or initial breaking out of a pipe connection. Two tongs should be used during makeup and breakout.
I. When greater-than-normal pull is needed to break a tight joint, all floor crewmen should move away from the rotary, and out of the path of the tongs before torque is applied. (Maximum rating of tongs or lines should not be exceeded.)
J. Employees should not stand between the two pipe tongs while the driller is making up or breaking out pipe or collars. (Note the ring and the triangle zone marked on the rig floor.)
K. All bolts/pins used to secure tong jaws should be kept in place, with nuts and secured with cotter pins or safety pins.
L. Designated personnel should operate power tongs. The lockout/tagout procedure should be used when working on power tongs.
M. Tongs should be inspected for stress cracks as per manufacturer's recommended inspection and maintenance programs. Qualified inspectors should carry out tong inspections.
N. Drawworks Line Pull Level – Line pull should be level with tong to reduce stress on the tong from this operation. In order to apply level pull to tong(s) the makeup/breakout line angle to tongs should be as level as possible.
O. Breakout/makeup tong arm should be as close as possible to a 90-degree angle to the line of pull.

Rotary Table Area

A. Rig supervisors should ensure that personnel are instructed in the proper use and maintenance of equipment around the rotary table area.
B. Personnel should not step on the rotary table while it is rotating.
C. The rotary table area should be constructed or covered with a non-skid material.
D. Hoses, ropes and lines should be clear of the rotary table and adjoining rotating equipment while it is in motion.
E. When not in use, the pipe tongs should be secured away from the rotary table.
F. If the rotary table is removed, the pick-up lines should be of sufficient strength and condition, and placed evenly around the block hook to ensure a level lift.
G. Rotary and motion compensator hoses should be equipped with safety lines at both ends.

The safety lines should be attached to structural objects such as the swivel and derrick, not to part of the high-pressure line.
H. Safety lines should be used to secure cementing or fracturing bumper hoses to an immovable object such as pump base or sub base.
I. Hoses should be inspected periodically and maintained to manufacturer's specifications.
J. Rotary slip bushings should be locked in the rotary at all times.

Portable Ladders

A. Rig supervisors should ensure that personnel are instructed in the proper use and maintenance of ladders, ramps, stairs and handrails around the rig.
B. Portable ladders should be inspected before each use for cracks, splits, loose rungs, etc. All ladders should be kept in a structurally sound condition. There should be no loose or bent rungs, and the ladder shall be fastened securely to the support structure.
C. All ladders should be used and kept in accordance with the manufacturer's original specifications.
D. Portable metal or aluminum ladders should be equipped with non-skid feet.
E. Wooden portable ladders should not be painted.
F. Ladders should not be used in a horizontal position as a scaffold.
G. Personnel should not climb higher that the third rung from the top on extension ladders or the second rung on stepladders.
H. Aluminum ladders should not be used when working on electrical equipment or working around electricity. Wood or fiberglass should be used.
I. The side rails should be held when climbing a ladder.
J. Personnel should face a ladder when climbing up or down.
K. Portable ladders should be secured at the top. If not, another person should hold them.
L. Personnel should not use boxes, chairs, sawhorses, tables, etc. to improvise a ladder.
M. Heavy, bulky tools and material should be hoisted when used on a ladder. Light tools, equipment, etc., should be attached to one's person.
N. Personnel should not reach beyond arm's length of the side rails of a ladder to gain better access. The ladder should be moved.
O. Only one person should be on a portable ladder at a time.
P. Dimensions of ladders, stairs and handrails should follow local regulations, good engineering design practices or the guidelines set out in Section 20. They shall have a uniform riser height and tread width. Ramps shall have a consistent gradual incline.

Decks, Floors and Walkways

A. Rig supervisors should ensure that personnel are instructed in the proper use and maintenance of decks, floors and walkways around the rig. All walkways should be kept free of spilled materials, loose objects, and other tripping hazards.
B. Hatches and other openings in decks and floors should be protected or provided with covers and closed when not in use.
C. Guardrails should be provided on all decks, raised floors and walkways over four feet in height and adjacent to tanks and other hazardous equipment. The height of the guardrail should be 42" with a mid-rail and a toe-board.
D. Detachable guardrails should be positioned around the moon pool, drilling slot and other similar areas.
E. Non-skid material should be positioned around the rotary table.
F. Rig personnel should not run on decks, stairs, floors and walkways.
G. Any walkway overlooking lower decks should have toe-boards.
H. Walkways should remain open at all times and should not be used as storage areas at any time.
I. Refer to Section 20 for additional information.

Equipment Guarding

A. Rig supervisors should ensure that personnel are instructed in the proper use and maintenance of equipment guarding around the rig.
B. All moving machinery that presents a hazard to employees working in its proximity should be adequately guarded.
C. Any removed guard should be replaced before the machinery is returned to operation.
D. Lockout and or tagout procedures should be used before removing guards.
E. All piping that could cause burns should be insulated or guarded.
F. All portable tools with exposed moving parts should be equipped with proper guards.
G. If expanded metal is used to fabricate equipment guards, the openings should be of a size (1/2 inch) that will prevent a person's fingers from going through it.

Derricks and Masts

A. Rig supervisors should ensure that personnel are instructed in the proper use and maintenance of derricks and masts.
B. Inspections of the derrick or masts should be performed periodically. (Refer to Section 16, IADC Rotary Rig Check Sheet, or API RP 4 G.)
C. The pipe racking fingers should be kept straight and properly secured. A safety cable or chain should be attached to each finger.
D. Drill collar tieback ropes should be secured to a derrick or mast member.
E. As each stand of drill pipe is set in the fingers it should be tied back or secured in the finger.
F. Personnel should not be in the mast or derrick when pulling or jarring on stuck pipe.
G. The derrick or mast escape device should be visually checked by the derrickman before each trip. It should be installed during rig up. The device should be installed in accordance with the manufacturer's recommendations.
H. Safety lines should be attached to all sheaves hanging in the derrick (i.e. tong, hoist, catline, etc.) These lines should be inspected frequently.
I. A full body safety harness and lifeline should be provided and used by each employee who works more than six feet above the drill floor. Refer to Section 20 Fall Protection.

J. The derrickman should wear a full body harness that is attached to a fall arrest device as well as positioning rope. All derrick safety harnesses should be the full-body type and inspected frequently. A backup should be provided if the one in use becomes defective.
K. Safety pins should be checked regularly to make sure they are properly secured.
L. The derrickman should inspect the monkeyboard before its use.
M. The monkey board should have a safety chain or cable attached. In addition, the hinged fold back section of monkey board should have a safety chain or cable attached. This safety chain or cable should be attached from the monkey board to the fold back section.
N. The casing/tubing stabbing board should be properly attached to the derrick structure. Safety chain/cable should be attached to the stabbing board. The stabber should use a full body harness and fall arrest device.
O. Employees should not ride the mast as it is being raised or lowered. All other personnel should stand clear of the A-frame until the mast radius is in position.
P. While the derrickman is accessing the monkey or stabbing board and there is a potential for the climb assist/anti-fall device to become entangled in the blocks, the blocks should not be moved. Once on the board the derrickman should use another anti-fall device attached to the derrick above his head. The location of the anchor point should be such that it does not get into the path of blocks.
Q. Any time the derrickman plans to connect to the ladder-climber assist/anti-fall device, or do anything other than routine operations, the drilling operator should be notified.

Pipe Racks and Bins

A. Rig supervisors should ensure that personnel are instructed in the proper use and maintenance of pipe racks and bins.
B. When pipe, casing or any other piece of equipment is being moved on pipe racks and in bins, personnel should not be allowed under, inside, or on top of pipe racks and bins.
C. Each layer of tubulars should be secured to avoid movement. (*Examples of pipe stops are shown in 3.28.2 at the end of this section.*)
D. Pipe racks should be inspected periodically.
E. Pipe racks and bins should be level.
F. Personnel should not be on the catwalk when tubulars or other equipment is being hoisted to the rig floor.

Derrickman's Escape Device

A. Rig supervisors should ensure that personnel are instructed in the proper use and maintenance of the derrickman's escape device.
B. Derrickman's escape device should be installed during rig up and should be operable when the mast is raised.
C. The derrickman should perform a visual inspection of the escape device and escape line before each trip in or out of the hole.
D. The device should be installed according to manufacturer's specifications.
E. The device should be used only in the event of an emergency.
F. The safety device should be inspected prior to rigging up and periodically as per company procedures/policies developed in consideration of the manufacturer's recommendations.

3.16 Drilling Line, Crown Block and Traveling Block

A. Rig supervisors should ensure that personnel are instructed in the proper use and maintenance of drilling line crown block and traveling block. Derrickmen should never touch the active line while traveling blocks are moving.
B. Drilling lines should be visually inspected daily for wear and breaks.
C. The drilling line should not be allowed to rub against other objects that may cause damage.
D. Drilling line is stiff and can flip when being cut. Employees should use caution when handling the drill line.
E. The deadline anchor bolts should be checked periodically to ensure that they are properly torqued. In addition, all the drilling line retainer bolts should be in good condition and in place through the anchor drum.
F. All excess drilling line should be spooled up off the ground or deck.
G. Crown sheaves and traveling block should be inspected and lubricated each day.
H. The crown block and traveling block sheave grooves should be checked periodically for proper gauge.
I. A slip-and cut-program should be followed. Calculate the ton-miles and follow the slip-andcut program as recommended by the drilling line manufacturer.
J. The line guide cable and rollers should be inspected each tour to determine their condition.

Drawworks, Brakes, Clutches and Sand Reel

A. Rig supervisors should ensure that personnel are instructed in the proper use and maintenance of drawworks, brakes, clutches and sand reel.
B. All rig personnel should be instructed in how to shut down the drawworks and rotary table in the event of an emergency.
C. All guards should remain in place at all times and be kept in good condition. Guards should only be removed for maintenance or repair (follow lockout/tagout procedures) and replaced prior to putting back in operation.
D. Only designated personnel should operate the drawworks.
E. While operating the drawworks, the operator should not be distracted.
F. The driller should chain the brake down anytime he leaves the driller's console. If an

automatic driller device is in use, the brake handle should be secured as per the automatic driller device operating procedures.
G. The driller should supervise all drawwork repairs. Do not start up other operations until repairs are completed and guards are in place.
H. Employees should not stand on top of the drawworks or inside the sand line or main drum guard when the drums are moving.
I. The sand reel should be equipped with a proper line-spooling device.
J. Defective zerk and alemite fittings should be replaced.
K. The brake blocks, linkage, pins, cotter keys, etc. should be checked periodically.
L. Water should not be directed at the brake band when washing the drawworks.
M. Clutches should be kept in good repair and properly adjusted.
N. The crown-o-matic should be visually checked at tour change and function tested at first opportunity. It should be reset and checked after drill line is cut and slipped. This information should be included in the IADC report. It should be checked anytime it is moved or adjusted.

Mud Pumps and Equipment

A. Rig supervisors should ensure that personnel are instructed in the proper use and maintenance of mud pumps and equipment.
B. Caution should be used when working around high-pressure components.
C. Lockout/tagout procedures should be used when repairing or maintaining equipment.
D. Mud pumps should have pressure relieving safety (pop off valve) devices. These devices should be installed to manufacturer's recommendations. Inspection and maintenance of these devices should be done based on company procedures and policies developed in considerations of manufacturer's recommendations. There should not be any valves or other restrictions placed in the pressure release (pop off valve) relief line. Shear pins recommended by the manufacturer are the only pins that are to be used in shear pin type pop off valves. Pressure relief device (Pop off valve) cover should be in place.
E. Measures to eliminate the use or restrict the operation of the pressure relief safety device should not be taken.
F. Liners should not be removed from or seated in a pump by running the pump or by applying hydraulic, pneumatic or gas pressure.
G. Guards should be in place and secured while a pump is in operation. (*Examples of good guarding are shown in 3.28.3 at the end of this section.*)
H. Studs and nuts on the fluid end should be maintained in good condition and kept tight.
I. Good housekeeping and lighting should be maintained around the mud pumps.
J. Discharge lines coming from the pump should be snubbed off.

Mud Pits and Equipment

A. Rig supervisors should ensure that personnel are instructed in the proper use and maintenance of mud pits and equipment.
B. Mud pits may be considered confined spaces so proper precautions should be taken. *(Refer to Section 10).*
C. High-pressure fittings and lines should be properly rated for the expected working pressures.
D. Mud gun unions and connections should be kept tight.
E. Only designated employees should be allowed to operate mud guns.
F. Walkways should be kept clear of tripping hazards. Flow lines should be placed so that they do not create tripping hazards.
G. Electrical equipment should be located to prevent contact with fluids.
H. Caustic soda should be added to water slowly to avoid splashing and should be mixed using a mixture tank or barrel. Chemical barrel should be designed to prevent splash back to employees.

I. When mixing chemicals employees should follow precautions as stated on the manufacturer's MSDS and warning labels. Refer to Section 2.7 Chemical Hazard Communication.
J. Chemicals that are not compatible such as paraformaldehyde and caustic soda should not be mixed together.
K. Approved explosion-proof lighting fixtures should be installed on mud pits.
L. The agitator's power source should be isolated and locked out before entering the mud pits.
M. At the mud mixing hopper or mixing location, the following items should be available for the employee's use:
1. Eye protection.
2. Face protection.
3. Proper respiratory protection.
4. Rubber gloves and apron.
5. Eyewash station / shower, and
6. Appropriate caution and/or danger signs.
7. MSDS for chemicals.
N. Mud samples should not be caught by using a cup with a rope attached, due to the possibility of the rope getting caught by the agitator.

High-Pressure Lines and Fittings

A. Rig supervisors should ensure that personnel are instructed in the proper use and maintenance of high-pressure lines and fittings around the rig.
B. Employees should familiarize themselves with the location of high-pressure lines and fittings.
C. Employees should not attempt to tighten or loosen unions or other connections under pressure. Never hammer on a pipe or connection that is under pressure.
D. Pressure relief valves should be checked periodically according to manufacturer's recommendation.
E. Lines or piping systems that may kick under pressure should be secured.
F. Care must be taken to ensure proper halves of hammer type unions are mated together. "1502" threads in a two inch wing nut will appear to be completely made up to the "602" threads on the female half but will come apart when the line is pressured up. If in doubt, a go-no-go gauge should be used.
G. High-pressure lines should be fitted with high-pressure fittings. Caution should be exercised during repair to insure only high-pressure fittings are being installed.
H. All personnel should stand clear of high-pressure lines being used during cementing, acidizing, well testing procedures, etc.
I. Chicsan sections in high-pressure lines should be watched for leaks. Chicsan connections should be secured with a safety line. When required to reciprocate pipe with chicsans attached, caution should be used during movement.
J. A JSA should be developed and discussed in pre-planning safety meeting and before unusual or temporary jobs begin.
K. Do not stand in front of valves or bull-plugs when they are under pressure.
L. Snub each end of high-pressure lines. Where possible, high-pressure lines should be snubbed to a structural part and not back to other parts of the high-pressure line.

Engines

A. Rig supervisors should ensure that personnel are instructed on the proper use and maintenance of engines.
B. Positive lockout measures should be provided to ensure that the source of power is not activated during the engine repair, inspection or adjustments.
C. All exposed revolving parts such as radiator or cooling fans, belts, flexible drives, generators, water pump pulley, shafts, couplings and other moving parts should be provided with adequate guarding to prevent contact or items being caught in moving parts. *(See examples of good guarding in 3.28.4 at the end of this section*.)
D. Guarding removed for maintenance purposes should be replaced as soon as possible and

before operation of the equipment.
E. Spark arresting devices should be installed in engine exhaust systems where required.
F. Engines should be equipped with safety alarms and/or automatic shutdown controls to be activated during emergencies or operational difficulties such as overheating, low oil pressure and over speeding.
G. Exhaust manifolds and piping should be constructed, installed and maintained to prevent exhaust gases from leaking between the engine and the discharge line. The discharge should be directed away from the engine and the work area.
H. Areas below engine skids and beneath the sub base should be kept clear of drained motor oil and debris.
I. The air box drains, on engines so equipped, should be drained according to company policies or procedures developed in consideration of the manufacturer's recommendations.
J. "Caution High Noise Area" signs should be posted and hearing protection available in the engine area. Personnel working in high noise areas should wear adequate hearing protection.

Air-Operated Equipment

A. Rig supervisors should ensure that personnel are instructed in the proper use and maintenance of air-operated equipment around the rig.
B. Air tanks should be drained frequently to prevent accumulation of moisture.
C. A valve should not be installed between the tank/compressor and the pressure relief valve.
D. Compressed air used for cleaning purposes should be regulated to limit pressure.
E. Each air line should be secured to prevent it from coming loose at the connections.

Blowout Prevention Equipment

A. Rig supervisors should ensure that personnel are instructed in the proper use and maintenance of blowout prevention equipment.
B. Pick-up lines, eyes and shackles should be inspected for strength and condition before lifting a blowout preventer or the entire stack. Refer to Section 3.5.
C. Check with the manufacturer before using any padeyes on the annular for picking up the annular and other BOP units. Most annular padeyes are designed only for picking up the weight of the annular itself. Follow manufacturer's recommended procedure for picking up BOP stacks.
D. Blowout preventers and components should not be climbed on until they are set on the wellhead flange, the test stump, flange of another blowout preventer unit or in the stowed position. When climbing on BOP stacks, fall protection described in Section 19 should be utilized, but not attached to the BOP.
E. Personnel should stay clear of any possible path of the hoisted BOP stack until the BOP stack is nearly in position. Once in position employees can assist in guiding or aligning the blowout preventer into place.

F. Hands and feet should be kept from between the flanges. Hands and feet should not be placed on top of the bolts that have already passed through the holes of an upper flange while the unit is being lowered.
G. While hammering up the blowout preventer, bolts and nuts, closed socket hammer wrenches of correct size, as well as sledgehammers of suitable weight and size should be used for agility and accuracy. Hydraulic torque equipment should be used according with company policies and procedures developed in consideration of the manufacturer's recommendations.
H. A rope or rubber "O" ring should be used on the hammer wrench to hold it in place when hammering.
I. Employees should not be permitted on the blowout preventer when the stack is being pressure-tested. If during pressure testing the BOP stack, it is discovered that repairs are required, all pressure to the stack should be released before repair work is begun.

J. When nippling down the blowout preventer, all hydraulic lines should be bled to zero pressure before hammering is permitted on the hydraulic unions.
K. Scaffolding and work platforms should be inspected before being utilized for access to the BOP stack.
L. Choke and Kill lines should be snubbed off at each end and at each connection on long vertical installations.
M. BOP bolts should be long enough to allow for a full nut when fully tightened. (*See 3.28.5 at the end of this section*.)
N. Be sure that the proper ring gasket is used. Ring gaskets should not be reused.
O. The rotary should be stopped when personnel are working on the BOP or Rotating Head.

BOP Accumulators, Pulsation and Suction Dampeners

A. Rig supervisors should ensure that personnel are instructed in the proper use and maintenance of accumulators, pulsation and suction dampeners.
B. A qualified person should charge accumulators and high-pressure pulsation dampeners as per company policies and procedures as developed in consideration of the manufacturer's recommendations. The pre-charge should be checked as per company policies and procedures developed in consideration of manufacturer's specifications.
C. Each control on the BOP accumulator and each BOP remote unit should be clearly marked as to its exact function.
D. After a ram is placed in open or closed position, flag the controls; do not leave controls in neutral position.
E. The blind / shear ram control handles should be protected in a way to prevent against accidental closure. (Accumulator and Drill Floor Remote Control Units)
F. Suction and mud pump pulsation dampeners should be charged by qualified personnel as per company policies and procedures developed in consideration of manufacturer's recommendations.

Stabbing Board

A. Rig supervisors should instruct personnel in the proper use and maintenance of the stabbing boards.
B. Stabbing board and components should be inspected periodically and prior to use.
C. Fall protection system should be installed as per Section 20.
D. The stabbing board is to be properly installed and safety lines attached as required.
E. Stabbing board locking devices should be provided such that:
1. One locking device operates when the lifting handle is in neutral.
2. One locking device operates if the hoisting mechanism fails.
3. Both devices are independent of each other.

Handling Tubulars

A. Rig supervisors should ensure that personnel are instructed in the proper use and maintenance of tubulars and tubular handling tools.
B. When stabbing tubulars, personnel are to keep their hands and fingers from between the pin and box of the two joints of tubulars.
C. Joints of drill pipe that are to be added to or removed from the drill string should not be allowed to remain in the mousehole while hoisting or lowering pipe during a trip.
D. Each stand of drill pipe being hoisted from the rig floor should be held back as the pipe is lifted so it will not swing freely across the rig floor.
E. As a stand of drill pipe is led across the rig floor for stabbing by the person tailing the pipe, the derrickman should break the swing in the pipe from aloft.
F. As the person tailing the pipe gives the stand to the stabber, each should keep their hands

from between the tongs and pipe.
G. The driller's view of the drill pipe in the rotary table should not be obstructed at any time.
H. When setting pipe back, it should be racked by pushing against the outer face of the pipe. Do not get fingers caught in between pipes (collars). Feet should be kept away from beneath the pipe as it is set down.
I. Feet should not be placed beneath the pipe when rabbiting drill pipe or tubing. Never put feet directly under pipe, especially when using YT type elevators.
J. When rabbiting tubulars, crewmen should face away from the pipe rack to avoid possible eye injury, even though eye protection is being worn during this operation.
K. To prevent lift subs from backing out while working with the drill collar, each drill collar lift sub should be tightened into the collar before the collar is hoisted into the derrick.
L. Feet, knees and hands should not be placed on the underside of a drill collar clamp while the clamp is being tightened onto a drill collar in the rotary table.
M. A drill collar clamp secured to a drill collar should be removed prior to hoisting the collar so as not be hoisted overhead height into the derrick.
N. When setting the drill bit into a bit breaker, hands and feet should not be placed on the bit breaker while the bit and collar are guided into the bit breaker opening. Feet should not be used to adjust the lock on the bit breaker.
O. Stabilizers, wall scrapers or pup joints being added into the drill string should be set on the rotary table unsupported by a hoist line.
P. Tools added or removed from the drill string should be handled with a hoist line. Tools should not be thrown or allowed to fall onto the rig floor, but laid down with a hoist line.
Q. Formation mud should be scraped off the drill collars and/or stabilizer before it is hoisted into the derrick.
R. Employees should not peer into the bell nipple or through the rotary table when the BOP is operated. In addition, the supervisor should make sure that everyone is well away from the rotary table when the blind rams are operated.
S. Casing equipment should not be rigged up until the drill pipe has been completely hoisted out of the wellbore.
T. The casing-tong safety door should not be removed so that hands and limbs will be protected from the tong's drive works.
U. A work scaffolding or platform should be constructed around the casing spider to prevent overstretching or becoming off balance in order to reach the equipment.
V. Hands should not be placed on top of the casing collar joint protruding from the casing slips when another joint of casing is being stabbed. Hands should be kept on the outside of the casing at all times.
W. When lowering the casing elevators over a joint of casing in the derrick, the driller should be aware of the derrick stabber's hands to prevent catching them between the elevators and the joint of casing.
X. Single joint casing pick-up elevators of the correct size should be used and should have a safety pin attached by chain.
Y. When removing cores from a core barrel on the drill floor, employees should not place their hands or feet under the core barrel opening.

II. Personal Protective Equipment (PPE)

Introduction

In many workplaces, exposure to or contact with harmful agents such as chemicals, infectious agents, sharp objects, or extreme temperatures can create a potential for injury to the body and skin. Wherever practicable, these hazards should be eliminated or reduced through the use of engineering and/or

administrative controls. We can protect against those hazards that continue to exist by using appropriate protective clothing for the job.

RESPONSIBILITIES

- Employer shall ensure that PPE be provided, used, and maintained in a sanitary and reliable condition to prevent injury.

- When employees provide their own PPE, the employer shall assure the adequacy, including the proper maintenance and sanitation, of such equipment.

Hazard Assessment and Equipment Selection

- Employers are required to assess the workplace to determine if hazards that require the use of PPE are present. Employers must select and have affected employee's use properly fitted PPE suitable for protection from existing hazards.
- Employers must certify in writing that a workplace hazard assessment has been performed.
- Defective or damaged PPE shall not be used.
- Before doing work requiring of PPE, employees must be trained to know when PPE is necessary, what type is necessary, how it is to be worn, and what its limitations, as well as know its proper care, maintenance, and storage.

Establishing a PPE Program

- Sets out procedures for selecting, providing and using PPE as part of an employer's routine operation
- First -- assess the workplace to determine if hazards are present, or are likely to be present, which necessitate the use of PPE
- Once the proper PPE has been selected, the employer must provide training to each employee who is required to use PPE

Training

- When PPE is necessary
- What type of PPE is necessary?
- How to properly put on, take off, adjust, and wear
- Limitations of the PPE
- Proper care, maintenance, useful life and disposal

Engineering Controls

- Initial design specifications
- Substitute less harmful material
- Change process
- Enclose process
- Isolate process
- Ventilation

Work Practice Control

- Use of wet methods to suppress dust
- Personal hygiene
- Housekeeping and maintenance
- Job rotation of workers

Eye Protection

In many workplaces, flying particles, dusts, vapors, chemicals or harmful rays can create a potential for eye or face injury. Whenever practicable, these hazards shall be eliminated or minimized through the use of substitution or engineering controls. To protect against those hazards which continue to exist after all such control measures have been implemented, appropriate protective eyewear or face wear must be used.

What are some of the causes of eye injuries?

- Dust and other flying particles, such as metal shavings or sawdust
- Molten metal that might splash
- Acids and other caustic liquid chemicals that might splash
- Blood and other potentially infectious body fluids that might splash, spray, or splatter
- Intense light such as that created by welding and lasers

Safety Spectacles

- Made with metal/plastic safety frames
- Most operations require side shields
- Used for moderate impact from particles produced by such jobs as carpentry, woodworking, grinding, and scaling

Goggles

Safety goggles offer greater eye protection than safety glasses by providing a secure shield around the entire eye area to protect against hazards coming from any direction. Safety goggles are impact resistant and must meet the requirements of Standard. Like safety glasses, they are available in a variety of tints and shades. Safety goggles may have direct or indirect ventilation to protect against fogging. Goggles with direct ventilation allow heat and humidity to dissipate, but do not protect against splash hazards. Goggles with indirect ventilation are designed to protect against dust and splash hazards.

- Protect eyes, eye sockets, and the facial area immediately surrounding the eyes from impact, dust, and splashes
- Some goggles fit over corrective lenses

Welding shield

Protect eyes from burns caused by infrared or intense radiant light and protect face and eye from flying spark, metal spatter and slag chips produced during welding brazing, soldering and cutting

Face Shields

Face shields worn alone are not considered protective eyewear. They are designed to provide general protection to the face and the front of the neck. Full face shields are often used to protect against chemicals or heat or glare hazards. Face shields do not fully enclose the eyes, and are to be used in conjunction with primary eye protectors such as safety glasses or goggles. Face shields are available with crown protectors to protect the front part of the head, or chin protectors.

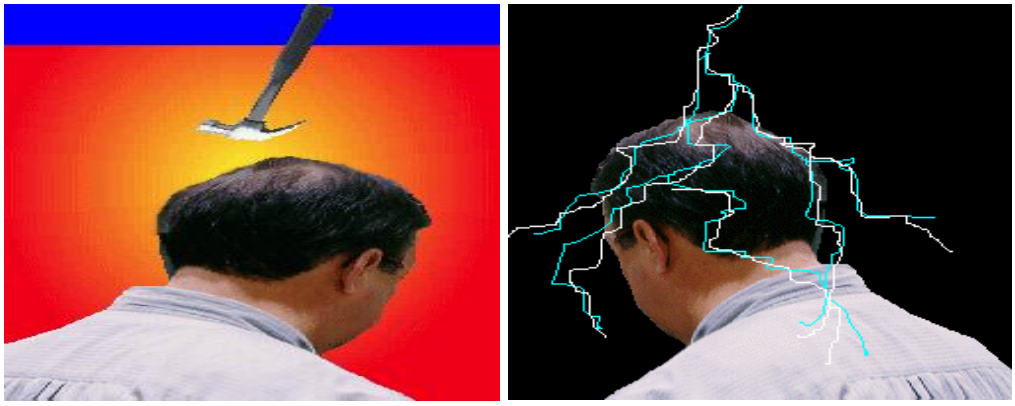
- Protect the face from nuisance dusts and potential splashes or sprays of hazardous liquids
- Do not protect employees from impact hazards

Head protection

Head injuries may be prevented by using the appropriate protective headwear for the job. Appropriate headwear must protect against the specific hazard presented, provide a comfortable and secure fit, and comply Standard

What are some of the causes of head injuries?

- Falling objects
- Bumping head against fixed objects, such as exposed pipes or beams
- Contact with exposed electrical conductors



Classes of Hard Hats

Class A

- General service (e.g., mining, building construction, shipbuilding, lumbering, and manufacturing)
- Good impact protection but limited voltage protection

Class B

- Electrical work
- Protect against falling objects and high-voltage shock and burns

Class C

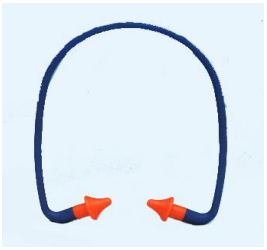
- Designed for comfort, offer limited protection
- Protects heads that may bump against fixed objects, but do not protect against falling objects or electrical shock

Hard hats require a hard outer shell and a shock-absorbing lining. The lining should incorporate a head band and straps that suspend the shell from 1 to 1-1/4 inches away from the user's head to provide shock absorption during impact and ventilation during wear.

Ear Protection

Earmuffs

Earplugs



Canal cap

Exposure to high noise levels can cause hearing loss or impairment. It can create physical and psychological stress. There is no cure for noise-induced hearing loss, so the prevention of excessive noise exposure is the only way to avoid hearing damage. Specifically designed protection is required, depending on the type of noise encountered and the auditory condition of the employee. Preformed or molded earplugs should be individually fitted by a professional. Waxed cotton, foam, or fiberglass wool earplugs are self-forming. When properly inserted, they work as well as most molded earplugs. Some earplugs are disposable, to be used one time and then thrown away. The non-disposable type should be cleaned after each use for proper protection. Plain cotton is ineffective as protection against hazardous noise. Earmuffs need to make a perfect seal around the ear to be effective. Glasses, long sideburns, long hair, and facial movements, such as chewing, can reduce protection. Special equipment is available for use with glasses or beards.

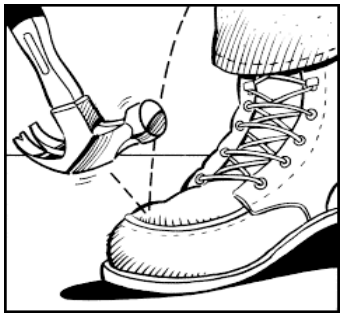
Protect your hearing…

Use hearing protection when:

- Noise levels is 85 dB or Higher
- in high noise areas
- Using power saws, impact tools, etc.

Off the job when shooting, using power tools, etc.
Replace worn or broken hearing protectors immediately

Foot protection



In workplaces, falling or rolling objects, sharp objects, exposed energized electrical conductors or other hazards can create a potential for foot injury. Whenever practicable, these hazards shall be eliminated or reduced through the use of proper engineering and/or administrative controls. To protect against those hazards which continue to exist after all such control measures have been implemented, appropriate protective footwear must be used.

What are some of the causes of foot injuries?

- Heavy objects such as barrels or tools that might roll onto or fall on employees' feet
- Sharp objects such as nails or spikes that might pierce the soles or uppers of ordinary shoes

- Molten metal that might splash on feet
- Hot or wet surfaces
- Slippery surfaces

Hazardous condition

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 MSDS for protection

Hand protection

In many workplaces, exposure to chemicals, infectious agents, sharp objects, extreme temperatures and other hazards can create a potential for injury to the hand. Wherever practicable, these hazards should be eliminated or reduced through the use of engineering and/or administrative controls. We can protect against those hazards which continue to exist by using appropriate hand protection for the job.

Appropriate protective gloves must be worn in all situations where the hands are potentially exposed to workplace hazards such as chemicals, infectious agents, cuts, lacerations, abrasions, punctures, burns and harmful temperature extremes. Glove selection must include an initial workplace assessment to identify the specific hazards relating to the types of chemicals or other hazardous materials to be used, the specific tasks to be performed, and the conditions and duration of such work.

Hand Hazards

- Cuts & punctures
- Chemical exposure
- Vibration
- Electric shock

- Burns
- Heat & Cold
- Biohazards

What are some of the hand injuries you need to guard against?

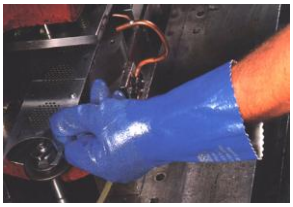
- Burns
- Bruises
- Abrasions
- Cuts
- Punctures
- Fractures
- Amputations
- Chemical Exposures

Types of gloves

Buty: provide the highest permeation resistance to gas or water vapor frequency used for ketones

VIFON: is highly resistant to permeation by chlorinated and aromatic solvents

NIFRILE: provide protection against wide variety of petroleum product and also resistance to cut punctures and abrasion



KEVLAR: protects against cuts slashes and abrasion

STAINLESS STEEL MESH: protection against cuts

Chemical Resistant Gloves

Chemical resistant gloves which provide an effective barrier against the specific chemicals used must be worn whenever hands are potentially exposed to chemicals. An appropriate chemical resistant glove must demonstrate no significant degradation, a high breakthrough time and a low permeation rate upon contact with the chemicals used. Chemical permeation through an inappropriate glove can result in significant worker exposure and serious health effects, particularly when using highly toxic chemicals which are readily absorbed into the bloodstream via the skin.

Body protection

Many hazards can threaten the torso: heat, splashes from hot metals and liquids, impacts, cuts, acids, and radiation. A variety of protective clothing is available: vests, jackets, aprons, coveralls, and full body suits. Wool and specially treated cotton are two natural fibers that are fire resistant and comfortable since they adapt well to changing workplace temperatures. Duck, a closely woven cotton fabric, is good for light-duty protective clothing. It can protect against cuts and bruises on jobs where employees handle heavy, sharp, or rough material. Heat-resistant material, such as leather, is often used in protective clothing to guard against dry heat and flame. Rubber and rubberized fabrics, neoprene, and plastics give protection against some acids and chemicals. It is important to refer to the manufacturers' selection guides for the effectiveness of specific materials against specific chemicals. Disposable suits of plasticlike or other similar synthetic materials are particularly important for protection from dusty materials or materials that can splash. If the substance is extremely toxic, a completely enclosed chemical suit may be necessary. The clothing should be inspected to ensure proper fit and function for continued protection.

What are some of the causes of body injuries?

- Intense heat
- Splashes of hot metals and other hot liquids
- Impacts from tools, machinery, and materials
- Cuts
- Hazardous chemicals
- Contact with potentially infectious materials, like blood
- Radiation

Chemical Resistant Clothing

Where the chemical hazard results in a high level of skin protection required, an appropriate chemical resistant apparel which provides an effective barrier between the chemicals used and the area of the body to be protected must be worn. It is important to note that no single material will protect against all chemicals, and that no material is totally impermeable. Materials only temporarily resist chemical breakthrough; even the most chemically resistant material will break down after repeated chemical exposures.
Selecting the clothing material which best protects against a particular chemical must be based on chemical resistance performance upon contact with the chemical. Appropriate chemical resistant

Respiratory Protection

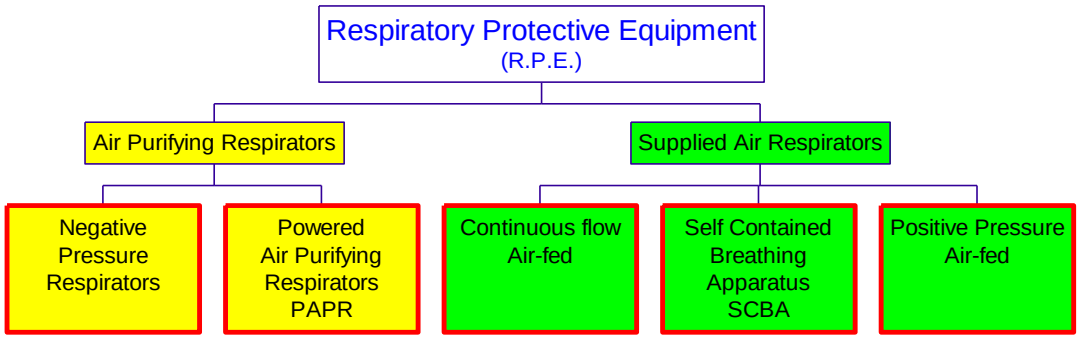
Respirators shall be used in the following circumstances:

1. Where exposure levels exceed the permissible exposure limit (PEL), during the time period necessary to install or implement feasible engineering and work practice controls;

2. In those maintenance and repair activities and during those brief or intermittent operations where exposures exceed the PEL and engineering and work practice controls are not feasible or are not required;
3. In regulated areas;
4. Where the employer has implemented all feasible engineering and work practice controls and such controls are not sufficient to reduce exposures to or below the PEL;
5. In emergencies.

How do I select RPE?

1. Identify the hazard
2. Assess the degree of risk
3. Select appropriate RPE
4. Train in proper use



RPE comes in a wide variety of types, each suitable for a particular range of applications. Although the type of application of certain RPE may overlap, no respirator is ideal for all applications and care should be taken to understand the limitations of any respirator before selection.

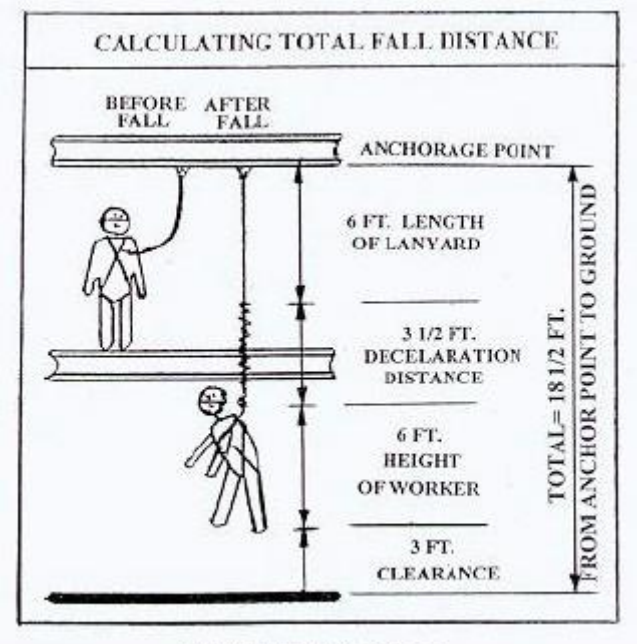
Fall Protection

Personal Fall Arrest Systems:

These consist of an anchorage, connectors, and body belt or body harness. It must do the following:

1. **Limit maximum arresting force on an employee to 900 pounds when used with a body belt.**
2. **Limit maximum arresting force on an employee to 1800 pounds when used with a body harness.**
3. **Be rigged so that an employee can neither free fall more than 6 feet (1.8 meters) nor contact any lower level.**
4. **Bring an employee to a complete stop and limit maximum decelerion distance an employee travels to 3.5 feet (1.07 m). (shock absorber)**

5. **To keep at least 3 feet clearnance from the ground.**

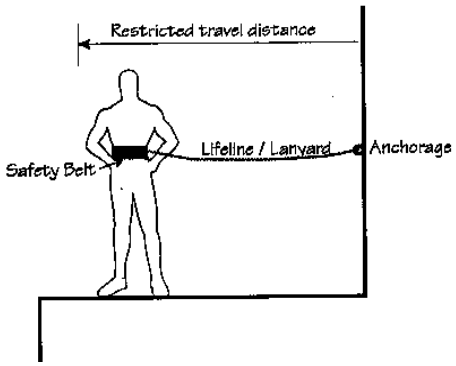


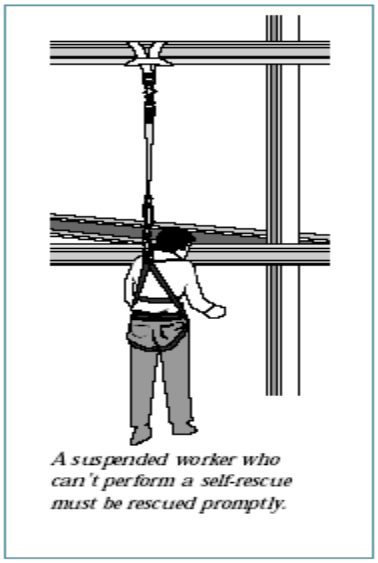
Total Fall Distance

6. **Have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance 6 feet or the free fall distance permitted by the system, whichever is less.**
7. **The use of body belts for fall arrest is prohibited (1/1/1998) and a full body harness is required.**
8. **The anchoring point must withstand a force not less than 5000 pounds.**

3- Positioning Device Systems:

Body belt or harness is to be set up that a worker can free fall no farther than 2 feet.
Secured to an anchorage capable of supporting 3000 pounds





A suspended worker who can't perform a self-rescue must be rescued promptly.

Fall-protection systems are designed to minimize workers' exposure to fall hazards and to reduce their risk of injury if they do fall. Nevertheless, employers must establish procedures to ensure that workers who fall receive prompt emergency and medical attention. Emergency procedures should identify key rescue and medical personnel, equipment available for rescue, emergency communications procedures, retrieval methods, and primary first-aid requirements.

III. Hazard Communications and Materials Handling

CHEMICALS IN THE WORKPLACE

About 32 million workers are potentially exposed to one or more chemical hazards. There are an estimated 575,000 existing chemical products, and hundreds of new ones being introduced annually. This poses a serious problem for exposed workers and their employers.

Chemical exposure may cause or contribute to many serious health effects such as heart ailments, kidney and lung damage, sterility, cancer, burns, and rashes. Some chemicals may also be safety hazards and have the potential to cause fires and explosions and other serious accidents.

Because of the seriousness of these safety and health problems, and because many employers and employees know little or nothing about them, the Occupational Safety and Health Administration (OSHA) has issued a rule called "Hazard Communication." The basic goal of the standard is to be sure employers and employees know about work hazards and how to protect themselves; this should help to reduce the incidence of chemical source illness and injuries.

The Hazard Communication Standard establishes uniform requirements to make sure that the hazards of all chemicals imported into, produced, or used in U.S. workplaces are evaluated, and that this hazard information is transmitted to affected employers and exposed employees.

HAZARD EVALUATION

The quality of the hazard communication program depends on the adequacy and accuracy of the hazard assessment. Chemical manufacturers and importers are required to review available scientific evidence concerning the hazards of the chemicals they produce or import, and to report the information they find to their employees and to employers who distribute or use their products. Downstream employers can rely on the evaluations performed by the chemical manufactures or importers to establish the hazards of the chemicals they use.

The chemical manufacturers, importers, and any employers who choose to evaluate hazards are responsible for the quality of the hazard determinations they perform. Each chemical must be evaluated for its potential to cause adverse health effects and its potential to pose physical hazards such as flammability. (Definitions of hazards covered are included in the standard.)

WRITTEN HAZARD COMMUNICATION PROGRAM

Employers must develop, implement, and maintain at the workplace a written, comprehensive hazard communication program that includes provisions for container labeling, collection and availability of material safety data sheets, and an employee training program. It also must contain a list of the hazardous

chemicals in each work area, the means the employer will use to inform employees of the hazards of non-routine tasks (for example, the cleaning of reactor vessels), and the hazards associated with chemicals in unlabeled pipes.

If the workplace has multiple employers on-site (for example, a construction site), the rule requires these employers to ensure that information regarding hazards and protective measures be made available to the other employers on-site, where appropriate.

The written program does not have to be lengthy or complicated, and some employers may be able to rely on existing hazard communication programs to comply with the above requirements.

The written program must be available to employees, their designated representatives, the Assistant Secretary of Labor for Occupational Safety and Health, and the Director of the National Institute for Occupational Safety and Health (NIOSH).

LABELS AND OTHERS FORMS OF WARNING

Chemical manufacturers, importers, and distributors must be sure that containers of hazardous chemicals leaving the workplace are labeled, tagged or marked with the identity of the chemicals, appropriate hazard warnings, and the name and address of the manufacturer or other responsible party.
In the workplace, each container must be labeled, tagged or marked with the identity of hazardous chemicals contained therein, and must show hazard warnings appropriate for employee protection. The hazard warning can be any type of message, words, pictures, or symbols that convey the hazards of the chemical(s) in the container. Labels must be legible, in English (plus other languages, if desired), and prominently displayed.
Exemptions to the requirement for in-plant individual container labels are as follows:

- Employers can post signs or placards that convey the hazard information if there are a number of stationary containers within a work area that have similar contents and hazards.
- Employers can substitute various types of standard operating procedures, process sheets, batch tickets, blend tickets, and similar written materials

for container labels on stationary process equipment if they contain the same information and are readily available to employees in the work area.

- Employers are not required to label portable containers into which hazardous chemicals are transferred from labeled containers and that are intended only for the immediate use of the employee who makes the transfer.
- Employers are not required to label pipes or piping systems.

MATERIAL SAFETY DATA SHEETS

Chemical manufacturers and importers must develop an MSDS for each hazardous chemical they produce or import, and must provide the MSDS automatically at the time of the initial shipment of a hazardous chemical to a downstream distributor or user. Distributors must also ensure that downstream employers are similarly provided an MSDS.
Each MSDS must be in English and include information regarding the specific chemical identity of the hazardous chemical(s) involved and the common names.

In addition, information must be provided on the physical and chemical characteristics of the hazardous chemical; known acute and chronic health effects and related health information; exposure limits; whether the chemical is considered to be a carcinogen by NTP, IARC, or OSHA; precautionary measures; emergency and first-aid procedures; and the identification of the organization responsible for preparing the sheet.

Copies of the MSDS for hazardous chemicals in a given work site are to be readily accessible to employees in that area. As a source of detailed information on hazards, they must be located close to workers, and readily available to them during each work shift.

LIST OF HAZARDOUS CHEMICALS

Employers must prepare a list of all hazardous chemicals in the workplace. When the list is complete, it should be checked against the collected MSDS's that the employer has been sent.

If there are hazardous chemicals used for which no MSDS has been received, the employer must write to the supplier, manufacturer, or importer to obtain the missing MSDS.

EMPLOYEE INFORMATION AND TRAINING

Employers must establish a training and information program for employees exposed to hazardous chemicals in their work area at the time of initial assignment and whenever a new hazard is introduced into their work area.

INFORMATION

At a minimum, the discussion topics must include the following:

- The existence of the hazard communication standard and the requirements of the standard.
- The components of the hazard communication program in the employees' workplaces.
- Operations in work areas where hazardous chemicals are present.
- Where the employer will keep the written hazard evaluation procedures, communications program, lists of hazardous chemicals, and the required MSDS forms.

TRAINING

The employee training plan must consist of the following elements:

- How the hazard communication program is implemented in that workplace, how to read and interpret information on labels and the MSDS, and how employees can obtain and use the available hazard information.
- The hazards of the chemicals in the work area. (The hazards may be discussed by individual chemical or by hazard categories such as flammability.)
- Measures employees can take to protect themselves from the hazards.

- Specific procedures put into effect by the employer to provide protection such as engineering controls, work practices, and the use of personal protective equipment (PPE).
- Methods and observations--such as visual appearance or smell--workers can use to detect the presence of a hazardous chemical to which they may be exposed.

TRADE SECRETS

A "trade secret" is something that gives an employer an opportunity to obtain an advantage over competitors who do not know about the trade secret or who do not use it. For example, a trade secret may be a confidential device, pattern, information, or chemical make-up. Chemical industry trade secrets are generally formulas, process data, or a "specific chemical identity." The latter is the type of trade secret information referred to in the hazard communication standard. The term includes the chemical name, the Chemical Abstracts Services (CAS) Registry Number, or any other specific information that reveals the precise designation. It does not include common names.

The standard strikes a balance between the need to protect exposed employees and the employer's need to maintain the confidentiality of a bona fide trade secret. This is achieved by providing for limited disclosure to health professionals who are furnishing medical or other occupational health services to exposed employees, employees and their designated representatives, under specified conditions of need and confidentiality.

MEDICAL EMERGENCY

The chemical manufacturer, importer, or employer must immediately disclose the specific chemical identity of a hazardous chemical to a treating physician or nurse when the information is needed for proper emergency or first-aid treatment.

As soon as circumstances permit, the chemical manufacturer, importer, or employer may obtain a written statement of need and a confidentiality agreement.

Under the contingency described here, the treating physician or nurse has the ultimate responsibility for determining that a medical emergency exists.

At the time of the emergency, the professional judgment of the physician or nurse regarding the situation must form the basis for triggering the immediate disclosure requirement. Because the chemical manufacturer, importer, or employer can demand a written statement of need and a confidentiality agreement to be completed after the emergency is abated, further disclosure of the trade secret can be effectively controlled.

NON-EMERGENCY SITUATION

In non-emergency situations, chemical manufacturers, importers, or employers must disclose the withheld specific chemical identity to health professionals providing medical or other occupational health services to exposed employees, and to employees and their designated representatives, if certain conditions are met. In this context, "health professionals" include physicians, occupational health nurses, industrial hygienists, toxicologists, or epidemiologists.

The request for information must be in writing and must describe with reasonable detail the medical or occupational health need for the information. The request will be considered if the information will be used for one or more of the following activities:

- To assess the hazards of the chemicals to which employees will be exposed.
- To conduct or assess sampling of the workplace atmosphere to determine employee exposure levels.
- To conduct pre-assignment or periodic medical surveillance of exposed employees.
- To provide medical treatment to exposed employees.
- To select or assess appropriate personal protective equipment for exposed employees.
- To design or assess engineering controls or other protective measures for exposed employees.
- To conduct studies to determine the health effects of exposure.

The health professional, employee, or designated representative must also specify why alternative information is insufficient. The request for information must explain in detail why disclosure of the specific chemical identity is essential, and include the procedures to be used to protect the confidentiality of the information. It must include an agreement not to use the information for any purpose other than the health need stated or to release it under any circumstances, except to OSHA.
The standard further describes in detail the steps that will be followed in the event that an employer decides not to disclose the specific chemical identity requested by the health professional, employee, or designated representative.

IV. Occupational Health

Introduction:

Industrial hygiene is the science of anticipating, recognizing, evaluating, and controlling workplace conditions that may cause worker injury or illness.
Industrial Hygienists use environmental monitoring and analytical methods to detect the extent of worker exposure and employ engineering, work practice controls, and other methods to control potential health hazards.
By recognizing and applying the principles of industrial hygiene to the work environment, most workplaces will become more healthful and safer.

Worksite Analysis:

A workplace analysis is an essential first step that helps an industrial hygienist determine what jobs and work stations are the source of potential problems. During the worksite analysis, the industrial hygienist measures and identifies exposures, problem tasks, and risks.
The most-effective worksite analysis include all jobs, operations, and work activities. The industrial hygienist inspects, researches, or analyzes how the particular chemicals or physical hazards at that worksite affect worker health. If a situation hazardous to health is discovered, the industrial hygienist recommends the appropriate corrective actions.

Recognizing And Controlling Hazards:

Industrial hygienists recognize that engineering, work practice, and administrative controls are the primary means of reducing employee exposure to occupational

hazards.

Engineering controls minimize employee exposure by either reducing or removing the hazard at the source or isolating the worker from the hazard. Engineering controls include eliminating toxic chemicals and substituting non-toxic chemicals, enclosing work processes or confining work operations, and the installation of general and local ventilation systems.

Work practice controls alter the manner in which a task is performed. Some fundamental and easily implemented work practice controls include (1) changing existing work practices to follow proper procedures that minimize exposures while operating production and control equipment; (2) inspecting and maintaining process and control equipment on a regular basis; (3) implementing good housekeeping procedures; (4) providing good supervision; and (5) mandating that eating, drinking, smoking, chewing tobacco or gum, and applying cosmetics in regulated areas be prohibited.

Administrative controls include controlling employees' exposure by scheduling production and tasks, or both, in ways that minimize exposure levels. For example, the employer might schedule operations with the highest exposure potential during periods when the fewest employees are present.

When effective work practices or engineering controls are not feasible or while such controls are being instituted, appropriate personal protective equipment must be used. Examples of personal protective equipment are gloves, safety goggles, helmets, safety shoes, protective clothing, and respirators. To be effective, personal protective equipment must be individually selected, properly fitted and periodically refitted; conscientiously and properly worn; regularly maintained; and replaces, as necessary.

Examples Of Job Hazards

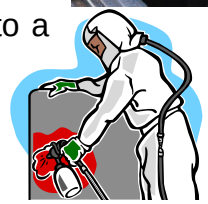
To be effective in recognizing and evaluating on-the-job hazards and recommending controls, industrial hygienists must be familiar with the hazards' characteristics. Potential hazards can include air contaminants, and chemical, biological, physical, and ergonomic hazards.

1. Air Contaminants

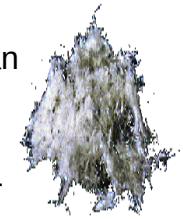
These are commonly classified as either particulate or gas and vapor contaminants. The most common particulate contaminants include dusts, fumes, mists, aerosols, and fibers.

Dusts are solid particles generated by handling, crushing, grinding, colliding, exploding, and heating organic or inorganic materials such as rock, ore, metal, coal, wood, and grain. Any process that produces dust fine enough to remain in the air long enough to be inhaled or ingested should be regarded as hazardous until proven otherwise.

Fumes are formed when material from a volatilized solid condenses in cool air. In most cases, the solid particles resulting from the condensation react with air to form an oxide. The term mist is applied to liquid suspended in the atmosphere.



Mists are generated by liquids condensing from a vapor back to a liquid or by a liquid dispersed by splashing or atomizing. Aerosols are also a form of a mist characterized by highly respirable, minute liquid particles.



Fibers are solid particles whose length is several times greater than their diameter, such as asbestos.

Gasses are formless fluids that expand to occupy the space or enclosure in which they are confined. They are atomic, diatomic, or molecular in nature as opposed to droplets or particles which are made up of millions of atoms or molecules. Through evaporation, liquids change into vapors and mix with the surrounding atmosphere.

Vapors are the volatile form of substances that are normally in a solid or liquid state at room temperature and pressure. Vapors are gases in that true vapors are atomic or molecular in nature.

2. Chemical Hazards

Harmful chemical compounds in the form of solids, liquids, gases, mists, dusts,

fumes, and vapors exert toxic effects by inhalation (breathing), absorption (through direct contact with the skin), or ingestion (eating or drinking). Airborne chemical hazards exist as concentrations of mists, vapors, gases, fumes, or solids. Some are toxic through inhalation and some of them irritate the skin on contact; some can be toxic by absorption through the skin or through ingestion, and some are corrosive to living tissue.

The degree of worker risk from exposure to any given substance depends on the nature and potency of the toxic effects and the magnitude and duration of exposure. Information on the risk to workers from chemical hazards can be obtained from the Material Safety Data Sheet (MSDS) be supplied by the manufacturer or importer to the purchaser of all hazardous materials. The MSDS is a summary of the important health, safety, and toxicological information on the chemical or the mixture's ingredients. Other provisions of the Hazard Communication Standard require that all containers of hazardous substances in the workplace have appropriate warning and identification labels.

3. Biological Hazards

These include bacteria, viruses, fungi, and other living organisms that can cause acute and chronic infections by entering the body either directly or through breaks in the skin. Occupations that deal with plants or animals or their products or with food and food processing may expose workers to biological hazards. Laboratory and medical personnel also can be exposed to biological hazards.

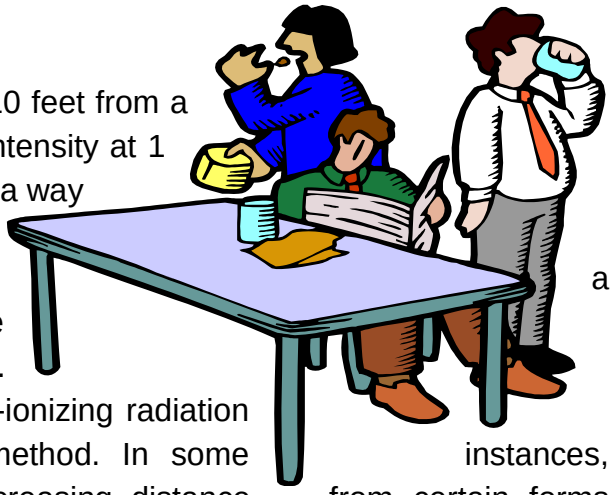
Any occupations that result in contact with bodily fluids pose a risk to workers from biological hazards. In occupations where animals are involved, biological hazards are dealt with by preventing and controlling diseases in the animal population as well as properly caring for and handling infected animals. Also, effective personal hygiene, particularly proper attention to minor cuts and scratches especially on the hands and forearms, helps keep worker risks to a minimum.

In occupations where there is potential exposure to biological hazards, workers

should practice proper personal hygiene, particularly hand washing. Hospitals should provide proper ventilation, proper personal protective equipment such as gloves and respirators, adequate infectious waste disposal systems, and appropriate controls including isolation in instances of particularly contagious diseases such as tuberculosis.

4. Physical Hazards

These include excessive levels of ionizing and non-ionizing electromagnetic radiation, noise, vibration, illumination, and temperature. In occupations where there is exposure to ionizing radiation, time, distance, and shielding are important tools in ensuring worker safety. Danger from radiation increases with the amount of time one is exposed to it; hence, the shorter the time of exposure the smaller the radiation danger. Distance also is a valuable tool in controlling exposure to both ionizing and non-ionizing radiation. Radiation levels from some sources can be estimated by comparing the squares of the distances between the worker and the source.



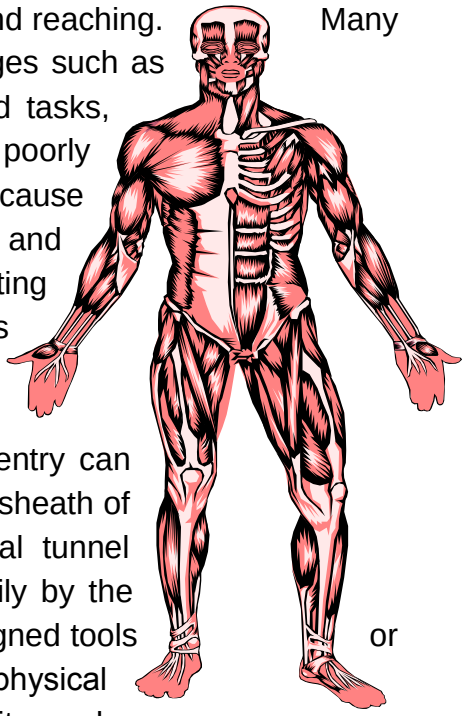
For example, at a reference point of 10 feet from a source, the radiation is 1/100 of the intensity at 1 foot from the source. Shielding also is a way to protect against radiation. The greater the protective mass between a radioactive source and the worker, the lower the radiation exposure. Similarly, shielding workers from non-ionizing radiation can also be an effective control method. In some instances, however, limiting exposure to or increasing distance from certain forms of non-ionizing radiation, such as lasers, is not effective. For example, an exposure to laser eradiation that is faster than the blinking of an eye can be hazardous and would require workers to be miles from the laser source before being adequately protected.

Noise, another significant physical hazard, can be controlled by various measures. Noise can be reduced by installing equipment and systems that have been engineered, designed, and built to operate quietly; by enclosing or shielding noisy equipment; by making certain that equipment is in good repair and properly maintained with all worn or unbalanced parts replaced; by mounting noisy equipment on special mounts to reduce vibration; and by installing silencers,

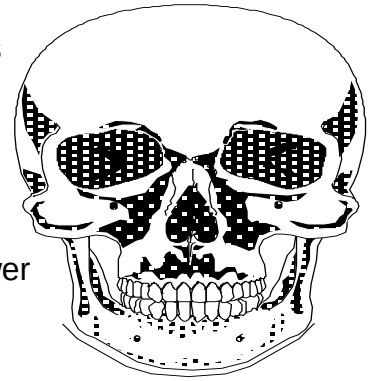
mufflers, or baffles. Substituting quiet work methods for noisy ones is another significant way to reduce noise – for example, welding parts rather than riveting them. Also, treating floors, ceilings, and walls with acoustical material can reduce reflected or reverberant noise. In addition, erecting sound barriers at adjacent work stations around noisy operations will reduce worker exposure to noise generated at adjacent work stations. It is also possible to reduce noise exposure by increasing the distance between the source and the receiver, by isolating workers in acoustical booths, limiting workers' exposure time to noise, and by providing hearing protection. OSHA requires that workers in noisy surroundings be periodically tested as a precaution against hearing loss. Another physical hazard, radiant heat exposure in factories such as steel mills, can be controlled by installing reflective shields and by providing protective clothing.

5. Ergonomic Hazards

The science of ergonomics studies and evaluates a full range of tasks including, but not limited to, lifting, holding, pushing, walking, and reaching. Many ergonomic problems result from technological changes such as increased assembly line speeds, adding specialized tasks, and increased repetition; some problems arise from poorly designed job tasks. Any of those conditions can cause ergonomic hazards such as excessive vibration and noise, eyestrain, repetitive motion, and heavy lifting problems. Improperly designed tools or work areas also can be ergonomic hazards. Repetitive motions or repeated shocks over prolonged periods of time as in jobs involving sorting, assembling, and data entry can often cause irritation and inflammation of the tendon sheath of the hands and arms, a condition known as carpal tunnel syndromes. Ergonomic hazards are avoided primarily by the effective design of a job or jobsite and by better designed tools or equipment that meet workers' needs in terms of physical environment and job tasks. Through thorough worksite analyses, employers can set up procedures to correct or control ergonomic hazards by using the appropriate engineering controls (e.g., designing or redesigning work stations, lighting, tools, and equipment); teaching correct work practices (e.g., proper lifting methods); employing proper administrative controls (e.g., shifting workers among several different tasks, reducing production demand, and increasing rest breaks); and, if necessary, providing and mandating personal



protective equipment. Evaluating working conditions form an ergonomics standpoint involves looking at the total physiological and psychological demands of the job on the worker. Overall, the benefits of a well-designed, ergonomic work environment can include increased efficiency, fewer accidents, lower operating costs, and more effective use of personnel.



HAZARD ABATEMENT

How Hazards are controlled at its source.

- Along its path. (Erect a barricade between the hazard and the worker.)
- At the worker. (Remove the worker from the exposure, such as automated/remote controls, worker rotation, providing PPE when all options have been exhausted.)
- Monitoring activities (locate new hazards and assess the effectiveness of existing controls.)
- Preventative and Corrective Measures
- The implementation of Control Measures:
    1. Administrative (through personnel, management, monitoring, limiting worker exposure, measuring performance, training and education, housekeeping and maintenance, purchasing.)
    2. Engineering (isolation of source, lockout procedure, design, process or procedural changes, monitoring and warning equipment, chemical or material substitution.)
    3. PPE (body protection, fall protection.)

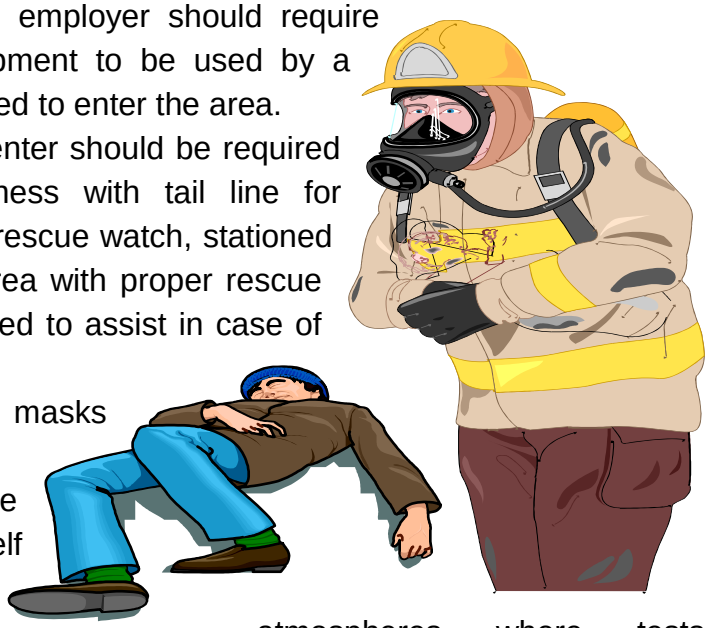
H2S or Toxic Gas Exposure

- Hydrogen Sulfide is highly toxic, colorless, and heavier than air. It has the odor of rotten eggs, initially.
- 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%.
- Its odor is NOT a reliable warning signal because higher concentrations of

the gas temporarily destroy the sense of smell. This is the primary reason for employees not detecting the presence of H2S and consequently inhaling a lethal amount. The only positive means is by testing with an approved H2S detector. ***DO NOT RELY SOLELY ON THE SENSE OF SMELL!***

GENERAL PROCEDURES

- Any area where H2S has been reported or encountered, or where the is insufficient oxygen, there should be NO entry until sufficient tests have bee made to determine the extent of the hazard and the area is purged to reduce the hazard to allowable concentrations.
- 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 required 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 readily available for consult on matters of occupational health. Emergency numbers should be conspicuously posted.



V. Specialized Work Procedures

A. Hazardous Energy Control (Lock-out/Tag-out)

Lockout/tagout procedures are for your safety.

They are designed to prevent accidents & 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.

control hazardous energy sources caused:

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

Scope and Application

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 following situations:

While servicing or maintaining cord and plug 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.)

What is Tag out?

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.

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.

- 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.
- 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...

Inspection Points – Administrative

- 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?
- Are 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?

B. Work Permits (Confined Space and Hot Work)

Introduction

Work permit systems are a major factor in the safety of the oil and chemical industries.

No construction, repair, maintenance work, dismantling or modification should be carried out anywhere inside a refinery without the authority of the manager or his authorized representative. In all cases except for work of a routine and non-hazardous nature, this permission should be given in the written form of a work permit

Definition:

work permit ;
Signed statement by an authorized person that a non-routine job may be carried out under precautions

Certificate;
Signed statement that specified checks or tests have been carried out by an authorized person and that conditions are acceptable. Certificate do not replace permits, they are complementary

Precaution statement;
List of safety measures to be taken before and /or during the work covered by work permit

Permit applicant [initiator]
The person who applies for permit Often foreman /supervisor responsible for its execution or the person who will carry out the job

Permit holder [operator]
The person who carries out the job or his immediate supervisors at the job site permit Applicant and Permit Holder can be the same person

Responsible operational
The person authorized to grant work permits in area concerned the area must be defined

Authorized gas tester

The person who is trained to perform as gas tests and issue gas test certificate

Non routine activities

Activities which are outside the regular operation of plant example maintenance

The objectives

- To ensure non routine activities carry out without any loss
- To make clear to the person(s) carrying out the job the risks involved an precautions to be taken,
- To ensure that the person responsible for an area of the installation is aware of all work being done there

Procedure prior to the issue of work permit

Before issuing a permit, the person signing it should inspect the site and satisfy himself that conditions and precautions covered by the permit will render the operation safe.

The safety considerations to be stipulated on the work permit should be arrived at by full consideration of all the factors relating to both the work to be carried out and its location.

Firstly consider the equipment to be worked on to determine whether hazardous liquids or vapors may escape during the work.

Secondly consider the method of doing the job to assess whether this will introduce any potential hazards (e.g. sources of ignition).

Thirdly consider the location in relation to other equipment (e.g. furnaces, vents, drains) to assess the likelihood of a hazard affecting the job. The consideration of these factors can be aided by the use of a systematic checklist on the work permit form, but should include any additional factors that may be necessary to ensure full safety during the job. Gas-free or other testing requirements should be stipulated at this stage.

The factors to be considered should include the following; it is necessary to assess these conditions not just at the time of issuing the permit but on a continuing basis to cover the full period of the work to be carried out .

Isolation from sources of flammable, hot or dangerous liquids, gases, pressurized systems or radiation sources. Isolation may be by locking isolation valves of the double block and bleed type,

work permit should contain:

- A clearance certificate
- A checklist for other certificates which may be required
- A checklist for required safety precautions
- A section for validity and renewal of the permit
- A section for hand over of the work.

- **Clearance Certificate**

Which can that the equipment has been drained of liquid, depressor of gas and isolated from other equipment in the installation and from power sources. This certificate forms part of the Work Permit itself because it is required for every non-routine job.

- **Gas Test Certificate**

Which can either refer to entry into a confined space (i.e. safe atmosphere for breathing) or to hot work (i.e. atmosphere free from flammable vapor). As a “Hot Work Gas Test Certificate" is frequently required, it is often included as a separate section on the Work Permit form.

- **PROCEDURE**

CAN BE GRUPED INTO

1. **Job preparation**
2. **Job execution**
3. **Job completion**

- **Hot work program**

The area is periodically surveyed to ensure the conditions remain suitable for hot work and shall be re-surveyed following all breaks, meals, meetings or other interruptions in the work.

- Continuous monitoring should be provided in areas where changing conditions are likely or in high risk areas such as in tanks or in the process areas of plants.
- If conditions change so that hot work under a permit expires due to potential danger (hydrocarbon leak) no work will be resumed until additional testing is conducted. The source of gas must be determined and the area is again safe to resume work and a new/revised permit is properly issued.
- No hot work shall begin if a lower explosive limit (L.E.L.) grater than 10 percent is measured. No exceptions to this rule shall be made.

- Hot oil units must be located at least 150 feet from any combustible or flammable vapor source.
- A fire watch must be on duty at all times during the performance of the work and the Responsible Supervisor shall review his duties which include:
- Survey the area to be sure the necessary fire protection equipment is in place and ready for use.
- Survey the area for combustible or flammable materials.
- Having the fire extinguisher in position prior to the start of work. The extinguisher nozzle must be at hand while the hot work is being performed.
- **CONFINED SPACE ENTRY CERTIFICAT**

Confined space is defined as any task, vessel, pit, or open-topped space more than 4 feet deep or any other enclosed space that is not designed for routine employee occupancy, and has one or more of the following characteristics:

1) Contains an actual or potentially hazardous atmosphere
2) Makes ready escape difficult
3) Restricts entry for rescue purposes

The Operating Supervisors are responsible for implementing and enforcing the confined space entry certificate.

General Requirements while the Permit is in operation:

- Before entering the interior of any vessel or tank, it washed be drained, washed, and purged to the extent practical.
- Blind all necessary flanges or disconnect all lines which may carry harmful agents.
- Lockout and tag all necessary pumps, motors, or any other energy source to ensure complete isolation of the confined space.
- Use ventilation equipment that must be hazard classed for the area it will be used in.
- The atmosphere must be tested for oxygen content, flammability (LEL), and any suspected toxic contaminants such as hydrogen sulfide.

- The individual conducting the test shall wear a SCBA (self-contained breathing apparatus) or airline positive pressure respirator with egress bottle.
- AU equipment used for atmospheric testing shall be calibrated and operationally checked prior to use.
- The percentage of oxygen for unprotected entry into a confined space shall be no less than 19.5% nor greater than 23.5%. The oxygen level must be monitored before the flammability test is conducted.
- Portable or fixed DANGER signs must be posted at all point(s) of entry to the confined space which may not be safe for unprotected entry or signs which shall state Confined Space - Entry Permit Only.
- A vessel or confined space entry permit must be completed by the company supervisor authorizing entry into the confined space.
- Place the permit in a transparent envelope at the entrance of the confined space during performance of work.
- Continuous monitoring shall also be conducted for toxic gases which may be released during the course of the work.
- Proper personal protective equipment (gloves, goggles, hearing protection, etc.)Shall be used where applicable.

VI. Fire Safety

Introduction:

This lecture is discussing in brief: What is fire, classes of fires, different types of fire extinguishers, how to use each type of extinguisher, methods of fire extinction and how to extinguish all classes of fires.

The guidance also discusses, fire prevention measures and how to act correctly in case of emergencies.

What Is A Fire?

Simply fire is a chemical reaction which involves rapid oxidation or burning of a combustible material.

In the past, we learned that three elements, fuel, heat, and oxygen were necessary for fire to start and continue burning, hence the fire triangle concept.

In recent years this concept has been expanded to include a fourth element, that of chemical reaction, thus creating the fire tetrahedron.

Fig. 1 : Fire Tetrahedron

The following is a brief description of each element and their interaction:

1-Fuel (Combustible Substances):

Combustible substances exist as Solids, Liquids and gases.

Solids : Such as wood, paper, cartons, cloth.
Liquids: Such as M. Gasoline, Solvents, Alcohols.
Gases: Such as Propane, Butane, Hydrogen.

2-Oxygen:

All combustible substances need oxygen to burn. Oxygen is normally available in the air in sufficient quantities (21%). There must be at least 16% oxygen present for a fire to burn.

All substances (fuel) will only burn in air if the ratio between the air and the vapor of these substances lies between certain limits. If too much, or too little fuel is present, burning will not take place.

These limits are referred to as the lower and upper limits of flammability.

3-Heat (Source of Ignition):

Heat is the energy needed to increase the fuel's temperature to the point where sufficient vapors are produced for ignition to occur. The sources of ignition which can produce enough energy are:

A- Electricity:

- Electricity is the most common and costly ignition source of fires and explosions.
- How can Electricity Starts a Fire?
  - By overloading an outlet.

- Faulty installation of wiring (Loose connections).
- Damaged wire or cable's insulation.
- Electrical malfunction of motors.

B- Smoking:

- A fire caused by the misuse of smoking materials (cigarettes) is the second major source of ignition.
- Many of these fires have been the result of smoking materials dropping into holstered furniture and producing smoky and toxic smoldering fires.

C- Cutting and Welding (Hot Works):

- Hot works includes brazing, cutting, grinding, welding, soldering, using torches etc., fires that are ignited by hot work result from sparks or globules of molten metal that generated.

D- Open Flames:

- Open flames include portable torches, cigarettes, lighters, matches, space heaters etc.

E- Hot Surfaces:

- This category includes those instances where heat is carried by conduction from the surface of electrical heating equip., boilers, furnaces, ovens etc. to adjacent combustibles and causes fires.

F-Spontaneous Ignition:

- Some materials oxidize and throw off heat. If those materials are confined, that heat cannot escape, then ignition can result.
- Some products that heat spontaneously are animal and vegetable oils , also paint deposits that contain drying oil may spontaneously ignite . Also rags contaminated with oil may ignite spontaneously.

G-Static Sparks:

- Static electricity occurs between two objects in contacts. Electrical charges are produced on the objects when they are separated. If these charges build up, it will develop enough energy to jump as a spark to nearby grounded or less highly charged objects.
- These sparks can ignite flammable vapors, flammable gases or finely dispersed combustible solid materials.

H-Friction:

Friction generates heat, in machinery, loose or worn moving parts rubbing against each other can generate enough heat to ignite nearby combustibles.

4-Chemical Reaction:

The chemical chain reaction known as fire, occurs when fuel, oxygen, and heat are present in the right conditions and amounts.

Classes of Fires:

Fires are classified by the fuel they burn. There are four classes according to the American system:

1- Class A Fires:

- These are fires involving ordinary combustibles:
- Cloth, wood, paper, rubber, many plastics.
- The most effective extinguishing agent is WATER, and dry chemical rated for A, B, and C fires.

2- Class B Fires :

- These are fires involving flammable and combustible liquids such as: Motor Gasoline - Solvents (Acetone) - Alcohols.
- The extinguishing agents include: Foams - Dry Chemicals - Carbon Dioxide.

3- Class C Fires :

- Fires that involves energized electrical equipment where the electrical non - conductivity of the extinguishing agent is of great importance.
- The extinguishing agents are: Dry Chemical - Carbon Dioxide - Halons.

Water or any fire extinguisher contains water or any agent mixed with water are not allowed to be used on fires involving live electrical equipment, since water is a good conductor of electricity.

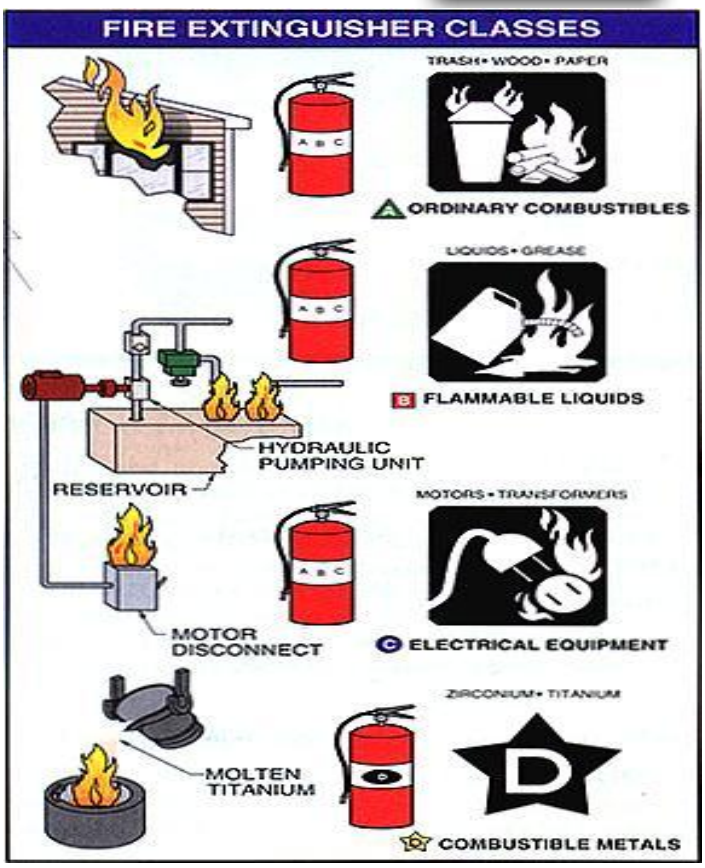
4- Class D Fires:

- These are fires involving metals such as: Sodium - Potassium Magnesium.
- Special types of fire extinguishers is used to extinguish such fires

Fire Extinguishers:

There are six types of Fire Extinguishers***:***

- Water Fire Extinguishers
- Foam Fire Extinguishers
- Dry Powder Fire Extinguishers
- Carbon Dioxide Fire Extinguishers



General Rules for Using Portable Fire Extinguishers:

1- Fight the fires in up wind direction.
2- Start fighting the fire from safe distance (2 - 5 m) away from the flame.
3- Direct the stream to the base of the fire.

4- Sweep the stream from side to side.

5- Do not leave the fire area unless you are sure that the fire is completely out. If the fires re-ignite, repeat the process.

VII. Materials Handling

Tools-Hand and Power

Introduction:

Some jobs would be impossible without using hand tools. Everyone is familiar with common, everyday hand tools, but you should not take them for granted. Hand tools mishaps can cause serious injuries. If you know how to use the tools and take care of them, you will have better chance of avoiding an injury.

Tools Injuries:

There are many types of injuries that can be caused by tool use. Serious eye injuries can result if materials shatter while using hammers or mallets. Filling or chiseling creates chips that can get into your eyes. While you are looking up to use tools above your head, dust and debris can fall into your eyes.

A screwdriver could slip and cause puncture wound. If a knife slips, you could cut a tendon, artery, or nerve. Tool use presents plenty of other opportunities for minor scrapes, cuts, or bruises.

Avoid Tool Injuries:

Tool injuries can be prevented by keeping tools in good condition, using the right tool for the job, using the tool properly, and setting up the work so you are not straining yourself, and wearing personal protective equipment.

- Always wear safety glasses when using hammers, chisels, punches, wire cutters, saws, files, crowbars, bolt cutters, or any tool that could create chips or pieces.
- Wear cut resistant gloves when handling knives or other sharp edges.

- Arrange the work and use tools so that the tool will move away from your hands and body if slips.
- Make sure that the material you are working on is held securely – use clamps or a vise if you need to.
- Stand where you have firm footing and good balance while you use tools.

Select the Tool You Need:

- Use durable tools made from good quality materials.
- Metal tools should have working points that resist bending, cracking, chipping, or excessive wear from normal use.
- Handles should be made of a durable material that does not crack or splinter easily if the tool is dropped or hit.
- You may need a handle with a cushioned grip to help absorb impact or squeezing pressure.
- Selecting tools with comfortable grips eases strain and gives you better control over the tool.
- Pay extra attention to any tools that you will be using around electrical parts. Make sure that the handles is electrically insulated and rated to handle the voltage.
- If you need to use tools to work in areas where flammable liquids are stored or used, the tools must be made from non-sparking alloys in order to prevent sparks that can ignite flammable vapors.

Use the Right Tool the Right Way:

Look at your hand tools. Their shape and design shows you how they are intended to be used.

Knives:

Using knives as pries, screwdrivers, can openers, awls, or punches can easily damage the blade. A sharp blade needs less pressure to cut and has less of a chance of getting hung up and slipping. Always move the blade away from you as you cut.

Screwdrivers:

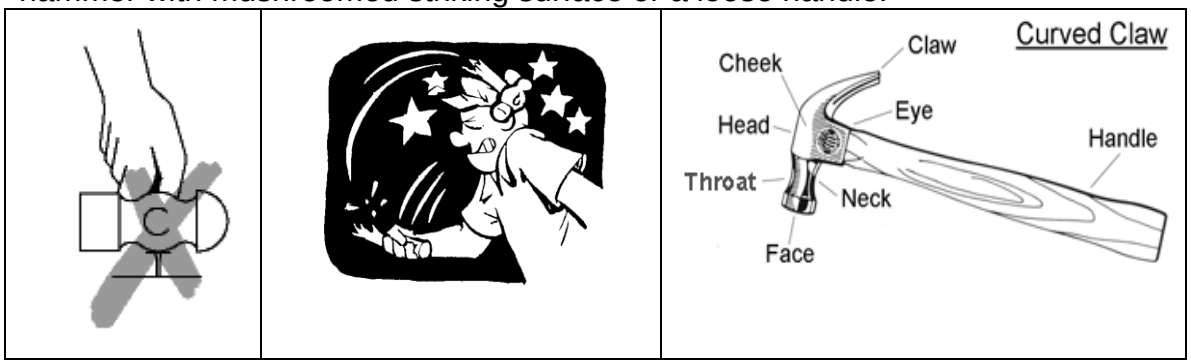
Screwdrivers are made in various shapes and sizes and for many uses. Use the correct screwdriver for the job.

- Use a slot screwdriver with a blade tip width that is the same as the width of slotted screw head.
- Keep the screwdriver handle clean. A greasy handle could cause an injury or damage from unexpected slippage.

- Store screwdrivers in a rack or partitioned pouch so that the proper screwdriver can be selected quickly.
- Do not hold the stock in one hand while using the screwdriver with the other. If the screwdriver slips out of the slot you may cut your hand.
- Do not try to use screwdrivers on screw heads for which they are not designed.
- Do not use defective screwdriver (i.e. ones with rounded or damaged edges or tips; split or broken handle; or bent shaft.
- Do not use screwdrivers for prying, punching, chiseling, scoring, scraping or stirring paint.
- Do not carry screwdrivers in your pockets.

Hammers and Mallets:

Nail hammers are designed to drive nails. Mallets have a striking head of plastic, wood, or rawhide and are designed for striking wood chisels, punches, or dies. Another type of hammers is designed for striking concrete or stone. You can damage a hammer by trying to use it for the wrong purpose. Do not use a hammer with mushroomed striking surface or a loose handle.



Pliers:

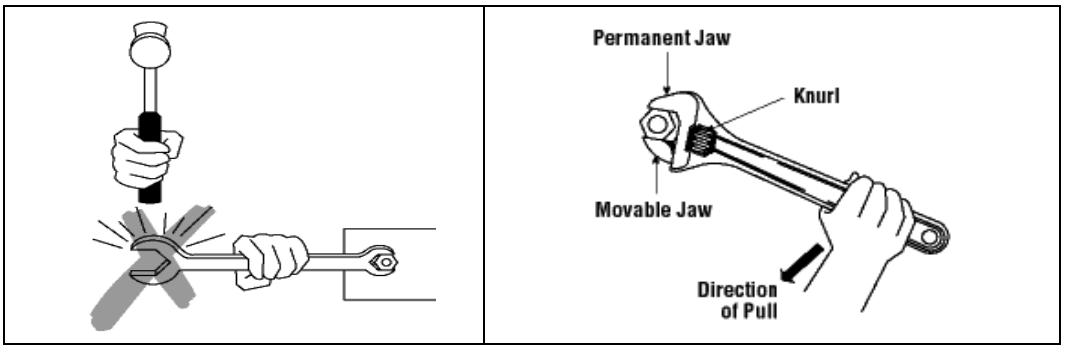
Do not substitute a plier for a wrench. The face of the pliers is not designed to grip a fastener, and the pliers can easily slip off of the nut or bolt. Pliers are designed for gripping so you can more easily bend or pull material. They will provide a strong grip if you protect them from getting bent out of shape and keep the gripping surface from being damaged.

Cutters:

Use cutters or snips to remove banding wire or strapping. Trying to use a pry bar to snap open banding can cause injury. Keep the cutting edges sharp and protect them from getting nicked or gouged.

Wrenches:

- Use adjustable open-ended wrenches for light-duty jobs when the proper sized wrench is not available.
- Position yourself so you will be pulling the wrench towards you, with the open end facing you.
- Box and socket wrenches should be used when heavy pull is required, because they completely encircle the fastener.
- Do not try to increase the torque by hitting the wrench with hammer or by adding a cheater bar to the wrench's handle – This can break or damage the wrench.
- If the fastener is too tight, use some penetrating oil to lubricate it.



Wood Saws:

- Select a saw with coarse teeth for sawing green wood, thick lumber, or for making coarse cuts.
- Select a saw with fine-toothed to make fine cuts in dry wood.
- After use, wipe the saw with a lightly oiled rag to keep the teeth clean.
- Protect the saw from getting bent or damaged in storage.

Metalworking Hand Tools:

- Hack saws should have the blade installed with the teeth facing forward, and apply pressure on the forward stroke. Use a light pressure to avoid twisting and breaking the blade.
- Metal files need to be kept clean and protected from damage. Use files with proper handles.

Maintain Your Tools:

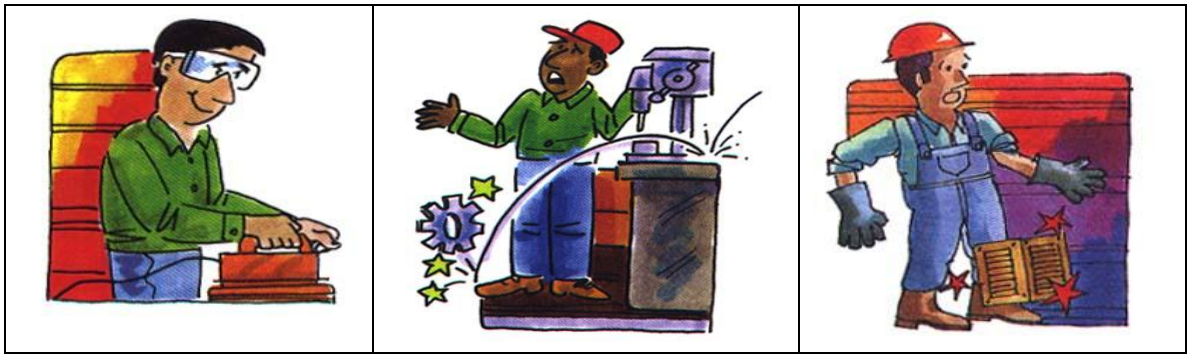
Tools will last longer when you take care of them:

- Inspect tools before you use them and before you put them away.

- Maintain and repair tools before it is too late. Sharpen cutting edges regularly. Avoid waiting until they are completely dull before trying to sharpen them. Replace loose handles on hammers or mallets.
- Keep tools clean. Grease and dirt can hide damage, and prevent you from getting a good grip when you use the tool.
- Discard damaged tools. Striking tools with mushroomed surfaces, screwdrivers with rounded edges or bent shafts, or bent pliers are examples of tools that can cause more harm than good.

Work at Working Safely:

- Take out only the tools that you will need for the job. Piles of extra tools can get in the way or get lost.
- Carry your tools safely. Use a tool box or a tool chest to move tools around. If you need to carry tools, especially on a ladder, wear a tool belt. If you are working on a platform or a ladder, keeping the tools in your tool belt helps keep them from being dropped onto unsuspecting victims below.
- Always wear appropriate personal protective equipment



WORKPLACE HEALTH PROGRAM ELEMENTS

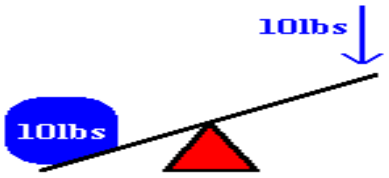
- Back Safety and Lifting
- The Force is Against You

The Forces Involved

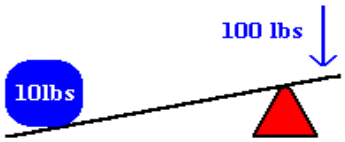
- The amount of force you place on your back in lifting may surprise you!

- 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.

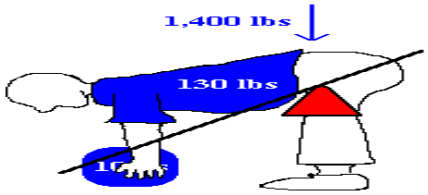
- If you shift the fulcrum to one side, it takes much more force to lift the same object. Your waist acts like the fulcrum in a lever system, on a 10:1 ratio. Lifting a ten pound object puts 100 pounds of pressure on your lower back.



- 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.



Common Causes of Back Injuries

- Anytime you find yourself doing one of these things, you should think; DANGER! My back is at risk! Try to avoid heavy lifting, especially repetitive lifting over a long period of time

Prevent 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.

Help Your Back

- Things You Can Do
- Minimize problems with your back by exercises that tone the muscles in your back, hips and thighs.
- Before beginning any exercise program, you should check with your doctor

VIII. First Aid

Introduction:

Accidents in the workplace are all too frequent; most of them are minor and need only a sterile plaster or a rest for a little while. But in some cases the accident will be more serious and will need the attention of a trained First Aider.

This guidance is designed to raise awareness of first aid in the workplace and give you some very simple tips so that you will be able to help in the event of a serious accident.

First Aid:

First aid is not just putting a bandage on a wound or rolling a person into the recovery position, it is much more!

First Aid is literally the **first aid** given to any person who is required or has been taken ill.
You may only be able to give comfort or be a reassuring voice in the midst of a person's distress, while you wait for trained help to arrive. These actions could be the most effective **First Aid** in that situation. A cool, calm and comforting voice can have a major effect on the state of an injured or ill person.

The 3 P's:

Any first aid treatment given must be based on the three P's:

- **Preserve** life
- **Prevent** the condition getting worse
- **Promote** the recovery and well being of the ill and injured person.

You're Safety:

Before you can attend to any casualty, you must assess the situation for your own safety. Be sure that you will not become the next person to become the injured or ill.
Also an assessment will give you those vital indications to what might have happened. They must be done quickly and calmly so don't panic.

Never move the casualty unless he or she is in extreme danger of further serious injury or death

The ABC of Dealing with an Unconscious person:

There is a great danger of brain damage to the unconscious person if action is not taken quickly. (Within 3 – 4 minutes after breathing stops brain damage could start) Take the following steps:

- Look for a response by speaking in a louder voice and gently shake the casualty on the shoulder. If there is no response,
- Check the Airways. They might have "swallowed their tongue". Open the airway by lifting the chin and tilting the head back.

Open the airway by lifting the chin and tilting the head back

Closed airway preventing breathing (Swallowed Tongue)

Open airway allowing breathing

- Check for Breathing. This is done by putting the side of your face close to the mouth of the casualty and looking down the chest. If the casualty is breathing, you should see either the rise of the chest or feel the movement of air across the side of your face. If there is no breathing, you will need to breath for the casualty!

- Open the mouth and remove any obstructions. Maintain the tilted head position, pinch the nose closed, place your mouth over the casualty's mouth to form a seal and give a steady blow of about 2 – 3 seconds. Move away from the mouth, breath yourself and repeat the action. This will force air into the lungs.

Remember A B C -

- Airways
- Breathing
- Circulation

- Once you have inflated the lungs you need to check for the casualty's Circulation. This is done by taking the pulse, best found at the side of the neck (the carotid pulse). You should feel the pulse coming from the heart to the brain. If you cannot feel any thing, try again, take your time, 10 – 20 seconds or so, be sure, don't panic.

If your casualty has not started breathing and you have not found a pulse you may have to start mouth to mouth resuscitation and chest compressions.

After each cycle of 15 compressions you will need to give 2 breaths

Get yourself in a comfortable position next to the casualty. To get the right place on the chest, measure two fingers up from the base of the breath-bone. Place the heel of one hand on the middle of the chest – over link your other hand.

You will need to compress the chest about 2 inches (5 cm) to be effective at a rate of 15 compressions in each cycle. After each cycle of 15 compressions, you will need to give two breaths, as you did before. You must maintain these actions until help arrives. Do not stop.

Compress the chest about 2 inches at a rate of 15 compressions in each cycle

If at this point the casualty starts to come around you will need to place him or her in the recovery position.

The Recovery Position:

The recovery position will maintain the casualty in stable position allowing you to get help or a first aid kit.

<table>
<tr>
<td> 
Kneel next to the casualty</td>
<td>2. 
Lift the nearest arm to you in a right angle, palm up!</td>
</tr>
<tr>
<td>3. 
Pull up the opposite knee</td>
<td>4. 
Grab the opposite hand and lift arm over to cup the head</td>
</tr>
</table>

5.  *Grab a belt loop or shirt top and roll casualty towards you*	6.  *Make sure the airway is open and monitor the casualty's condition until help arrives*

Bleeding:

If you come across a person who is bleeding you should apply direct pressure to the wound with a clean dressing. This will slow the flow of blood.

Great care must be taken with a head wound; direct pressure may not be possible, so apply a pad over the wound with very little pressure.

Raise the bleeding wound above the level of the heart if possible. This will also slow the flow of blood.

Note: Blood has the potential to carry such things as HIV and Hepatitis. Care should be taken when being exposed to the blood of other people. If you have plastic or latex gloves wear them to protect yourself.

Fracture:

Broken bones can be very painful and will cause the casualty great distress. Try not to move the casualty, give them a lot of comfort and reassurance. If you have to move the casualty, make sure that you immobilize the broken limb with a sling or bandages.

Burns:

A chemical burn

Burns are very painful and dangerous injuries. They must be drenched in clean water continuously.

Never:

- Remove clothing stuck to the burnt area.
- Burst blisters.

Even small burns can be dangerous and need treating with care. Any burn could bring on the biggest killer of all Shock. Seek urgent help.

Shock:

Shock is one of the biggest killers in accidents. Seemingly small injuries can bring on shock, making any injury potentially life threatening.

But be alert for the key symptoms:

- Cold, clammy sweating skin
- Raised pulse rate
- Pale skin color

Calm, comfort, warmth and care will help to reduce the effects of shock. Always seek medical assistance.

Electrical Shock:

Electricity shocks kill frequently. If you come across a shocked person **do not touch them** until you have switched off the flow of current.

Don't touch a shocked person until it's safe

Electric shocks can cause the heart to stop and induce breathing to stop. It can also cause burns both surface and internal.

You must treat a shocked person with the **ABC** routine. Once revived put casualty into the recovery position

Turn off flow of current

Hospital treatment must be received even for what you might think is a light shock, there could be internal damage to organs or tissues.

Sprains and Strains:

These injuries are common after slips, trips and lifting loads. They are not life threatening but very painful and uncomfortable; they are fairly easy to treat. Apply a cool compress to reduce swelling, a supporting bandage (not too tight, it might stop the flow of blood) and elevate the injured part. Ensure the person has plenty of rest.

X. Emergency Response

- The response section outlines the various functions implemented during an actual emergency, including the applicability of various support systems.
- Also discusses using dispersion and other accident-consequence modeling to aid in shaping the plan and summarizes personnel training necessary for a reliable and appropriate response.

What is an emergency?

An emergency is any unplanned event that can cause death or significant injury to employees, customers, or the public.

An emergency can shut down your business or organization, disrupt operations, cause physical or environmental damage, and/or threaten the facility's financial standing or public image.

Emergency management is the process of preventing, preparing for, responding to, and recovering from an emergency.

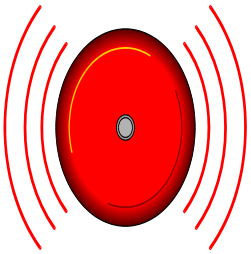
The Six Elements of an Emergency Action Plan

- Emergency escape procedures and escape route assignments.
- Procedures to be followed by employees who remain to operate critical plant operations before they evacuate.
- Procedures to account for all employees after emergency evacuation have been completed.
- Rescue and medical duties for those employees who are to perform them.

- The preferred means of reporting fires and other emergencies.

- Names and regular job titles of persons or departments who can be contacted for further information or explanation of plan duties.

Warning Systems and Emergency Alarms

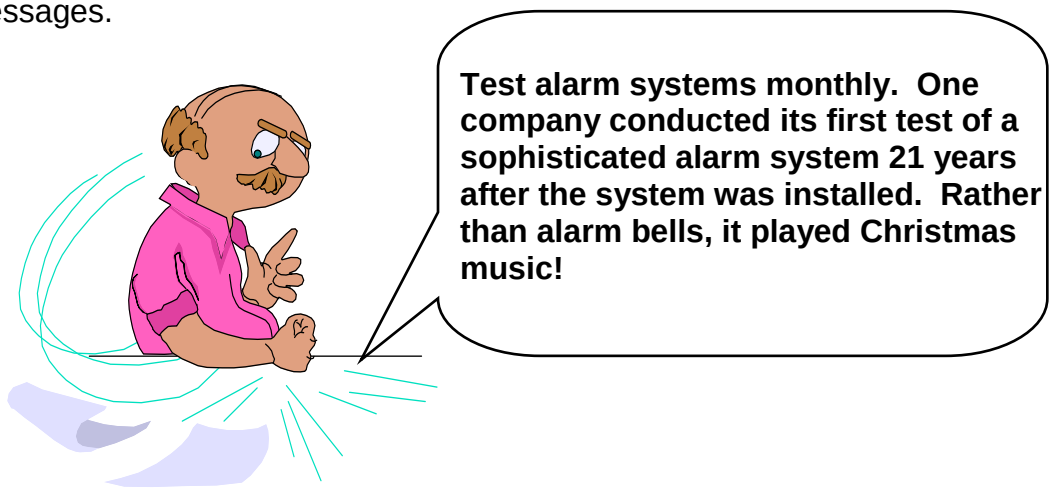


- Alarm must be capable of being perceived above ambient noise or light levels by all employees affected.

- Tactile devices, vibration, or forced air may be used to alert those who would not otherwise be able to recognize an audible or visual alarm.

- The alarm must be distinctive and recognizable as a signal to evacuate the work area or to perform actions designated under your emergency action plan

- Where a communication system also serves as an alarm system, all emergency messages shall have higher priority over all non-emergency messages.



- To develop effective response tactics, the planner must assess and consider several general factors for each credible incident:

- **Processes**—pressure, temperature, chemical reactions.

- **Usage**—what form the material is in (solid, liquid, or gas), what quantities are involved.

- **Material Transfer** —the movement of materials throughout the system, including on-site tanker and rail car deliveries, loading and unloading fixed tanks, compressed gas, and pipelines.

- **Storage**—any materials needing isolation or segregation, including proper containment, with emphasis on compatibility and quantities.

- ***Plant Fire Response Organization***
    - *Fire-Fighting Brigade*
    - *Equipment*
    - *Personnel Availability*