ELECTRICAL ACCIDENTS - SAFETY ASPECTS

The fear of accident and safety measures to avoid these accidents, in our normal day to day life is built in our concience. Right from getting up from the bed in the early morning, going to bathroom, working in kitchen, going out for work, playing, eating every time you take precaution to see that untoward does not happen. Inspite of it accidents do happen, in majority of cases due to our own negligence is not adhering to safety or forgetting them or due to over-confidence.

Taking safety precautions is not only individual but also social responsibility of everyone. Taking of safety precautions should be not only to your safety or the safety of your subordinate staff or near ones, but also you have to ensure the safety of public in general and their property and also to your property and assets. Accidents may cause damage/loss to you, your staff/friend, public and property. It is therefore necessary that safety is made daily practice in all your action at home, office and everywhere and everytime.

Accidents are normally caused though they do happen like in natural calamities viz. earthquake, flood, lightning etc. Even in these natural calamities, the loss of life and property can be minimised by taking safety precaution at the time of planning like proper designing, to take care of these natural forces, by providing drainage outlets, warning etc. running lightning masts and earth wire etc.

Electricity has become necessity in our daily life and electricity, today is used in every home and office not only for lighting but also for daily chores like cooking, heating, air conditioning, entertainment, washing and even water purifying. The use of electricity in industrial and agricultural sectors need not be emphasised.

To cater to the power demands of the above sectors the Govt. has installed and operating thousands of mtr. of transmission and Distribution linesknown as power lines and various sub-stations and equipments. These power lines, criss-crossing the entire territory and areas pose a hazard not only to workmen but also to public in general, as contact with live power line is deadly and cause accidents, both fatal and non-fatal. The snapping of power line, bursting of electrical equipment like transformer, circuit breaker etc. or even blowing of fuses, if not properly

tected and taken safety precautions may lead the above
idents and also loss of property to both the Govt and
public.

ses of Electrical Accidents:

ctrical accidents are caused due to the following.

Poor Designing

Poor Construction

Lack of maintenance/Improper maintenance

Lack of knowledge/training

Not taking safety precaution

Poor Designing:

Non consideration of earth quake forces, correct wind loads etc. and correct soil bearing capacity while designing foundations for line supports like towers and poles.

Improper sizes of cable, conductors, transformers etc. which may get over loaded and cause blasts, fires and snapping of power lines.

Improper use of correct type of cables, equipment i.e. if it is near furnaces etc. fire proof cables, near water marine cables, near chemical factories etc. special cable resistant to chemical/fumes etc.
Not designing for proper clearences while crossing railway lines, navigable water ways etc. in consultations with the concerned authorities.

Poor Construction:

Not adhering to designs
Not adhering to IE rules/department code of practice inrespect of clearences, earthing, power line crossing, providing guardings etc.
Using sub-Standard materials

While construction itself not using proper tools and tackles for tensioning, erection etc.

Not using correct size of clamps etc.

Lack of maintenance/improper maintenance:

Lack of regular inspection of power line for safe clearances from ground, near by building, trees etc. and taking action to maintain the clearences.

Lack of maintenance of tools and tackles, like greasing of lifting equipment like jacks, chain pulley blocks etc. broken insulation pliers, screw drivers etc.

Lack of maintenance on metallic parts like cross arms, poles etc.

Non testing of relays and other protective equipment regularly for their performance.

Lack of maintenance of earth pits, DC battery supply etc. regular checking of earth resistance and DC voltage.

Non checking of electrical transformers, and circuit breakers etc. for their oil values, insulation registance etc.

Lack of Knowledge/Trainimg:

Lack of knowledge of the work on the part of the workmen and supervisory staff.

Lack of knowledge of inherint dangers involved in the work, and safety measures to be adopted.

Lack of training to use tools tackles, first aid etc.

Lack of knowledge to analyse the cause for abnormalites in the electrical system readings.

Not Taking Safety Precautions:

Personal injuries and injuries to staff are to a great extent, caused by not taking safety precautions.

Not using safety equipments like safety belts, hand gloves etc. have caused lot of accidents.

Issuing line clear without earthing the lines, non observance

phase made direct while obtaining line clear.

iv) Not earthing the line on either side of the place of working.

v) Not providing guardings between ~~near~~ power lines at different voltages on the same pole or while crossing the other power lines/telephone lines.

vi) Power lines crossing one another at angles other than 90°.

vii) Improper lighting, carrying of umbrellas etc. in switch yards etc.

Procedure for working on HT Line:

while working in HT line, always take line clear from the authority competent to issue the line clear for working on the said line. Observe the floowing.

(1) Take line clear

(2) See for yourself that circuit breaker is tripped, isolato are open and the blades actually opened.

(3) Ensure earthing is done. Follow earthing procedure using earthingrods. First connect the earthing rods wire to earth. Then hook the earthing rod to each phase conductor.

(4) While going on line, remember the staff attending the work (better make a list of the staff).

(5) Earth again at the poles which are on the either side of the place of your working so that any voltage, from paralled power lines or power line crossing the line on which you are working, is not induced.

(6) Use safety equipment like safety belts, ladders, ropes etc

(7) After the work is over ensure that all staff have come bac and no one is left out.(check the earlier list).

(8) Remove the earthing provided on the lines at place of work, follow the procedure for removing earthing rods. First remove earthingrods from phase conductors, and then disconnect earthing rods wire from ~~h~~ the earthing.

(9) Return the line clear to get the line charged.

General safety precautions

voltages shall be considered dangerous even though the voltage may not be high to produce shock. electrical circuits are to be treated alive and no work (maintenance, repair, cleaning) is to be carried on any part of the electrical apparatus or circuits unless such parts are :-

a) Dead
b) Isolated and practicable steps taken to lock off from the live conductors
c) Efficiently connected to earth at all points of disconnections to supply to such apparatus or between such and such points of work;
d) Released for work by issue of a permit
e) Checked for de-energisation

person shall touch the insulation which covers or supports any conductor subject to high voltage ess the conductor is dead and earthed.

nger notices, barriers, screens shall be fixed or moved only under the supervision of an Authorized son. Working space adjacent to exposed live parts shall not be used as passageways.

w electrical apparatus shall not be placed in service without the approval of the Senior Authorized son and until the same has been thoroughly examined and if necessary, tested by him. In places ere there is an occasional danger of explosion from inflammable gas or vapour mixture, all ctrical apparatus shall be constructed as to prevent danger and excluded from the area of risk.

ctrical conductors and cables shall be arranged so that the course of any conductor can be duly ed. Electrical circuits and any other electrical equipment shall be identified by labels or other able means to reduce the risk of accidents by mistakes.

he event of near approach a lightning storm, all outside work on electrical system should cease. Use overalls, loose dressing, jumpers and coats having metal buttons, metal straps and similar metal ngs should be avoided. Loose clothing should not be worn.

oes with nailed soles should not be worn. Shoes should have sewn soles or preferably rubber soles. not wear suspenders and arm bands with metal buckles or other metal parts.

tal key chains or metal keepers for key rings or watch rings should not be worn on the outside of thing. Extra precautions should be taken when working in an abnormally damp area.

orkmen shall satisfy themselves regarding safe working conditions and place themselves in a safe sition while working to avoid falling, stumbling, slipping or moving backwards against live parts. nen working under hazardous conditions, the workmen shall, under no circumstances, hurry to take take necessary changes and also shall not continue to work under such conditions when tired or nausted.

person to guard the same so that unauthorised person do not forcibly close the AB switch to cause accident.

e lines for Junior Engineers:

The Junior Engineer going for work should know the work to be carried out and should also be aware of the network in the area.

After taking line clear, should explain to his staff the work to be carried out and assign the work properly.

He should ensure that all tools and tackles are available and workmen are aware of using the same for a safe way of working.

He should explain the nearby power lines, if any, and also the dangers involved in the work place.

He should ensure that all his staff are in proper condition to work i.e. they are not drunk, sick, or mentally depressed due to any problem.

2. Rubber gloves should not be kept with other materials. They should be kept separately
3. In rubber gloves, other materials should not be kept
4. Rubber gloves should be kept dry and clean. Boric powder should be applied from outside.
5. Gamackzine powder should be applied to protect hand gloves from insects. Before working, hand gloves should be checked. Spoilt hand gloves should not be used.

Wooden (bamboo) ladder

a. Always for climbing pole, ladder should be used.
b. Ladder should be 6 meters in length.
c. Ladder should be varnished or oil should be applied to prevent it from spoiling by rainwater.
d. Never use metal ladder without permission
e. Only one man should work on the ladder at one time.
f. Damaged ladder should not be used.
g. Never use metallic colour.

Discharge or earthing rods

After switching off supply, line and electrical equipment should be discharged. Otherwise, a man who is working on the line may be electrocuted due to static charge. Earthing rods are used to earth this static charge and hence prevent a person from getting electrocuted. There are different types of earthing rods in practice.

Insulated tools

Insulated tools should be used properly. Checks should be kept for insulation of tools. Pliers, screwdrivers, testers are categorized as insulated tools.

Crash helmet

When the work is going on a pole, a person who is working on the pole throws nut bolts, clamps etc to the ground which may hurt the person who is standing on the ground. To prevent this, the person standing on the ground uses a crash helmet.

Goggle (welding): it is used to prevent injury to the eyes of a welder at the time of welding

Fire extinguishing equipments

orkmen shall not toss and/or material from one person to another, but transfer them from hand t
nd or by a hand line and a tool bag.
orkmen shall not place tools near the edge of a scaffold, roofs or structure from where they are liable
fall off or be kicked off.
orkmen shall not do anything to startle a person working in a hazardous location.

tructions for working on live line and transformer

Don't work on live line without permit

Any circuit should be treated as live up to the time we are not aware that it is dead.

Always patrolling should be done from the ground level. Never climb the pole.

Attendance of staff which are taken for work should be taken at the time of coming back after completion of the work.

If one line should be attended at different places, then separate permit must be taken.

After switching off the line, first check should be made for proper opening of A.B. Switch contacts, and then line should be earthed.

Proper lock should be provided after opening A.B. Switch

Where work is carried out, both sides of the pole should be earthed.

Before working on transformer, never hurry for work without earthing the transformer by shorting rods

D.O. Rod should be put always from ground level.

Shorting rods should be put after wearing hand gloves.

fety equipment and its safety

Hand gloves: there are two types of hand gloves which are used for HT and LT lines. Never use LT hand gloves to work on HT.

a. *Use of hand gloves*
   i. To operate isolators and A.B. Switch
   ii. To discharge the LT and HT line equipments by the help of discharge rods for earthing
   iii. To put fuses (fuses in D.P., pole fuses)
   iv. To put horn gas fuses, and transformer D.O. fuses
   v. To operate O.C.B.

Maintenance of rubber hand gloves

1. Rubber gloves should be used, if necessary

rmit

s a permission for working on a line, taken from authorized person by the official who is working on line

ıthorized person

1. Shift engineer or operation in charge can work
2. Permit is given to authorized person only
3. Authorized person should be named by Executive Engineer, ~~P.S.S or Senior P.S.S~~
4. Permission should be given for work which is noted in the application
5. Name of the authorized person should be put on the notice board in the sub-station, in power engineer's office and also in the Superintending Engineer's office
6. Permit can also be given by Chief Electrical Engineer, Superintending Engineer and Executive Engineer
7. For H.T line, authorized person should be of line inspector or equivalent cadre.

ethod of giving and taking permit

1. Application should be submitted to the authorized person of that area.
2. Where giving in writing is not possible, it should be given on the phone. At that time, the person receiving the phone application should repeat what is conveyed from the other end. After that, it must be noted in the L.C book.
3. Permit book is a very important record book. It should be numbered properly. It should only be used for line work. No page should be taken out of the permit book or misplaced.
4. Person who is taking the permit should only return it back. He should take the permit in his name and after returning, cancel his name.
5. Permit can be cancelled on phone
6. When permit is taken and received on phone, talk in a decent manner

ow to avoid accidents

cidents never occur but they are caused due to bad workmanship, unhealthy conditions of work, use improper tools and plants and over confidence. Accidents are classified as follows:

a) Considering line work
   i. If pole is not erected in alignment, then at the time of stringing the line, accidents may occur

Sand filled bottles, carbon dioxide cylinders should be kept in generating station, sub-station, big offices for extinguishing the sudden fire hazard.

Gum boots

It is used by linemen and other field staff at the time of patrolling of line at night to protect them from the poisonous bites of reptiles and other insects.

Safety of equipments

Line and sub-station equipments, line transformers, circuit breakers etc should be maintained properly by linesmen i.e. their important task.

a) *Power and distribution transformer should never be overloaded*

Care should be taken to see that it never crosses full load current. Check should be kept to the oil limit of the transformer. No leakage of oil should be present. All jumpers should be made by using lugs. They should be airtight. On above all aspects, checks should be kept at the time of shutdown.

b) *Circuit breaker*

Is used for the safety of transformer and lines. Always oil should be tested. If it is spoilt, then it should be replaced. Check should be kept for male and female contacts of circuit breaker. Routine shutdown work should be done properly.

Sub-station panel

Check should be made for loose contacts and cracks on the panel. Maintenance must be done regularly.

Earthing

In every equipment, earthing should be checked. Nut bolts should be tightened. After every 3 months, earth resistance should be measured and it should be seen that it should not cross the permissible limit.

Other equipments

1. Ropes 2. Workman's Cradle

All the tools and plants should be maintained properly. This way, we can avoid accidents. Ropes should be kept properly and it should be protected from rainwater. Steel ropes and tirfor should be kept in a godown where it will be protected from rainwater. Varnish and oil paints should be applied to the ladder. Rubber gloves should be kept dry and clean. Never use pliers as hammer.

Sand filled bottles, carbon dioxide cylinders should be kept in generating station, sub-station, big offices for extinguishing the sudden fire hazard.

Gum boots

It is used by linemen and other field staff at the time of patrolling of line at night to protect them from the poisonous bites of reptiles and other insects.

Safety of equipments

Line and sub-station equipments, line transformers, circuit breakers etc should be maintained properly by linesmen i.e. their important task.

a) *Power and distribution transformer should never be overloaded*

Care should be taken to see that it never crosses full load current. Check should be kept to the oil limit of the transformer. No leakage of oil should be present. All jumpers should be made by using lugs. They should be airtight. On above all aspects, checks should be kept at the time of shutdown.

b) *Circuit breaker*

Is used for the safety of transformer and lines. Always oil should be tested. If it is spoilt, then it should be replaced. Check should be kept for male and female contacts of circuit breaker. Routine shutdown work should be done properly.

Sub-station panel

Check should be made for loose contacts and cracks on the panel. Maintenance must be done regularly.

Earthing

In every equipment, earthing should be checked. Nut bolts should be tightened. After every 3 months, earth resistance should be measured and it should be seen that it should not cross the permissible limit.

Other equipments

1. Ropes 2. Workman's Cradle

All the tools and plants should be maintained properly. This way, we can avoid accidents. Ropes should be kept properly and it should be protected from rainwater. Steel ropes and tirfor should be kept in a godown where it will be protected from rainwater. Varnish and oil paints should be applied to the ladder. Rubber gloves should be kept dry and clean. Never use pliers as hammer.

nit

a permission for working on a line, taken from authorized person by the official who is working on ne

norized person

. Shift engineer or operation in charge can work
. Permit is given to authorized person only
. Authorized person should be named by Executive Engineer, ~~P.S.S or Senior P.S.S~~
. Permission should be given for work which is noted in the application
. Name of the authorized person should be put on the notice board in the sub-station, in power engineer's office and also in the Superintending Engineer's office
. Permit can also be given by Chief Electrical Engineer, Superintending Engineer and Executive Engineer
. For H.T line, authorized person should be of line inspector or equivalent cadre.

hod of giving and taking permit

. Application should be submitted to the authorized person of that area.
. Where giving in writing is not possible, it should be given on the phone. At that time, the person receiving the phone application should repeat what is conveyed from the other end. After that, it must be noted in the L.C book.
. Permit book is a very important record book. It should be numbered properly. It should only be used for line work. No page should be taken out of the permit book or misplaced.
. Person who is taking the permit should only return it back. He should take the permit in his name and after returning, cancel his name.
. Permit can be cancelled on phone
. When permit is taken and received on phone, talk in a decent manner

to avoid accidents

dents never occur but they are caused due to bad workmanship, unhealthy conditions of work, use nproper tools and plants and over confidence. Accidents are classified as follows:

) Considering line work
   i. If pole is not erected in alignment, then at the time of stringing the line, accidents may occur

3. **Personal behaviour**
    a. No smoking and drinking at the time of work
    b. No talking and making fun at the time of work

4. **Personal precautions**
    a. Be careful. Use flags or any signs
    b. Work carefully
    c. Understand carefully the work that has been allotted
    d. Work as per standard
    e. Keep check on T&P time
    f. If sick or facing some abnormalities and unable to work, then please bring this to the notice of the higher authority at once
    g. Every accident must be reported immediately.
    h. Enquiry must be made immediately
    i. Record of accidents will help in avoiding future accidents

Safety from electric shock

When a person gets electric shock, his heart will release excessive pressure and he may face terrible pains. Generally the resistance between two hands of the human body is 9000 ohms. When the hands become wet, the resistance will be about 1500 ohms. If the hands are wet with salt water, then the resistance further decreases to 500 ohms. Therefore a person experiences a severe shock in the bathroom and in the rainy season.

Human being getting shock depends on the following factors

1. Current flowing through the body
2. Electrical pressure
3. Electrical conductor touching human body
4. Time of getting electric shock
5. If the area of the body is more, then the person will experience a greater shock. If the body of a human being gets 0.1 amps current at 50 Hz frequency, then his tissues will start facing utmost pressure and will result in decomposition. He will lose balance if he gets 0.29 amps current. If 0.4 amps and 0.5 amps current flows through a person' s body, his breathing will stop. This time, artificial respiration should be started immediately.

ii. If stay is not earthed properly or no break insulator is provided for stay, accidents may occur when human beings or animals may come in contact with current (fault current) which passes through the stay.

iii. Accidents may occur if H.T. and L.T lines are not provided with road-cross guarding

iv. If the line which comes to A.B Switch and the D.O fuse is not joined properly then accidents may occur

v. If service connection is not released properly, it may result in accidents.

Working without authority

i. NMR is made to work on pole or instructed to replace fuse

ii. Making helper to work on a live line

iii. Putting consumers fuse and cut out fuse

Doing work without understanding

i. Working on ring/feeder and not opening the feeder properly on which work is to be carried out

ii. No attention is paid towards one direct phase in box

iii. Working on street lights without putting them off

iv. Care is not taken at the time of crossing of H.T and L.T line

v. Working without permit

vi. Climbing the pole when patrolling

Working without permit and disobeying the instructions

i. Working on the H.T line without permit

ii. Working on transformer before falling of the D.O line

iii. Working on L.T line before switching off H.T line or H.T and L.T combine structure or working without permit on the H.T line

iv. No lock to A.B Switch

Accidents due to carelessness

i. No sufficient precaution taken at the time of erection of pole and stringing of line

ii. Working without using safety equipments

iii. Wearing gold ornaments and other metallic accessories on body at the time of working

iv. Working on live line due to over confidence

v. Working without safety

1. Switch off the supply immediately
2. Send an authorized person immediately to switch off the supply
3. Don't touch the person with your hand and also don't touch him even if he is standing on a wooden chair.
4. To remove the person from the contact of the electrical equipments, use rubber gloves and boots. If a man gets a shock on a H.T line, then use proper equipments to take out the man from the line.
5. After taking the person down, his clothes should be loosened.

Other important points to be noted

1. Don't delay in treatment
2. Delay may cause death
3. Death due to electric shock is rare, but a person usually dies due to delay in treatment
4. Up to half an hour of an electric shock, the heart tissue will be alive. Start giving artificial respiration.
5. Call the doctor immediately
6. Continue artificial respiration until the doctor arrives
7. If 5/10 A current flows through the body for one second, then the heart may stop.
8. If 1/10 A at 50 volts flows through the body for 3 seconds, then the heart may stop. If required first aid is given, the patient may be saved.

<u>;t aid for electric shock</u>

1. Use Burnol on the wound. Dress the wound in such a way that it is airtight.
2. Wrap a blanket around the person to keep his body warm.
3. Patient should be treated with warm water bottle
4. No drinks should be served to a fainted patient
5. Drink containing alcohol should not be served to the patient without the doctor's permission
6. Start artificial respiration immediately.
7. ***<u>After he gets conscious</u>***
    a. Give him sodium-bicarbonate solution to drink
    b. Give him table salt to smell
    c. If the patient has wounds in his throat, do not give him any drinks without the doctor's permission
    d. Keep urine of the patient for medical checkup

Working without safety equipment

i. Working without safety rope and workman's cradle
ii. Working without using insulated pliers, spanners, testers and screw drivers
ii. Doing maintenance of street light without using ladder
v. Discharge rod and earthing rods are not used at suitable time

Irregularity in routine maintenance

i. No adequate tree clearance
ii. Broken and snapped guarding is not repaired
ii. No replacing of damaged kit kats
v. No replacing of spoiled service wire
v. Delay in maintenance of transformer

avoid accidents

Supervisor and his responsibilities

a. Working conditions and method
b. Safety equipment should be available and used
c. Proper maintenance of T & P
d. Safety rules and regulations should be observed by official
e. Work should be allotted as per ability
f. If there is a limitation on safety, it should be eliminated
g. *Please instruct the official about the following* :
    i. Work to be done
    ii. Possibility of accident
    iii. Safe method of working
    iv. Oral instructions should be repeated again

Personal responsibility

a. Self prevention
b. Subordinate protection
c. Outsider care
d. Boards assets and liability should be maintained

Name of the Organization .....

Department (issuing the permit) .....

Permit No. ..... Time ..... Date .....

1. I ..... certify that the following apparatus has been made dead, is isolated from all live conductors and has been connected to earth and the work mentioned in para (3) can now be carried out in accordance with the safety rules and regulations:

   .....

2. For the purpose of making the above apparatus dead, the following switches/isolators/links/fuses have been opened and the section so isolated has been earthed at each isolation point and danger notice plates fixed thereon:

   Switches .....
   Isolators .....
   Links .....
   Fuses .....

3. Work to be carried out (testing work, if any, to be specifically mentioned): .....

   .....

4. I have also recorded the above operations in the Log Sheet/Log Book including the instructions for the person who may relieve me.

5. This permit is now being issued to ..... (name of the person to whom the permit is being issued) for carrying out the work mentioned in para (3).

(Signature of the permit issuing authority)

(Designation) .....

Department (receiving the permit) .....

Permit No. ..... Time ..... Date .....

I ..... confirm that I have been issued this permit by..... (name of the permit issuing officer) and have been placed in direct and continuous charge of the work mentioned in para (3) and accept the responsibility of carrying out the said work taking all necessary safety precautions to avoid danger and no attempt will be made either by me or by men working under my control to carry out any other work on any apparatus other than that detailed in paras (1) and (3).

(Signature of the person receiving the permit and responsible for carrying out the above work)

(Designation) .....

f. Artificial respiration should be continued till the doctor arrives.
g. Up to the doctor's checkup, no treatment should be given to the patient, which w increase his tension.
h. When patient becomes normal, allow him to take rest. Give him a cup of tea
i. Don't excite him. He may get a heart attack.

aution to be taken at the time of working on the line and equipments

. All equipments should be considered as live. Don't work
   a. Without switching them off
   b. Without earthing
   c. Without permit
. Before working on H.T line, prior permission should be taken. If line is on self name, self name permission should be taken
. Working on live line without permission is dangerous
. Feeder should be switched off and earthed properly before working
. Line should be discharged with the help of discharge rods, before working
. Regular attendance should be taken before working on a line
. Hand gloves should be used before operating the A.B Switch
. Use safety belt and rope at the time of working

line safety precaution

. Line should be switched off before working. No ignorant man should be sent to switch off the line. One board of "CAUTION" should be kept near the line
. The line must never be touched by hand or by a tester to see whether it is switched off or not
. The line should be earthed by shorting rods and for using shorting rods, hand gloves must be used. The shorting rods must be removed only after the completion of the work.
. Safety belt should be used
. To put aerial fuse, ladder should be used. If aerial fuse is very near to the line, it should be put 4 feet below the line
. For fixing street lights, ladder should be used
. Tree cutting on the line must be done only after shutdown

the reverse.

ignature of the person transferring the permit)
)esignation) .....

(Signature of the person receiving the permit)
(Designation).....

---

me..... Date.....

:onfirm that the work specified in para (3) on reverse has been completed d all workmen withdrawn and warned that it is no longer safe to work the apparatus mentioned in para (1) on the reverse. I also confirm at all temporary earths and other connections made by me and by men ıder my control have been removed except that any precautionary steps ken by the permit issuing officer before the issue of this permit have not en interfered with by me or by men under my control. I hereby return e permit for cancellation leaving the dead apparatus ready for putting to service.

(Signature of the person returning the permit)
(Designation).....

---

ime..... Date.....

he work mentioned in para (3) on the reverse has been carried out; all ırths made for the purpose have been removed and danger notice plates ıt aside. The following switches/isolators/links/fuses have been closed ıd apparatus put back into service. Entry has been made in the Log ıeet/Log Book:

Switches.....

Isolators.....

Links.....

Fuses.....

(Signature of the permit cancelling authority)
(Designation).....

C-6. Where work is to be carried out on live low or medium voltage mains or apparatus, the following additional instructions shall be complied with:

a) No work shall be carried out by any person unless he is adequately protected from the risk of electric shock by the use of rubber gloves or other approved equipment especially provided for the purposes.

b) When a person is working on live mains or apparatus, he shall always be accompanied by a second person, who shall preferably be capable of rendering first aid and artificial respiration.

c) When a man ascends a pole where the line is alive, he shall make use of a safety belt and rubber gloves; such work shall be carried out under the direction of an experienced person who is competent to supervise the specific work and who shall remain present in the immediate vicinity for the whole time the work is in progress.

d) The person-in-charge shall examine the safety equipment before use by the workmen to ensure that it is in sound condition, and also that it is being properly used.

C-7. On completion of the work, remove all earthing devices, so that the mains and apparatus are fit in all respects for charging; withdraw all workmen and warn them that it is no longer safe to touch or approach the mains and apparatus, and thereafter return the keys and the permit duly discharged to the permit cancelling authority for cancellation.

C-8. All accidents shall be immediately attended to and reported to the proper authorities. In the event of a serious accident involving danger to life, the person-in-charge shall immediately get a doctor on site or remove the victim to the nearest hospital with the minimum delay. In the event of the victim being certified dead by a doctor, the body should NOT be removed without the permission of the police.

C-9. These instructions shall be read out and explained to the workmen in the language they understand, and copies shall be pasted on the various notice boards. Ignorance of the instructions shall not be accepted as an excuse for non-compliance with them.

GENERAL SAFETY PRACTICES IN ELECTRICAL WORK

D-1. EXERCISE CARE

D-1.1 Place yourself in a safe and secure position to avoid slipping, stumbling or moving backward against live conductors or apparatus. Do not rely for protection upon the care assumed to be exercised by others.

2-1. The following special instructions primarily to provide safe working conditions shall be rigidly complied with by all persons and at all times when working on a job with a permit-to-work. Any one disregarding these instructions or behaving in a manner likely to cause danger, either to himself or to anyone else, should be properly punished.

2-2. No person shall carry out or attempt any work on live mains or apparatus except with a permit-to-work and under the direct supervision of a competent person.

2-3. The person-in-charge shall explain the nature and duration of work to be carried out to the permit issuing authority, and obtain from him a permit-to-work before commencing any work.

2-4. The permit issuing authority shall not issue a permit unless:

a) the switches have been withdrawn and are completely isolated on both sides, links and fuses opened, mains and apparatus discharged and earthed, and all adjacent live parts adequately protected. Where possible, the switches shall be locked and keys handed over to the person-in-charge, who will not return them until completion of the work. Switches and fuses of all control panels shall also be rendered inoperative;

b) danger notice plates are attached in conspicuous place on the mains and apparatus, and at all other control points, under the permit-to-work; and

c) an entry is made in the Log Book or Log Sheet to the effect that the mains and apparatus under permit have been made dead. On no account shall they again be made alive until the return by the person-in-charge of the permit-to-work and the keys.

2-5. The person-in-charge, before allowing any workman to commence work on the mains and apparatus, shall take the following precautions:

a) Explain the nature of work, and the precautions taken by the permit issuing authority to ensure the safety of the workmen and also the precautions to be taken by them during the progress of the work;

b) Satisfy himself that the switches controlling the mains and apparatus have been isolated, discharged, properly earthed where possible and tested with a discharge rod and that danger notice plates have been placed at conspicuous places; and

been effectively earthed locally before permitting men to work upon it.

D-6. DANGEROUS AREAS

D-6.1 When working in areas which contain or may contain live mains and apparatus, fix danger notice plates, barriers, rails or other guarding arrangement for the working area. Do not store materials within high voltage enclosures or low voltage areas.

D-7. WARNING BOARDS

D-7.1 Warning boards shall be placed by the person-in-charge on all switchgear before men are permitted to work and should only be removed by the person who has placed them. It is desirable that the person issuing the permit shall place one warning board on the switch energizing the mains for each permit issued so that he can be sure that all the permits-to-work are returned when he has to charge the mains.

D-8. VISITORS AND UNAUTHORIZED PERSONS

D-8.1 Visitors and unauthorized persons shall not be allowed to proceed in the vicinity of live mains and apparatus, unless accompanied by an authorized person who will be responsible to ensure that his instructions regarding safety are strictly complied with.

D-9. WORKING IN DAMP SITUATIONS

D-9.1 Extra precautions should be taken when working in abnormally damp area.

D-10. USE OF TONG OR CLIP-ON AMMETERS

D-10.1 These shall not be used on high voltage conductors, unless the conductors are lead-sheathed. On low voltage conductors, all persons, not accustomed to the handling of tong or clip-on ammeter, shall be warned by the person instructing him of the necessary precautions to be observed before being allowed to use it.

D-11. WARNING THE PUBLIC

D-11.1 When, either accidentally or otherwise, live mains and apparatus constitute a danger to persons in a public place, a person shall be detailed to stand by and personally warn the public until the danger has been removed.

D-1.3 Make a habit of being cautious. Be on the lookout for danger notice plates, danger flags, warning boards and signals, etc. Warn others when they seem to be in danger near live conductors or apparatus.

D-2. PERSONAL APPAREL

D-2.1 Use of overalls, dungarees, jumpers and coats having metal buttons, metal straps and similar metal fittings should be avoided. Bone buttons may be used. Buttons should be sewed in place with thread. Loose clothing should not be worn.

D-2.2 While working on live conductors, do not roll up sleeves as dry cloth gives some protection against shocks.

D-2.3 Do not wear shoes with nailed soles. Shoes should have sewn soles, or preferably rubber soles.

D-2.4 Do not wear suspenders and arm bands with metal buckles or other metal parts. These might come in close proximity to live parts and cause serious, if not fatal, injury.

D-2.5 Metal key chains, or metal keepers for key rings or watch chains should not be worn on the outside of clothing. There is always a possibility that they may come in contact with live conductors or live apparatus.

D-2.6 While welding, wear goggles, safety glasses or any other eye protection as instructed by the person-in-charge depending upon the type of work handled.

D-3. TREAT EVERYTHING AS LIVE

D-3.1 Treat all electrical conductors and apparatus always as live and consequently dangerous to human life, unless it is positively known to be dead and properly earthed and take precautions accordingly.

D-4. THINK BEFORE YOU ACT

D-4.1 Think carefully before you act. Make sure you are right. Watch out for the other man and make sure he is right.

D-4.2 Never speak to any person working upon live mains or apparatus, unless the person doing the work is aware of your presence.

D-5. DANGEROUS VOLTAGES

D-5.1 All voltages are dangerous. It shall be borne in mind that even low voltage shock may be fatal.

Before working on any circuit or apparatus, make sure that the controlling switches are opened and locked or the fuse holders withdrawn.

Always treat circuit as alive until you have proved them to be dead, the insulation of the conductors may be defective.

Before working on motor or other rotating machine, make sure that it cannot be set in motion without your permission.

Cultivate the habit of turning your face away whenever an arc or flash may occur.

Guard against arcs as well as high voltage, remember that burns from arcs may be very severe.

See that all splices and connections are securely made.

Use extreme care when breaking an inductive circuit as dangerously high voltage is likely to result.

Thoroughly discharge to earth all cables before working on the cores.

Test rubber gloves periodically.

Place rubber mats in front of electrical switchboards.

Prevent accumulation of gases in unventilated manholes. Varnishes emit flammable vapour.

Do not touch or tamper with any electrical gear or conductor, unless you have made sure that it is dead and earthed. High voltage apparatus may give leakage shock or flashover even without touching.

Do not work in live circuits without the express orders of the person-in-charge. Make certain that all safety precautions have been taken and you are accompanied by a second person competent to render first aid and artificial respiration.

Do not disconnect earthing connections or render ineffective the safety gadgets installed on mains and apparatus.

Do not tamper with the meter boards and cutouts, unless you are authorized to do so.

Do not expose your eyes to an electric arc. Painful injury may result even with short exposure.

Do not close or open a switch or fuse slowly or hesitatingly; do it quickly and positively.

Do not turn your face and then grope for switch or fuse.

Do not use metal case flashlight around apparatus which is energized.

Do not place any part of your body in circuit either to ground or across the terminal when making a connection or operating.

Do not use wires with poor insulation.

D-12.1 All portable electrical apparatus shall be regularly examined, tested and maintained to ensure that the apparatus and leads are in good order.

D-12.2 Ensure that all portable appliances are provided with 3-pin plug and socket connections and that the metal work of the apparatus is effectively earthed.

D-12.3 All loose wiring, such as flexible cables for portable lamps, tools and trailing cables and other portable and transportable apparatus, shall be tested regularly at frequent intervals to ensure safety.

SAFETY POSTER FOR VIGILANCE AGAINST ELECTRICAL ACCIDENTS

IMPORTANT: Electric shocks are easily received and are easily avoided. The risk is not always APPARENT. BE CAREFUL. Observe scrupulously the following DOs and DON'Ts:

DO	DON'T
1. Mains and Apparatus	
Before replacing a lamp or handling a fan, make sure that the supply is switched off.	Do not connect single pole switch or fuse in a neutral circuit, but always connect in the live or phase wire.
Use correct size and quality of fuse wire when renewing blown fuse.	Do not renew a blown fuse until you are satisfied as to the cause and have rectified any irregularity.
When removing fuse, pull out the supply end first and when replacing, the supply end should be put in last.	Do not use copper wire as substitute for fuse wire.
Place sign 'men working' or other warning boards on main switch before commencing work.	Do not close any switch, unless you are familiar with the circuit which it controls and know the reason for its being opened.

Organize precautionary fire drill.

Have sufficient number of fire extinguishers located in strategic positions, so that they may be available for immediate use in various areas.

Check fire fighting apparatus periodically.

Wipe up oil as soon as possible; use sand to cover oil spots.

4. Electric Shock

Remove the casualty from the cause, render first aid and send for doctor or take the casualty to a hospital or dispensary.

Report all accidents, whether minor or major, non-fatal or fatal, immediately to the person-in-charge.

Study carefully and practise first aid treatment for injured persons.

Study carefully and practise regularly the instructions for resuscitation (artificial respiration) after electric shock, displayed at every major electrical installation.

Whenever possible, use one hand only when working about an electrical circuit, even though it is supposed to be dead.

Do not take unnecessary risk with electricity. Low voltage, under certain circumstances, can be more dangerous than high voltage.

Do not leave the casualty in contact with live apparatus. Switch off current immediately.

Do not attempt to disengage a person in contact with a live apparatus which cannot be switched off immediately. Insulate yourself from earth by standing on rubber mat, or dry board before attempting to get him clear. Do not touch his body. Pull him by clothes if they are dry or push him clear with a piece of dry wood.

Do not discontinue artificial respiration until recovery or death is certified by doctor. It may take even more than 2 to 3 hours for recovery.

Do not remove the body without the permission of the police even after certification of death by doctor.

Do not touch an electric circuit when your hands are wet, or bleeding from a cut or an abrasion.

Do not work on energized circuits without taking extra precautions, such as the use of rubber gloves and wooden handles.

2. Portable Lamps and Appliances

Ensure that all portable appliances are provided with 3-pin plug and socket connections and the metal work of the apparatus is effectively earthed.

Always use portable hand lamps of the insulated safety type and provided with a rubber, plastic or wooden handle and wire guard.

Do not use a lamp in a metal holder fixed to the end of a loose flexible wire as a portable hand lamp.

Do not disconnect a plug by pulling the flexible cable or when the switch is ON.

Do not use kinked or perished cables for portable lamps and appliances.

Do not plug in any portable lamp or apparatus before making sure that the switch is OFF and that the wall plug is properly inserted in the socket.

3. Fire

Disconnect the supply immediately in case of fire on or near electrical apparatus.

Make sure, when using water hose, that the jet of water does not come into contact with live apparatus.

Keep flammable material only in special containers and in fireproof rooms.

Be sure that your men are familiar with the location of fire fighting apparatus.

Do not use fire extinguishers on electrical equipment, unless it is clearly marked as suitable for that purpose. Use sand or blanket instead.

Do not throw water on live electrical equipment in case of fire. It is dangerous to you.

each and practise safety at all imes. Good work can be spoiled y an accident.

ork deliberately and carefully. Iaste causes many accidents, be ure of what you are doing.

tamine before use all safety appli- nces, such as rubber gloves, mats, adders, goggles, insulated pliers, tc, for their soundness.

ways add the acid or soda to water nd not *vice versa* when mixing ulphuric acid or caustic soda and ater.

lways report immediately to the erson-in-charge or to any other roper authority any dangerous ondition or a dangerous practice hich you may observe.

ways be cautious while lifting or emoving a heavy apparatus or naterial.

arn others when they seem to be n danger near live conductor or pparatus.

lways be careful and take no chance gainst any possible accident.

ttend at once to all injuries however light they may be.

lways obey the safety instructions iven by the person-in-charge.

Do not wear loose clothing, metal watch straps, bangles or finger rings while working on electrical appliances. Do not hang clothes and such other things on electrical fittings.

Do not work on a pole or other elevated position if there is a live part on it without safety belt and rubber gloves, and unless a competent person stands on the ground nearby to direct operations and give warning.

Do not use a ladder without a lashing rope; otherwise the ladder should be held firmly by another person.

Do not go carelessly near running belts on machines.

Do not remove danger notice plates or other signs or interfere with safety barriers or go beyond them.

Do not bring a naked light near battery. Smoking in the battery room is prohibited.

Do not allow visitors and unauthorized persons to touch or handle electrical apparatus or come within the danger zone of high voltage apparatus.

Do not enter excavations which give out obnoxious smell, or work in badly lit, badly ventilated and congested areas.

Do not touch a circuit with bare fingers or hand or other make-shift devices to determine whether or not it is alive.

Nova cidade com
Hélio R[illegible]