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### Appendix "A" : treatment for electrical shock

**Section 1 : safety program**

In this setion , the mangment has established the following general rules and regulations in ordr to attain the lowest possible accident frequency and to provide a safer working environment for all employees

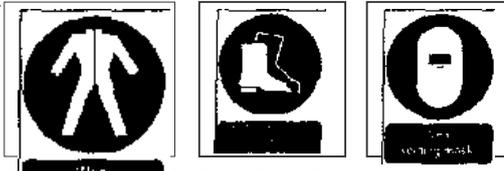
**Sub section A general rules**

All personal are required to confirm to all rules of conduct relating to safety while on the project job site Iperformence of work duties . it is the resbonsibility of ever employee to prevent injury to himself and To other people . deliberate non- compliance with company safety rules will result in disciplinary Action against the employee concerned .

**1) Standard work dress**

all construction workers shall wear clothing appropriaite to the individual work assignment  
1.1 personal whose work express them to rotating or reciprocating machines must avoid the following on the job site :

- a ) severely torn clothes
- b) rings
- c) loose sleeves
- d) watches
- e) loose long hair



1.2 all workers must avoid the use of sandals , or snoes that have been slit .

all employee are encouraged to keeb their working shoes in good repair . shoes with thin and worn soles should not be permitted in the job site

1.3 the company may issue at its discretion items of work clothes , such as overalls , boots , etc these remain the property of the company .

**2) personal conduct**

the following prohibitions shall be observedc by all employee present on the job (whether working or not ) :

- 2.1 to indulge in practical jokes , horseply , wreseplay , etc .
- 2.2 to destroy or tamper eith safety devices , sings , and singles .
- 2.3 to willfully and unnecessarily discharge fire extinguishers .
- 2.4 to sleep anywhere on the job site .



**3) equipment opertation**

only suitably qualified employee shall be allowed to operate mobile/ power construction equipment . the non-authorized use by unqualified personal of construction plant as trucs, loaders , cranes , excavators, will result in sever disciplinary action against the person (s) concerned  
all operators of mobile construction equipmebment shall comply with all posted limits and safety proc dures. All mobile equipment used in construction must be provided with back- up alarm that is clearly audible above the surrounding nosie.

**4) insuborination**

insubbordination toward any supervisor or toward mangment personal in to carring out properly issued inststructions or order for safety purposes shall be sufficient cause for disciplinary action in accordance with established and posted disciplinary procedures , dismissal



**5) reporting injuries , illness and property damage**

- 5.1 all employee shall immediately report injuries , regardless of their apparent severity . to their supervisor , to ensure that proper and adequate attention is obtained .
- 5.2 occupational injuries and illness , the first symptoms of which become evident after completion of the shift , shall be reported to once to the employees immediate supervisor.
- 5.3 all accidents that result in injury to third parties such as employees of another contractor or private vehicle driver , passenger, pedestrian or job site visitor shall be reported promptly to supervisor .
- 5.4 all accidents that result in damage to any constructed or partially constructed facility , to construction equipment or to private property shall be reported to the supervisor
- 5.5 all occurrences in which injury or serious property damage was prevented by fortuitous circumstances or deliberate preventive action , shall be reported promptly to the supervisor.



**6) reporting unsafe conditions**

in order to prevent injuries or damage , employee shall promptly report all observed unsafe condition

**7) correction unsafe acts**

generally , accidents result from two sources – unsafe acts and unsafe condition .

when conditions are unsafe , the supervisor should correct at once , either by instructing the employee how to work in the safe manner or by having the physical condition that could result in injury to personnel or property immediately corrected .

**8) personal protection**

all construction workers must wear hard hats of approved form at all times on the job site .

other approved protective equipment such as goggles , face shields, toe guard and safety belts shall be issued and used when required . if additional safety devices are required , the foreman or the supervisor shall be contacted without delay .

**9) protective equipment for specific use**

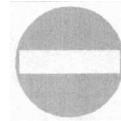
- a. safety belts must be worn by construction personnel working at elevated levels which are not protected by handrails or when working from suspended scaffolds, or in other situations of high risk such as close to strong water flows .
- b. respiratory protective devices  
dust respirators should be used where airborne contaminants such as dust , fumes, smoke , vapors, etc , exist. Other types of respirators will be required where concentration of toxic gas exists . the section supervisor will advise you .
- c. maintenance  
all protective clothes and equipment must be maintained in proper condition so that they will serve their intended purpose at all times . do not accept or allow use of defective equipment .

## 10) mechanical safeguards

- a. starting and operating machines  
only authorized and qualified employees are allowed to start and operate any mechanical equipment .
- b. machinery and tool guards  
machinery and tool guard must be provided for protection against revolving or reciprocating parts these guards shall be in place before the machine or tool is used and shall not be removed or made inoperative except during repairs.

## SUB SECTION B ROAD CONSTRUCTION

### 1) TEMPORARY TRAFFIC SIGNS



The following general rules apply to the use of all temporary traffic sign .

- 1.1 all necessary signs should in place , before any new route or detour is opened to traffic or before any work creating a dangerous condition is begun .
- 1.2 signs required by specific road conditions or restrictions should be immediately removed when these condition cease to exist . guides signs directing traffic to temporary routes should be removed when no longer applicable .
- 1.3 all signs for specific night time use must be reflective or illuminated by white light .
- 1.4 all signs should be placed at approximately right angles to the direction of traffic and at least 1.6 mt . (5 feet) above the road surface .
- 1.5 all signs should be inspected daily to assure that they are in proper position , clean and legible at all times . damaged signs should be replaced immediately .
- 1.6 sign should always conform to standard shapes and colors .
- 1.7 all signs should be securely installed .

### 2) barricades and fences



- 2.1 when all or major portion of the roadway is blocked to traffic , substantial fence barricades should be erected . dimensions may vary but the overall height should be at least 120 cms and when total closures is intended , the barricade should extend to the curb or ditch line on both sides .
- 2.2 there should be a minimum of two horizontal rails and these should be alternately striped at a forty five –degree angle pointing down in the direction the approaching traffic is to follow

## Subsection C : General excavation and trenches

- 1) Excavation works adjacent to roadways should be properly barricaded and posted

- lighting shall be provided during the hours of darkness .
- 2) pedestrian traffic should be protected by guard rails or fences and never be routed into the street without protection.
  - 3) when employees are working in a trench 1.2 m (4ft ) or more deep , one or more ladders shall be placed in the trench . ladders shall be placed at 15 m (50 ft ) intervals, but in no event shall a person in the trench be more than 4.6m (25 ft ) from a ladder .
  - 4) excavations and trenches 1.5 m (5 ft ) or more in depth and located in unstable or soft ground shall be shored or sloped in an approved manner . care should be taken to see that sole pieces of shoring are on solid ground .
  - 5) shoring and walls should be protected against damage from swinging loads being hoisted . trenches in hard compact material shall be shored or otherwise protected when 1.5 m or more deep . sides of trenches may be sloped in lieu of shoring but the slope may not be steeper than a 2 unit rise for each  $\frac{3}{4}$  unit horizontal .
  - 6) excavations and trenches shall be inspected daily by a foreman or supervisor . if there is evidence of slides or cave-ins all work in the exposed area shall cease until necessary precautions have been taken for the protection of employees.
  - 7) no material shall be stored closer than 0.6 m (2 ft ) from the edge of a trench or excavation .
  - 8) where normal bracing or shoring of trenches is not practical or economical due to unstable ground , special measures have to be adopted including sheet piling , trench boxes , etc , note that often the type of trench support required is determined by specific project requirement .

#### **sub section D : scaffolding**

all work that can not be performed safely from a ladder or by approved personnel –hoisting device , shall be done from a scaffold platform . only approved scaffold shall be used . makeshift substitutes or scaffold such as barrels , boxes , and other shall not be used since these often prove to be sources of accidents.

Scaffolds should be designed , built and inspected by competent person . to avoid the use makeshift platform , each job should be carefully examined ahead of time so that all necessary ramp and platform can be provided when and where needed



- 1) working platform  
every working platform shall be safe and of adequate dimensions .
- 2) construction  
scaffolds shall be strongly constructed to carry upon them and to provide safe work platform . all scaffolds more than 3 m (10 ft ) high shall have approved guardrails on all exposed ends or side . toeboard and screens shall be provided on scaffold if persons are required to pass either underneath or in close proximity .
- 3) Access and egress  
a safe means of getting to and from a working platform shall be provided and used
- 4) platform  
scaffold planks are to be no less than 4.1 × 24.5 cm (normal 2 × 10 inches ) scaffold grade . platform shall be no less than 46 cm (18 inches ) wide . all platform planks shall be cleated on the ends or otherwise secured to prevent displacement and if nailed , single head nails only shall be used .

5) guard rails and toe boards

The most frequent cause of falls from the use of scaffold is the omission of toe boards and guard rails. Guard rails should be waist high, securely connected to the scaffold structure of adequate strength. Toe boards shall be securely fastened to the platform.

6) BRACING

Scaffolds should be provided with diagonal braces for better stability.

7) Member and connections

Structural members, fasteners, and handrails should be clean and rust-free.

8) use of scaffold

Workers on scaffold platforms shall be secured or shall be secured or shall be placed in secured containers.

All workers on any type of suspended scaffolds shall always wear hard hats, and approved safety belts secured by lanyard to a lifeline or a firm part of the structure.

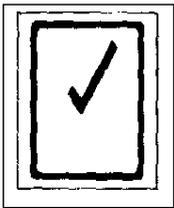
9) maintenance and inspection

9.1 all scaffolds should be inspected daily.

9.2 no excess materials should be stockpiled on scaffolding.

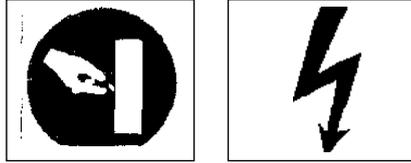
9.3 scaffolds structures should be protected from trucks, vehicles, and other mobile construction equipment.

9.4 no tools should be left overnight on scaffolds. the structure should be cleared of all rubbish daily.



### **Subsection E : Temporary Electrical Installations**

Only qualified personnel are to be allowed in perform any lype of electrical work .  
Poor workmanship and use of inerior materials can result in serious injury, fires and power failure



1) **switches**

All switches should be enclosed and grounded. They should be designed or installed to prevent accidental tripping

2) **electrical equipment**

All electrical equipment should be grounded,

3) **Temporary motor installation**

The current - carrying parts of motors should be enclosed or protected to prevent coming in contact with them. Switches and cut - outs should comply with requirements for permanent installation. Motors and wirings should be provided with the required overload and low voltage protection,

4) **Temporary lighting Installation**

Temporary lighting system on construction sites should provide adequate illumination for safe working conditions,

5) **inspection and Repairs.**

All electrical equipment is to be periodically inspected such inspection should be made by qualified personnel at reasonable intervals, according to the equipment used and the severity of conditions to which it is subjected, A monthly check list must be issued by the senior electrical engineer on site.

6) **identification of equipment**

All circuits should be marked for the type of service they provided. Unintentional hook up to high voltages can be prevented by use of polarized connections

7) **Portable Lights**

Portable lamp holders consisting of a rubber or plastic insulated handle and lamp cage with all wiring connections and socket parts enclosed, should be used for extension lights.

8) cables , leads , temporary wiring

Electrical cables, welding leads, temporary wiring shall be placed where they cannot be damaged and where they cannot cause injury. In ladder-ways, cables etc. shall be kept at least 1.8 m (6 ft) away from the front, and at least 0.3 m (1 ft) from the sides and back of the ladder. If placed on roadways, the cables etc. shall be placed in a protected trough or suspended at least 2.1 m (7 ft) above the ground and walking surface.

- 9) Cables must be correctly sized for the purpose intended. Do not use undersize cables for power installations .
- 10) whenever possible make use of low – voltage power tools , with suitable transformers.
- 11) do not allow cables or any part of a temporary electrical installation to be in contact with water or wet ground or to be placed where wet conditions are likely to occur .
- 12) construct proper temporary distribution boards . do not make flying connections with tape

**SubsectionF : Tools**



1) **hand tools**

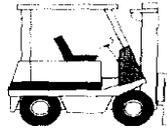
A dull or broken tool is unsafe, therefore a worn or broken hand tool shall be returned to the warehouse for repair or replacement

Hand tools shall be used for their intended purpose only. The design capacity of hand tools shall not be exceeded,

1.1 Care of tools

All tools should be kept in safe working condition. A tool room with suitable storage racks and bins should be provided. Keep all tools clean. Defective tools should not be issued. When tools are not in use they should be stored in suitable boxes or containers. Cutting edges should be protected. Storage area should be moisture free to prevent corrosion of tools. Temporary makeshift repairs should be prohibited, if tools can not be repaired on the job, they should be sent to the maintenance shop or warehouse.

1.2 using tools safety



Use the right tools for the job. The weight, size, and type of tools should be selected to fit the job at hand. Do not substitute pliers for hammers, screwdrivers for "Pinch bars", or for chisels.

In presence of inflammable materials, explosives, inflammable vapor, use non-sparking tool. Most hand tools are conductors of electricity. Use extreme caution in working around electrical circuits. Insulated and non-conducting tools should be tested frequently

2) **power tools**



2.1 electric tools

Electrically powered tools and equipment shall be grounded at all times when in use, unless the tools are double insulated and are U. L. approved or the equivalent.

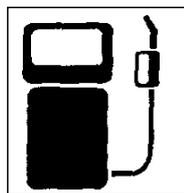
All power cables should be checked frequently for breaks in insulation and defective cables repaired or replaced .

Electrical tools should be disconnected when changing attachments . making minor repairs or adjustments.

Operating switches or levers that require constant manual pressure to activate power tools shall not be tampered with to make the tools operate without constant hand or finger pressure. The maximum speed at which grinding wheels shall be used, shall not exceed the manufacturer's rated maximum speed for the wheel.

Air hose connections shall be secured to prevent hoses from whipping in the event of accidental separation.

### 2.3 Gasoline Engine-Driven Tools



These types of tools or equipment should not be used in unventilated areas. Gasoline should be stored in a safe place and handled with caution. Stop engine before refueling.

### 2.3 portable machines

#### 1) grinder

Wheels should be inspected regularly. A cracked wheel may fly to pieces and should be discarded. Wheels should be equipped with hood guard

#### 2) Saw

It should not be jammed or crowded INTO the work. Blade use should be as recommended for the material being cut. piece being cut should be firmly held against back guide. All materials should be cut in a single, steady pass.

#### 3) drills

Always provide a pick punch or pilot hole for the drill point. select the correct bit for material being drilled. If bit is long enough to pass through material, protect against damage or injury on the side.

**Subsection G : Hazard Prevention**

- 1) Fueling equipment

No gasoline or diesel engine shall be fueled while it is running.

There shall be no smoking or open flame within 7.6 m (25 ft) of fuel storage tanks, fuel pumps, or refueling operations.

All fuel storage tanks shall be grounded in an approved manner, such electrical grounds shall not be removed without authorization.

- 2) explosion and gas hazard



No work involving a source of ignition shall be attempted near any pit, manhole, open sewer, drain vent, pipe trench, or any confined space; if there is reason to believe that flammable vapors may be present until tests made with approved hydrocarbon vapor and oxygen detectors indicate the atmosphere is safe for hot work.

- 3) Toxic Gases

Prior to entering any area (such as manholes, valve chambers, existing underground pipes, etc determine by the use of suitable gas detectors that no dangerous gases have accumulated. If in doubt do not proceed and contact your supervisor immediately.

**Subsection H : Mobile cranes and tower cranes**

Only able - bodied, trained, and qualified men should be permitted to operate this type of equipment. Training should include a thorough review of the operating characteristics of the equipment itself, it limitations and the hazards of improper usage. Supervision and direction of a new operator must continue until it is assured he can work on his own.

all equipment used for hoisting should be inspected daily, before starting operation.

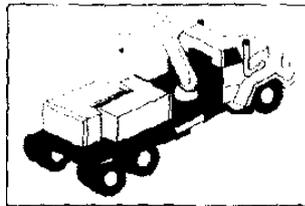
Workmen must not be permitted to adjust, oil, lubricate, or repair any machine unless it is first stopped and all engines switched off.

Any guards that must be removed to adjust / oil, should be promptly replaced.



1) **Mobile cranes**

No load should be lifted which exceeds the rated capacity of the crane at the operating boom angle chosen.



standard operating should be agreed upon and used To direct all operations. Only one man should be permitted to give signal to the operator unless load is being transferred to a point which is out of signalman. in such cases, a second signalman should be designated.

Outriggers on rubber tired cranes should be used when needed. When cranes are operated on soft ground, substantial mats should be laid down. Extreme caution should be used when operating near the edge of an excavation or in areas of uneven and/or soft ground.

2) **Tower Cranes**

inspection and testing should be done only by competent and experienced personnel

The crane should be completely inspected and tested before being put into initial operation.

This type of crane should be provided with an access ladder installed inside the tower There should be a landing platform at least every 30 feet.

Weights must be securely fastened in place. Additional safe chains or cables are required for back-up protection. The crane should be constructed of fire resistant material and completely enclosed for weather protection.

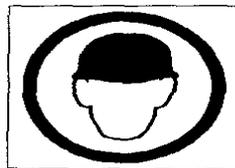
The catwalk on the jibs should have handrails. If handrails are not installed, safety belts and messenger cable must be provided. Special precautions are necessary when lifting large panels under windy conditions or when lifting one object with two tower cranes. The hook or load block of a tower crane should not be allowed to rest on any object as this could allow slack in the cable on the wind-up drum. When the tower crane is not being used, the load block should be raised to nearly its top elevation. Grounding devices, guards, junction box covers and similar protective equipment should be checked regularly to insure they are in place and performing their function properly,

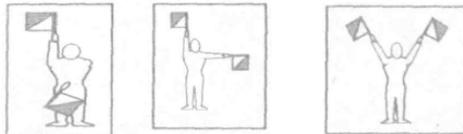
### Subsection I: Slings



- 1) An experienced man should be placed in charge of all slings on the job and held responsible for their good condition. Slings should be frequently inspected and a record kept of each inspection. If slings are wire rope, they should be inspected at regular intervals, not week
- 2) The eyes of rope slings should be properly spaced-in and should have thimbles to withstand wear
- 3) Slings should not be bent around sharp corners of the load. This can be prevented by using pieces of rounded wood, heavy bagging, or old rubber tires to protect the sling
- 4) When lifting a load with multiple slings, arrange them so as to equalize the weight of the load as much as possible,
- 5) When plates are lifted, they should be held by Uamps that hold firmly under the Load.
- 6) A damaged Slings shall be discarded at once.
- 7) Look After Your Slings

### Sub-section j : Basic safety precautions for crane operators



- 1) check capacity load chart in cab  
always check capacity on load in cab before making a lift . portion hoist line to radius required- then lift load
- 2) follow directions on all placards  
know what is the meaning and follow the instruction.  

- 3) know the standard hand signals  
these standard hand signals save load or life learn them .
- 4) keep your shoes clean

Before entering control cab, clean any mud or grease from your shoes. This will reduce the possibility of your foot slipping off a control panel, resulting in possible accident

- 5) Never back up without aid of signalman  
Never hack up without aid of signalman to verify that area behind machine is clear of obstruction and/or personnel.
- 6) watch clearances when travelling  
Do not take the chance of running into overhead or side obstruction. When moving in tight quarters, post look out help guard against collision or bumping of structures.
- 7) Always look turntdtjie before starting, any crane travel  
Use swing (house) lock to prevent swing motion.
- 8) Know load limitations before crossing  
Before travelling across bridges check to make certain that they will carry a load greater machine weight
- 9) Use Outriggers  
Unless lifting within ' on rubber capacities, operate with Outriggers fully extended so as to remove an weight from machine tires
- 10) Check machine stability before lifting load  
Make certain that outriggers are firmly positioned on solid surfaces, machine is level, brakes set and that load is properly rigged and attached to hook. Lift load slightly off ground and check stability before proceeding with lifts
- 11) do not exceed machine rating  
Do not rely on machine tipping stability to determine maximum lifting capacity. Do not exceed capacities shown on accessories, (hook block, jib, etc)
- 12) never push or pull with a boom  
Never pull Side ways with boom u use boom as a ram. Crane booms are not designed for side loading.
- 13) Check all rigging for proper attachment  
To obtain maximum lifting capacities, hook block must be rigged with sufficient parts of  
line. When operating with multi-part reeving no less than two wraps have to remain on hopstdrum
- 14) keep your boom down  
Swinging loads with a long line can create severe instability and possible structural failure of the boom
- 15) left one load at time  
Do not lift two or more separately rigged loads at one time, even if loads combined are within rated capacity.

- 16) Control loads at all times  
Perform an operational check of all braking devices prior to initiating any crane travelling operations
- 17) all no one to hitch acide  
permet no one to Tide loads for .in reason.
- 18) Avoid high wire acts  
If boom should come in contact, with electrical lines, stay on machine until boom is freed or current is cut off. Keep every fine dway from the machine. If you cjer off Hie machine, JUMP 'do not step off
- 19) Never Swing over ground personnel  
Never swing Over grund personee regardless of whether or not load .suspended to the boom,
- 20) keep everyone away from suspended loads  
Do not allow personnel or equiupment in area around or under subtended loads
- 21) never leave machine with load suspended  
do not leave machine with raised load . if you must leave machaine , lowerr to ground and stop engines before leave the clup . do not alloee slack on the lines .
- 22) never get or off a machine in motion  
never get or off a machine in motion . when getting "on or off" be sure of your footiong , to avoid slipping .

## Section 2 : Safe Practice Rules



second section, of this handbook provides basic guides and rules for each of the different construction crafts, These are intended to insure to each worker the highest degree of personal protection from accident or injury.

### 1. crane operator

- Each crane operator is required to have in his possession a valid crane operator's license issued to him.
- The manager or superintendent, or someone officially designated by him, shall review and approve the specific operation of a crane when the crane must operate in the vicinity of an overhead power line where any part of the crane or its load can come within 3 m (10 ft) of the overhead line. This approval must be given before the crane moves into the exposed area.
- Overhead electrical lines within the work area shall be marked with warning signs, 0.2 to 2.5 m (6 to 9 ft) above the ground.
- Outriggers shall be used at all times, except when the crane is travelling. If the crane has to travel with a load suspended, reasonable effort shall be made to keep the outrigger extended as far as is practicable. The load shall be secured by guys to prevent it swinging.
- Hand signals for crane and derrick operations shall be those prescribed by the applicable standard for the type of crane in use.
- Rigging and boom changes shall be made by a competent mechanic under the supervision of a qualified supervisor.

### 2. Housekeeping

- Keep boards with protruding nails out of passageways and working spaces. Nails shall be bent over and boards shall be piled out of the way. Nails can be removed later.
- Never leave loose board or tools on scaffolds, runways, or platforms where they may fall on people below or cause you or other workers to trip and fall.
- Clean up all loose materials and discard in the proper receptacles (or areas) after completion of each task producing such scrap.

### 3. Personal precautions

- Use both hands when going up or down a ladder. USE ROPE TO RAISE OR LOWER MATERIALS OF TOOLS. DON'T JUMP AND DON'T THROW THINGS AROUND.
- The soles of safety shoes should be heavy but flexible, trousers shall be cuffless or shall have the cuffs turned under and sewn.
- take special care when walking :
  1. on oiled forms
  2. on platform and scaffolds
  3. in the vicinity of trenches and excavations
  4. in areas with lumber that has protruding nails .
- Do not remove splinters yourself .let first aid do it .
- be alert for fire conditions. Observe the "No Smoking" signs whenever posted

### 4. Electrical workers

#### 4.1 lines and cables

All temporary wiring shall be supported on approved type insulators and shall not be looped over nails or brackets. All light bulbs are to be enclosed by insulated wire cages. Temporary wiring shall be at least no . 12 size or greater, NO bare wires of current-carrying parts of electrical installation shall be permitted within 3 m (10 ft) of the ground or other places where workmen are or may be, unless the bare wires or parts are enclosed by a fence or other type of barrier. Make sure that this barrier is at least 2 m (6 ft) away from the bare wires or parts. Wires shall be strung so that they do not come into contact with other power lines, telephone lines, or other types of conductors,

When installing underground conduit, trenches 1,5 m (5 ft) or more in depth or trenches in unstable ground shall be shored or sloped. The craft superintendent shall determine protective method to be used

#### 4.2 Tools and Workers, equipment

Each manual and powered hand tool used by an electrician shall be the proper tool for the work to be done. The tool shall be clean and fully operational, correctly adjusted and lubricated as necessary, guarded and grounded as required by regulations, and all cutting edges shall be sharp,

Safety belts and straps shall not be stored with sharpened edged tools, and unauthorized metal hooks and clips shall not be attached to the safety belt,

#### 4.3 Energized Areas

Wear shirts with full-length sleeves, buttoned down at the cuffs, when working around energized equipment. Also, in such cases, never wear loose, dangling chains, keys, or watches, rings, or jackets with metal zippers. Celluloid sunglasses with visors shall never be worn near energized lines, and nonmetallic hard hats (dielectric) only are permissible in those areas.

In addition, metal ladders and those with exposed metal reinforcements are prohibited for work on or near energized electrical lines or equipment. Small tools carried in belts shall be so arranged so as to prevent contact with energized parts, and finally, when working near energized lines or equipment, there shall be no more talk than is necessary to perform the work .

## 5. installation worker

Insulation workers are required to :

1. wear safety goggles when installing overhead insulation, and use only approved respirators.
2. empty cement bags carefully to prevent excessive dust, and then place empty bags as well as other scrap and debris in scrap receptacles daily or more often.
3. Be certain that all scaffolds and ladders comply with the project standards

## 6. Steel Workers. Riggers

### 6.1 Clothing and Personal Equipment

- Steelworkers shall wear close-fitting clothing, work shoes with non-slip soles and no nails, and cuff-less trousers. Rings shall not be worn on the job.
- A safety belt with an attached lanyard secured to a structural member or some other substantial anchorage shall be worn on swing staging, boatswain's chairs, needle - beam scaffolds, and while connecting or bolting structural steel. Steel workers may temporarily disengage the lanyard while connecting structural steel, when using a safety belt would be distinctly more hazardous than not using one

### 6.2 Loading Steel

- when steel is being loaded or unloaded onto a truck or trailer, the driver shall stay out of the cab while the loading or unloading is in progress, cable spreaders shall be placed with hooks facing outward. Workmen unloading steel shall stand clear of the luff before it is lifted and when the binders on the trailers or truck are being released.
- Minimum 100 - 100 mm (nominal 4 \* 4 inches) wood blocking shall be used when staging steel,
- Workmen shall never climb onto operating or moving equipment

### 5.3 Hooking On

- When hooking on, the weight of the heaviest piece to be lifted shall be carefully checked against the capacity charts for the slings and for the crane. Slings are used in choker hitch, softeners such as wood, split pipes or a piece of rubber tire shall be used on the beam flange to avoid cutting the sling,
- Use a tag line on the load and do not stand under the load while it is being hoisted.

### 6.4 Connecting

- When making a connection, straddle the beam and walk on the flange, if possible, Make sure of your grip on the beam at all times. Do not carry anything in your hands. Riding the ball or load is strictly forbidden and shall be cause for disciplinary action.

## 7. laboures

- if you don't understand what is to be done on a given task, ask your foreman. He would rather tell you than have you do something wrong and be injured. Be certain to properly use the safety equipment that will be issued to you. If you are not sure or do not know how to use it, again ask your foreman. Then be sure to obey the following rules:
  - 1) wear clothing appropriate to the type of work you are doing. Trousers should be cuff-less or the cuffs shall be turned under and sewn.
  - 2) when lifting, use your legs, not your back: if need it, get help for heavy loads
  - 3) do not stand under suspended loads.
  - 4) do not climb aboard moving equipment. When being transported in a truck, sit down. Do not ride on fenders.

## 8. equipment (crane) operators

### 8.1 general rules

Project safe practice rules 2.1 shall be posted in each crane with lifting chart and warning sign limiting operating of the crane to 3 m (10ft) or more from energized electrical power lines and equipment. In addition, the following rules shall be observed:

- (1) cranes shall be set level for each lift.
- (2) keep the crane boom low when moving in the yard.
- (3) all engines shall be stopped while being re-fueled.
- (4) shutdown:
  - set the brakes
  - dog the boom
  - place operating levers in neutral
- (5) no workmen shall ride the load, sling, or hook to do so may be cause for disciplinary action for the crane operator and the riders

### 8.2 loads

When handling loads be passed over heads OF WORKMEN.

- (1) loads shall not be passed over heads of workmen.
- (2) all loads shall be safely landed before being unhooked or unslung
- (3) do not test a load by lifting it if the exact or close approximation of the weight is not readily available. If in doubt ask a supervisor
- (4) loads shall be lifted only when hoist line in a vertical position
- (5) when a load is being lowered, the speed shall be limited and shall not exceed the hoisting speed of the equipment for the same load. Do not allow load to free fall.
- (6) exceptional care shall be taken in lifting a load from a water. When the loads leaves the water there is an added buoyance is lost.

when the boom is at vertical . I . e , will not descend by gravity :

- (1) warn all personnel in the area , particularly those to the rear of the crane .
- (2) the hoist line shall be attached to a truck , which can then pull gently to move the boom out of the vertical equilibrium , or attach the line to a stationary object and talk in on the hook , line , or back the crane away .
- (3) be extremely prudent in executing these maneuvers

## 9. power lines

refer to project safe practice rule 2.1 . if contact made with an energized power line , the operator shall :

- (1) stay where he is until contact is broken .
- (2) keep everyone away from the equipment .
- (3) stay in the equipment , but if possible . move the equipment to break the contact
- (4) if a person is rendered unconscious from electric shock and is still in contact with the electrical source . if possible immediately shut off the electrical circuit . if the crane is the source by virtue of being in contact with an electrical line or other source , break contact by moving the crane . if unable to take either of these actions , carefully using a dry rope or wood , moving the unconscious person from contact (do not touch the person with your hands or other parts of your body ) . immediately send for the medical unit and resuscitation equipment .

### 9.1 sandblasting

- (1) be extremely careful with sand blasting equipment
- (2) work only in areas which are protected by screen etc
- (3) do not allow access to other workers in the area sand blasting

### 9.2 general

- (1) safety belts shall be down while working on all swing staging , needle- beam scaffolds , floats , and all unprotected elevated locations above 3 m (10
- (2) avoid exposition other workers to brush or spray painting operations by working only in scheduled work areas and by posting signs on the floor or ground areas below the work locations.

## 10 pipeworkers

- each manual and power hand tool used by a pipefitter shall be proper tool for the work to be done . the tool shall be clean and fully operational , correctly adjusted and lubricated as necessary , guarded or grounded as required by regulations , and all cutting edges shall be sharp .
- Do not use inefficient tools or makeshift substitutes
  - (1) broken or malfunctioning tools shall be turned in for replacement
  - (2) the mushroom head on an impact tool shall be ground off , and the end ground off with a slight taper on the sides
  - (3) never use pipe wrench to tighten machine bolts .

- (4) never use a hammer or a pipe extentin on a wrench to tighten pipe connections
- (5) never put tools or foreign material into pipes
- (6) never use nails or scarews in place of wedges .
- (7) never hammer on open-end , spud-, or pin – type wrench because the jaws will tend to open . if force is required . abox wrench shall be used .

## 11. werlders

### 11.1 oxycetylene welding

#### hoses and connections

- (1) keep all gas connections tight between cylinders , appartus , hose , and pipeing
- (2) keeping hose , appartus , and cylinder vales free from grease , oil , dust , and dirt ..
- (3) inspect foses frequently . replace old or worn hose .

#### operation

- (1) never use acylinder of oxygen or acetylene without a preasure regulator .
- (2) make sure the regulator pressure –adjusting screw released before opening the cylinder valve
- (3) do not stand in front of the pressure regulator gauge when opening the cylinder valve
- (4) always open cylinder valves slowly
- (5) use frictiong lighter to light atorch .
- (6) if there is a flashback or burning inside . immediately shut off the torch oxjen valve , then close the acetylene valve.
- (7) when the torch is not in use , shut off all valves and then release pressure from the hose and regulators
- (8) never use aceylene at pressures in excess of 1.06 kg / sq cm (15 psi )
- (9) do not allow sparks , molten metal , or slag to fall on to cylinder s , or hoses
- (10) never allow oxygen to come into contact with oil grease
- (11) always wear suitable goggles when working with alighted torch .

### 11.2 lectric arc welding

- (1) wear clothing that will protect your body from rays of the rays of the arc and from hot metal sparks .
- (2) wear shoes that extend above the ankles, and cuffless trousers that extend below the tops of the shoes .
- (3) vetilation shall be adequate at all time while welding .
- (4) while welding the welding hood shall be in place before stricking an arc and at all times while welding .

- (5) keep shields in place to protect others from rays of the arc . warn them to avoid looking at the arc .
- (6) if persons working nearby are not protected by shields , advise them to wear protective goggles .
- (7) fire extinguishers shall be provided . know where they are .
- (8) use non- combustible material to support your work .
- (9) avoid tangled cables . where possible keep welding cables on overhead brackets or in floor troughs
- (10) Put rod stubs in a container. If rods are on the floor they become tripping hazards,
- (11) Do not weld on any container that has held combustible liquid unless the container has been steam-cleaned and has tested as negative for the presence of any flammable vapors.

**12, SHEETMETAL WORKERS**

**1. General**

- (1) Wear gloves. Clothing shall be sturdy and cover the maximum amount of body surface to minimize the exposure to cuts.
- (2) Report to your foremen to obtain proper first aid care for any cut you receive



**12.2 Shop Fabrication**

Know and observe the safety rules posted in the shop.

**12.3 Field Installation**

Observe all applicable safety rules and regulations.

Your foremen will specifically outline the rules for a particular job. These shall be followed.

**13. TRUCK DRIVERS**

**13 Rules for the Drivers**

- (1) Each driver must carry a valid driver's license.
- (2) The driver of each truck shall inspect his truck at the start of his workday.
- (3) Careless or reckless driving at any time shall not be tolerated and will be ground for dismissal.
- (4) Judgement must be used on whether or not the driver shall remain in the truck while it is being loaded by a shovel, crane, or other power equipment. If the load is heavy and must be raised high, it is advisable for the driver to get out of the truck after turning off the engine and setting the brakes when there is doubt, the driver's foreman shall tell him what to do.

**14 Other Personnel**

- (1) When a truck is used to transport construction personnel, all personnel shall be seated before the vehicle is started and shall remain seated until the vehicle is stopped and the driver has given the signal to dismount.
- (2) No person shall enter or leave a truck or any other type of vehicle that is in motion.

15 **Refueling**

During refueling, oiling, or greasing, the engine shall be shut off. The no-smoking rule shall be observed when refueling.

13.4 **frvck Equipment. Repair and Maintenance**

- (1) Each truck shall be equipped with a fire extinguisher with a minimum classification of 1A SBC. Do not tamper with the extinguisher. If the extinguisher must be used for any purpose, immediately return it to the warehouse for a refill or replacement.
- (2) Any defect of the vehicle may create a safety hazard. All malfunctions, particularly of brake must be immediately reported for repair.

**14. wearhousmen**

- (1) Use all available lifting devices for material handling when lifting bodily, lift with your legs, not your back. Get help if needed.
- (2) Protruding material in bins can cause injury. Store material properly, elevate or protect any stored item that protrudes into the warehouse isle space.
- (3) For fire protection, extinguishers shall be placed strategically throughout the storage area. know where they are and how to use them.

**Important**

- A refusal to follow safety instructions or to use personal protective safety equipment when directed by supervisors shall be considered cause for termination of employment•
- Neglect in observing safety instructions shall be considered cause for severe disciplinary action also leading to dismissal

### **Section 3 : Fire Prevention**

One source of fire hazard is poor housekeeping. Regular clean-up scarp material, saw-dust, rags, oil and other residue of construction will not only remove or reduce the fire hazard, but will promote general safety.

The following source of fire danger should be checked regularly :

- (1) Electrical wiring and equipment.
- (2) Heating devices.
- (3) Store of flammable liquid and materials.
- (4) The vicinity of welding operation.
- (5) Compressors, engine-generators and other internal combustible engines and their fuel supplies.
- (6) Below corrugated sheet metal roofs, storage sheds, temporal.
- (7) All places exposed to sparks and heat if refuse burning ta place nearby. 3.1

#### **3.1 House Keeping :**

Good housekeeping will remove part of the combustible materials danger. Lumber, fuel, clothing, and other combustibles which must be stored at the job site must be taken into account and proper protection provided.

Areas where combustibles are stored should not contain a heating source or if heating is necessary it should be planned to avoid overheating of these materials and have adequate ventilation.

"NO SMOKING" signs should be conspicuously posted in these areas and must be enforced at all times.

#### **3.Z Fire Protection**

- Fire extinguishers should be placed in convenient place throughout the buildings and construction site and should be identified clearly.
- It is important to provide the proper type of extinguishers for the job. Carbon dioxide or dry chemicals should be placed near electrical installations, while water, foamite or soda-acid extinguishers would be useless in fighting electrical fires.
- Portable fire extinguishers are designed to fight small fires only.
- Employees should be instructed in the operation of extinguishers.
- Fire extinguishers should be inspected and recharged regularly.
- Employees should know the types of fire extinguishers their work and living areas, and how the extinguisher operates in the event of fire. Employees should be instructed in the operation of extinguishers.

### 3.3 **Fire Hazard**

each employee shall be advised of and shall comply with the following fire prevention, detection and control requirement as applicable :

1. Don't be a litter bug. Never allow materials such as wood chips, cement sacks, old rags, clothing, paper bag or cartons to accumulate, since they constitute a fire hazard.
2. Oil spills, grease and diesel fuel shall be cleaned up promptly. Oil and grease shall be kept in the closed containers provided for them.
3. Do not tamper with fire extinguishers, fire hoses, fire detectors and other equipment intended to detect and extinguish fires.
4. Promptly report all observed damages, malfunctioning or empty fire extinguishers to your immediate supervisor repairs or refills can be made in a timely manner

### 3.4 **Fire Prevention in Welding and Cutting Operation :**

- Major causes of fires on construction projected (because of molten metal and sparks) are cutting and welding sparks from cutting and welding may retain heat for several seconds . which is sufficient to ignite combustible material.
- A fire watcher or a welder's helper is required whenever cutting or welding is performed in locations where fire might develop.
- In welding and cutting operation, suitable fire extinguisher equipment should be maintained in a state of readiness for instant use. Such equipment may consist of pails of water, buckets of sand or portable extinguishers, depending upon the nature and quantity the combustible material exposed. It is also advisable to have the watcher stay continuously at the welding at least half an hour after completion of the welding operation to detect and extinguish possible smoldering fires.
- In order to prevent fire hazard, the following precautionary measures should be followed :
  - (1) Highly volatile materials such as gasoline, solvents, paints, should be removed before commencing the work.
  - (2) Removal of easily combustible materials such as wood scraps, sawdust, oily rags, and wood shavings in the vicinity.
  - (3) Materials that cannot be removed during the work should be shielded with sheet metal or asbestos.
  - (4) Know the fire signal, where to go and what to do the event alarms are sounded.

### 3.5 **General**

- Highly combustible materials such as gasoline should be securely placed in a clean area.
- Flammable materials placed in public areas should be guarded and have suitable warning signs in the day time and have red lights on and around them at night.
- Oxygen and acetylene cylinders shall be stored in a secure and suitably placed enclosure properly constructed preferably in an isolated area. The enclosure must be locked at all times.
- Equipment such as power hand tools, welding machines, etc. must be switched-off when not in use for an extended period of time (i.e. more than a few minutes) and disconnected overnight.

*Section 4 :*

**High Voltage Work Safety Rules**

**1. General Safety Precautions**

**(1) Work on High Voltage Apparatus**

No person shall carry out work of any description (including maintenance, repairs, cleaning and testing) on any part of high voltage apparatus unless such parts of the apparatus are :

- a) dead;
- b) isolated and all practicable steps taken to lock off from live conductors;
- c) efficiently connected to earth at all points of disconnection of supply to such apparatus, or between such points and the point (s) of work, and the possibility of conductors becoming live by induction or other means taken into account in such earthing;
- d) screened where necessary to prevent danger and caution and Danger Notices fixed
- e) released for work by the issue of an appropriate work permit, and unless such person:
- f) is fully conversant with the nature and also the extent of the work to be done.

It is the duty of the person in charge of the work to ensure that the foregoing provisions are complied with, confirmation that the safety precautions are complete at points remote from his location shall be obtained from the relevant responsible client's engineer.

Making live or dead by signal or pre-arranged understanding after an agreed interval of time is forbidden.

**(2) Interference with conductors**

No person shall touch the insulation which covers or supports any conductor subject to high voltage unless the conductor is dead, and earthen.

**(3) Fixing of notices and screens**

Work shall not be carried out on any high voltage apparatus which has been made dead until caution notices have been attached at all points where such apparatus can be made live. Danger notices shall also be attached on or adjacent to the live apparatus and at the limits of the zone in which work may be carried out.

**(4) Safety Locks**

Safety locks, having keys differing from all other keys in the locality, shall be used to lock off all switches at points where the circuit, on which work is to be carried out could be energized.

**(5) Work on apparatus which can be made live from a remote point.**

Where work is necessary on primary equipment which can be made live from a remote point then the remote point should be insulated and the isolation and earthing checked and ensured that the isolation and earthing is properly locked up. The keys for these locks should be obtained and retained until the work is finished and all men instructed that it is no longer safe to work on the equipment and the permit to work canceled.

**(2) ACCESS**

- (1) Access to underground chambers

No person shall enter and no exposed flames (including smoking) is permitted in any underground chamber unless adequate precautions have been taken (e.g. use of suitable natural or forced ventilation) and the consent of one of the clients authorized persons obtained

Where one more persons are required to work in an underground chamber an extra person shall be kept on duty outside the chamber and such person shall keep in regular contact with the workers inside the chamber.

If necessary this person may enter the chamber but the number and length of these entries must be kept to an absolute minimum and no single entry shall exceed five minutes.

### 3. **switching**

#### (1) operating of circuit breakers and isolators

no circuit breakers or isolators connected to the client high voltage system shall be operated by company personnel. operation of circuit breakers and isolators on the clients hv system must be operated by the clients personnel.

the only exception to this ruling is when a section of the clients system has been completely isolated from the main system and is allocated to our control for the purpose of carrying out primary testing.

under these circumstances the person in charge of the testing shall be the only company representative to carry out the switching necessary for the tests. Under no circumstances shall the switchgear providing the isolation from the remainder of the clients system be operated. if at any time the switching being carried out by the clients engineer appears incorrect in any way or the work area has not been adequately isolated and earthed in accordance with these rules then the person in charge of the work shall politely inform the clients engineer of this objection.

No person must ever accept working on primary equipment which has not been properly isolated and earthed in accordance with these rules.

#### (2) switching for test purposes

when a section of equipment has been isolated from the main supply system for testing, the clients engineer may on the permit to work give general sanction for the operating of switches, isolators, earthing switches and earth connections within, and for the application of testing supplies to, the isolated section.

(4) **Earthing**

**1) Circuit main earths**

The person in charge of work on any primary plant shall ensure that circuit main earths have been applied by the client's engineer at all possible sources of supply.

**2) Additional Earths**

Additional earth connections may be attached and moved by a competent person under an electrical permit work.

**3) Equipment for earthing**

When high voltage apparatus is to be discharged and earthed it shall be done:

When By the use of earthing switches or special apparatus where provided; or

- a) By the use of earthing switches or special apparatus where provided; or.
- b) Where not provided by other approved means

4) Earthing leads for use at substations should have a cross section of not less than 0.1 sq. in copper equivalent.

5) Earthing leads shall be examined immediately prior to use.

**6) Procedure for the use of earthing leads**

The procedure to be followed when using portable earthing leads shall be :

- a) Verify that the circuit is not live and where practicable test by means of a voltage indicator of approved type, the indicator itself being tested immediately before and after verification.
- b) Earthing leads shall be connected to the earth system before being secured to the phases. They shall only be secured to the phases by means of a pole or other approved apparatus and care must be taken to ensure that good contact is made.
- c) All phases shall be earthed, even if work is to be carried out on one phase only.
- d) Where possible a circuit breaker or specially provided earth switch shall be used to make the earth connection. When the circuit breaker is used the trip feature shall be rendered inoperative before closing, unless this is impracticable. After closing, steps shall be taken to lock-off any means of tripping or opening the circuit breaker or switch.
- e) Earthing leads shall not be applied in any cell or compartment in which there is any exposed metal live at high voltage.
- f) When removing earthing leads at any point, they shall all be disconnected from the phase end before any on that phase or disconnected from the earth system

**7) Earthing of metal-clad switchgear**

For the purpose of earthing metal-clad switchgear approved appliances only shall be used. The insertion of the hand or any tool in contact spouts for this purpose is forbidden.

Before work is carried out on the withdrawable portion of truck type or metal-clad switchgear, all apparatus shall be :

- a) Checked by means of an approved voltage indicator, the indicator itself being tested immediately before and after the verification;
- b) Discharged to earth; and
- c) Efficiently connected to earth (such earth to remain connected unless the apparatus is bodily removed from its normal live position and is disconnected from all possible sources of supply).

(5) **Electrical permits-to-work**

**1) Arrangements for issue**

Work shall not be carried out on any high voltage apparatus or in proximity to any such apparatus where technical knowledge or experience is required to avoid danger until an electrical permit work to work has been received from the client's engineer, The person receiving the permit must be a competent person and if work is on primary equipment shall check that isolation and earthing has been properly carried out in accordance with these rules. The work must be carried out under the direct supervision of the competent person in whose name the permit is taken.

**2) Precaution against risk to personnel**

Precautions should be taken during the progress of the work ensure that:

- a) No person is put in any situation where there is a risk of danger.
- b) The risk of mal-operating any item of the client's system is reduced to the absolute minimum.

**3) Precaution against risk to personnel**

The person who holds the permit to work shall be personally responsible for the safety of all personnel working under that permit. He shall ensure that all of the relevant equipment remains isolated and earthen until the permit is cleared.

If it is necessary to carry out testing on the primary system which requires the removal of the circuit main earths then the person holding the permit shall personally carry out any switching on the isolated section of the system and shall be responsible for all safety aspects during the testing. Under no circumstances shall the switchgear providing isolation for the test section be operated.

When work is carried out in secondary panels where there are live 415/240 V Ac or 220V DC the person in charge shall advise anyone else working under the permit of the location of these live terminals and the terminals should be shrouded to prevent accidental contact.

**4) Precautions against inadvertent tripping**

Before commencing work all possible sources of remote tripping should be isolated wherever practicable. Any sources of possible tripping of live equipment which cannot be isolated should be identified and if possible labelled.

Everyone working under the permit should be made fully aware of the location of any possible source of inadvertent tripping. In addition alarms to NCC should be isolated where possible to prevent nuisance to the national control engineer,

The are on which it is safe to work should be clearly identified and adjacent equipment, or panels clearly marked as live equipment to minimize the risk of going to wrong panel. For relay or control panels this may be achieved by the use of polytene sheeting with arrows attached to the live panels either side of the panel to the worked on. These should be attached to the front and near of the relevant panels.

**5) Procedure for cancellation of a permit to work**

When the work is complete, or has to be suspended for some reason, the person holding the permit to work shall check that the equipment is in a suitable state to be returned to service. He shall then personally inform all other personnel who had been working under that permit, the permit is about to be canceled and that they should now treat the work area as dangerous, when this has been done he shall then sign off the permit to work and return it with any keys to safety padlocks to the client's engineer.

**(6) Work in substation and switching stations containing exposed live conductors**

**(1) Safety clearance to live conductors**

When the work is to be carried out in a substation in which there are exposed live high voltage conductors then unless the whole equipment is dead, the section which is made dead for the work to be carried out shall be defined as far as possible by the use of barriers or roping arranged so that the minimum clearance from the nearest exposed conductor to ground level or platform or access way which may be required to be used when the conductor is live

Rated voltage	Clearance
0 - 6.6kV	2565 mm (8ft. Sin.)
6.6 - 11 kv	2590 mm (8ft. 6in.) (8ft
11 - 22 kv	2645 mm 8. In) (9ft.
22 - 33 kv	2745 mm 0in.) (9ft.
33 - 66 kv	2975 mm 9in.) (11ft.
66 - 132 kv	3430 mm 3in.) (15ft.
132 - 275 kv	4575 mm 0in.) (18ft.
275 - 400 kv	5490 mm 0in.)

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The area to be defined at ground level shall only be that in which work is to be carried out. If the work cannot be carried out without leaving ground level, or such platform or access ways, the above minimum clearances shall also be obtained from the nearest exposed live high voltage conductor to the points from which work is carried out.

If the work is such that these clearances are not sufficient to avoid danger, other suitable arrangements shall be made to provide the requisite degree of safety

**(2) Use of ladders and long objects**

- a) Ladders shall be non metallic and of no greater length than is required for the work involved.
- b) The movement and erection of ladders and other long objects shall be carried out under the direct supervision of the authorized person in charge of the work and when moved at ground level they shall be carried only in a horizontal position and as near the ground as practicable.

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**7. Remotely and automatically controlled equipment**

- 1. Before work is carried out on remotely or automatically controlled equipment such as circuit breakers, isolators, tap changing gear, or air compressors, the automatic or remote control features shall first be rendered inoperative.

No work shall be carried out on the controlling equipment, wiring or relays except by an authorized person or a competent person acting under the direct instructions of an authorized person

## **8. Work on high voltage apparatus other than overhead lines**

1. Before any person is allowed to carry out any work on, repairs or modifications to any high voltage apparatus other than overhead lines, the following operation shall be carried out in strict sequence :
  - (a) The apparatus shall be :  
Switch out at all points of supply;  
  
Isolated from all points of supply, including voltage and auxiliary transformers and common neutral earthing equipment from which the apparatus may become live.
  - (b) The apparatus shall then be :  
  
Where practicable, checked by means of an approved voltage indicator to verify that the circuit is not live, the indicator itself being tested before and after the verification;  
  
Discharged to earth;  
  
Efficiently connected to earth at all points of isolation from the supply, excluding low and medium voltage connections but including points of isolation from common neutral earthing equipment where applicable, or between such points of work.
  - (c) Caution notices shall be attached at all points where such apparatus can be made live .
  - (d) Circuit breakers, isolators spout shutters, control handles and safety devices shall be locked in position by keys and the keys retained.
  - (e) Unless the circuit main earths through which the apparatus is connected to earth are close to and visible from the point of work, the apparatus shall be efficiently connected to earth by means of additional earths and the points of work. When such connections to earth prevent access to the points of work, all circuits connected to the apparatus on which work is to be done shall be efficiently ^ connected to earth at the nearest points to the points of work where access can be obtained, and additional earths shall also be applied at the points of work; these additional earths may be removed from each phase in turn when work is to be done on that phase but each phase earth so removed shall be placed before a second earth; on fixed earths are necessary.
  - (f) If operation (a) to (b) are carried out at more than one location the keys to all essential isolation and retained by the permit holder until the permit is canceled.

## **9. Work on metal-clad switchgear spouts**

### **(1) Busbar spouts of multi-panel switchboard**

When work is to be carried out on busbar spouts, the following operations shall be carried out in strict sequence :

- (a) The section of the busbars on which work is to be carried out shall be isolated for all points of supply from which it can be made live.

- (b) The isolating arrangements shall be locked so that they cannot be operated and shutters of live spouts locked shut. Where duplicate switches in one tank or on-load busbar selector isolators are installed and it is impossible to isolate them from all points of supply, then all switches that can be closed on to the busbars on which work is to be carried out shall have their mechanisms locked in the open position and the closing mechanisms shall be made inoperative,
- (c) Where practicable the busbars shall be checked by means of an approved voltage indicator to verify that they are not live, the indicator itself being tested immediately before and after the verification. The checking with the voltage indicator shall be done on the panel to be earthed with the circuit main earths.
- (d) Circuit main earths shall be applied at a panel other than that at which work is to be done, on the isolated section of busbars. The insertion of the hand or any tool into contact spouts for this purpose is forbidden.
- (e) Caution notices shall be attached at all points where the busbars can be made live.
- (f) Circuit breakers, isolators, spout, shutters, control handles and safety devices shall be locked in position by keys and the keys retained by the person in charge of the work.
- (g) If operations (a) to (e) are carried out at more than one location then the keys from all locations should be retained until the permit to work is canceled.
- (h) Danger notices shall be attached (where applicable) on or adjacent to the live apparatus at the limits of the zone in which work may be carried out.
- (i) An electrical permit-to-work shall be issued.
- (j) Work on the spouts shall then be done under the personal supervision of the person in charge who shall prove each spout dead by means of an approved voltage indicator before it is worked on, the indicator itself being tested before and after the verification.

**(2) Feeder spouts, voltage transformer spouts and single panel busbar spouts**

When work is to be carried out on feeder and voltage transformer spouts or on the spouts of a single and separate panel, the following operations shall be carried out in strict sequence :

- (a) the spouts on which work is to be carried out shall be isolated from all points of supply from which they can be made live.
- (b) The isolating arrangements shall be locked so that they cannot be operated and the shutters of live spouts shall be locked shut.
- (c) Where practicable the spout contacts shall be checked by means of an approved voltage indicator to verify that they are not live, the indicator itself being tested before and after the verification.
- (d) The circuit shall be earthed at the point of work and where practicable at all points of isolation from the supply.  
For the purposes of earthing, metal-clad switchgear approved appliances only shall be used. The insertion of the hand or any tool into contact spouts for this purpose
- (e) Caution notices shall be attached at all points where the circuit can be made live.
- (f) Circuit breakers, isolators, spouts shutters, control handles and safety devices shall be locked in position by keys and the keys retained by the person in charge of the work.

- (g) If operations (a) to (e) are carried out at more than one location the keys from all locations shall be retained until the permit to work is cleared.

- (h) An electrical permit-to-work shall be issued.
- (i) Work on the spouts shall then be done under the personal supervision of the person in charge who shall remove the earths at the point of work and prove each spout dead by means of an approved voltage indicator, before it is worked on. The indicator itself being tested before and after the verification. If the only earths that can be applied to the circuit are those applied in the spouts on which work is to be done and are circuit main earths, then while this work is in progress no other work shall be carried out on the circuit connected to those spouts.
- (j) Where the spouts are connected to an overhead circuit on which there is any likelihood of dangerous induced voltage, additional earths shall be efficiently connected at the nearest point to the point of work where access to the conductors can safely be obtained.

**10. Work on high voltage cables and conductors**

**(1) High voltage cables and conductors**

- (a) The provisions of rule 8 shall apply to work on high voltage cables.
- (b) No person after receiving an electrical permit-to-work shall work on, or in any way interfere with, any high voltage cable or conduit or trough containing a high voltage cable, unless personally instructed at the point of work by the person in charge.
- (c) When any high voltage cable is to be cut the person in charge, after satisfying himself that the cable has been made dead and identified, shall, before allowed work to proceed request the client's engineer to spike the cable in an approved manner at the point where the cut is to be made.
- (d) When any high voltage joint or chamber is to be opened in circumstances where it is not desirable to spike the cable entering the joint or chamber, the person in charge shall prove by use of the appropriate cable route records, supplemented if necessary by an approved cable electrical testing set, that the joint or chamber is associated with the particular cable which has been made dead, and on which it is safe to work. The tests shall be carried out in the presence of and with the assistance of the client's engineer.
- (e) When the work is to be carried out on cable circuits in proximity to other live circuits and on cable circuits with fully insulated metallic sheaths, special precautions should be taken to avoid danger from induced voltages.

**11. Testing of high voltage apparatus**

1. When any high voltage apparatus is to be subjected to voltage before being connected to the high voltage system the authorized person responsible for applying the test voltage shall ensure that such apparatus is adequately guarded to prevent danger and that danger notices are attached in conspicuous positions during the period the apparatus may be subject to voltage. All cables shall be discharged before and after the application of test voltage.
2. Temporary conductors used for testing purposes shall be of an adequate size and easily visible.
3. Test connections shall not be applied in a cell or compartment in which there is any exposed metal live at high voltage, (this rule does not exclude the use of approved voltage indicator or approved devices for phasing out circuits).

**12. Preparation for work on high voltage apparatus containing or operated by compressed air**

1. The following special precautions shall be taken before any work, other than operating adjustments, on high voltage apparatus operated by or containing compressed air may be carried out:

- (a) The valves controlling the supply of air to the equipment shall be closed and the air released from the associated receivers and pipework which shall be left open to atmosphere.
  - (b) The valves shall be locked in position by safety locks and the keys shall be retained by the person in charge of the work.
  - (c) Caution notices shall be attached to the valves.
2. Operating adjustments on equipment operated by or containing compressed air which require the normal air supply shall be carried out under the direct supervision of an authorized person.

**13. Work on or in the vicinity of equipment containing sulphur hexafluoride (sf6) gas**

1. In addition to the requirements of rules E8 (1) and E12 the following special precautions shall be taken when work involves access to any part of the equipment which is, or has been in contact with the gas or associated compounds :
- (a) The apparatus shall be isolated from all sources of the supply of gas, purged and the associated receiver (s) and pipework left open to atmosphere.
  - (b) The valves shall be locked by safety locks and the keys shall be retained by the person in charge of the work.
  - (c) Caution notices shall be attached to the valves.
  - (d) Because the gas yields toxic fumes when heated the use of naked flames (welding equipment, etc) shall be avoided in the vicinity of equipment containing SF6 gas.
  - (e) Precautions should be taken to check for leaks by the use of a lack of oxygen detector before any prolonged work on or in the immediate vicinity of equipment containing SF6 gas is started. If possible suitable masks or breathing apparatus should be available in the working area.

**14. Safety rules for work on medium and low voltage apparatus, conductors and equipment**

**1. General precautions**

The consequences of chock or serious bum from short circuit associated with medium or low voltage system may be serious or, in some circumstances, fatal. Wherever practicable, therefore, work on medium and low voltage apparatus, conductors and equipment shall be done while they are dead.

**2. Work on dead apparatus, conductor and equipment**

When works to be done on dead medium voltage apparatus, conductors of equipment controlled by a circuit breaker or switch shall be blocked off where practicable and a caution notices affixed. The keys shall be kept in a safe place, preferably in the possession of the person in charge of the work and the circuit shall be proved dead by an approved indicator before work is commenced.

When the work is to be done on dead medium voltage apparatus conductors or equipment supplied from fuses in a fuse distribution board, the fuses shall be removed and a caution notice affixed to the distribution board with a notice specifying the circuit upon which work is in progress. The fuses shall be kept in a safe place, preferably in the possession of the person in charge of the work and the circuit shall be proved dead by an approved indicator before work is commenced.

**3. Work on live apparatus, conductors and equipment**

Work on live medium or low voltage apparatus conductors or equipment shall be undertaken only by a competent person and shall not be carried out by one person working alone.

**15. Work on relay, control and other auxiliary equipment**

No work is to be carried out on relay, control or other auxiliary equipment inside an operational substation without the receipt of a permit to work from the client's engineer. Any such panels should be de-energized as far as practicable to reduce the risk of inadvertent tripping and the precautions referred to shall be applied.

## **16. Definition**

**High voltage apparatus** - any apparatus, equipment and conductors which are normally operated at a voltage exceeding 650 volts.

**Medium voltage apparatus**-any apparatus, equipment and conductors which are normally operated at a voltage exceeding 250 volts but not exceeding 650 volts.

**Low voltage apparatus** any apparatus equipment and conductors which are normally operated at a voltage not exceeding 250 volts.

**Danger** - a risk of bodily injury or loss of life or health from shock, burn, asphyxiation, or other cause.

**Dead**- at or about zero voltage and disconnected from any live system.

### **Earths** -

**Circuit main earth** - an earth which is applied adjacent to each point of isolation before commencing work on the associated primary plant.

**Additional earth** - an earth which is applied after the circuit main earths have been applied and permit to work have been issued (for example an earth applied at a point of work).

**Earth** connected to the general mass of earth in such a manner as will ensure at all time an immediate discharge of electrical energy without danger, when applied to apparatus equipment and conductors, all phases short-circuited and efficiently connected to earth.

**Live** - electrically charged.

**Caution notice** - a notice attached to apparatus or its control equipment conveying a warning against interference with such apparatus.

**Danger notice** - a notice attached to apparatus or section of the system, when live, calling attention to the danger of approach to or interference with such apparatus or section of the system.

**Co pipe tent person** - a person who has sufficient technical knowledge or experience to enable him to avoid danger.

**Authorized person** - a competent person over 18 years of age, adequately trained, and possessing technical knowledge and appointed in writing by the company to carry out specific work on HV system, apparatus or plant.

The certificate of appointment shall state the class of work the person is authorized to carry out and the apparatus, plant or section of the system to which it applies.

**Switching** - the operation of switchgear, isolators, fuses or other methods of breaking or making a circuit.

**Failure of supply** - during failures of supply all apparatus, equipment and conductors shall be regarded as being live until isolated

**Appendix "A"**  
**Treatment for electric shock**

The following methods should be learnt from a qualified instructor and practiced regularly.

**Immediate and speedy action is necessary**

**Free from contact:**

Switch off current immediately or send someone to do so. Do not attempt to remove a person from contact with high voltage unless suitable articles unsuitable for the system voltage are used for this purpose. When attempting to free person from contact with low or medium voltage use rubber gloves, boots or mat, or insulated stick, but if these are not available use a loop of rope, cap or coat to drag the person free. Whatever is used should be dry and non-conducting.

**After release**

Do not waste time moving him. Lay the patient down on something dry, if no breathing can be observed, immediately proceed to promote artificial respiration and send someone else for a doctor .. and ambulance.

**Artificial respiration ; mouth-to-mouth method**

- (i) Remove any foreign material-false teeth, vomit, etc. which may cause blockage of the air passages.
- (ii) To open the air passage tilt the patient's head backward as far as possible. Use one hand to push the patient's head backwards and the other to pull the jaw forwards. At the same time slightly opening the patient's mouth.
- (Hi) Take a deep breath, place your mouth over the patient's mouth and below. Seal the patient's nose either by pressing your cheek against it or by grasping it with the fingers.
- (iv) Give 6 to 8 quick blows and then continue to inflate the chest about 10 times per minute.  
Watch the chest during inflation. It should rise. No movement indicates a blocked airway. If so, check mouth and throat are clear and tilt the head further backwards

### **Artificial Respiration : Holger Neilsen method**

- (i) Lay the patient face down-hands under chin. The face should not be turned to either side. If the hands are injured prop the chin up from beneath with a firm pad.

See that the air passages are clear of foreign matter.

Kneel on one knee at the patient's shoulder blade and rock forward with your elbows straight until your arms are vertical, pressing downwards but not too heavily. This movement should take two seconds.

- (iv) Grasp the patient's arms just above the patient's head (2 seconds).
- (v) Lower arms and transfer your hands to his shoulder blades,
- (vi) Repeat total movement at the rate of ten times per minute

### **Artificial Respiration : Silvester's method**

- (i) Remove any foreign matter blocking the airway.
- (i) Place casualty on his back with a pad of some kind under his shoulder so that the head falls back fully extended.
- (iii) Kneel at his head. Grasp the patient's arms at the wrist. Cross them over the lower chest and press to squeeze the air out of the chest (2 seconds)
- (iv) Pull arms upwards and outward to above the head, stretching the chest (3 seconds).
- (v) Repeat the whole movement approximately ten times per minute

### **Other injuries**

After breathing, priority should be given to controlling bleeding. This is achieved by firm pressure on the wound.

- (i) Cover with a clean dressing and bandage firmly in place.
- (ii) If bleeding continues add further dressings on top of the first and increase the pressure by bandaging firmly in place.

Burns should be covered with a clean, sterile dressing to exclude air. The dressing should be bandaged lightly in position.

Unless it is dangerous to leave the casualty at the site of the accident, expert assistance should be sought before other injuries are treated. If it is necessary to move the casualty do so with the utmost gentleness carefully supporting any injured parts.