

UTTAR HARYANA BIJLI VITRAN NIGAM LIMITED



SAFETY MANUAL

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UTTAR HARYANA BIJLI VITRAN NIGAM
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PREFACE

It is with great pleasure that I present the Safety Manual for the benefit of all those who take upon the task to manage and maintain the distribution system of the Nigam. To make it more useful, elaborate safe operating procedures have been described along with sketches / photographs wherever possible. I hope it will not only provide a new dimension but as well generate interest in the users.

I need not emphasize the point here that safety needs complete attention in every aspect as it touches all spheres of our day to day life. We need to develop a healthy safety culture not only for our safety but also in the public interest at large and in the interest of company's property.

UHBVNL holds in deep reverence the value of the lives of its employees and human life in general. For this reason, it is intensely committed towards providing the latest safety equipment to all its employees. However, its concern does not end here. It is imperative that safety becomes a high-priority factor in all areas of operation, maintenance and construction in the organization.

UHBVNL thus has published this Safety Manual which is a collection of Safety Guidelines. These guidelines are a product of different experiences with incidents that have caused fatal injuries, service interruptions, property damage and economic loss. These guidelines are formulated to counter previous shortcomings and to accomplish the highest standards of safety.

The observation of all the guidelines in this manual will enable and empower the employees to build a safe work environment for all UHBVNL employees.

Wishing all UHBVNL employees a happy and safe work experience.

Vijayendra Kumar, IAS

Managing Director,

UHBVNL

 **IGNORANCE OF RULES AND REGULATIONS WILL RESULT IN ACCIDENTS TO SELF AND HIS CO-WORKERS.**

 **STUDY THE MANUAL CAREFULLY.**

 **NO OPERATION OR ACTIVITY IS SO URGENT THAT IT HAS TO BE PERFORMED IN AN UNSAFE MANNER.**

 **TIME IS IMPORTANT BUT SAFETY IS MORE IMPORTANT.**

ELECTRICITY SAFETY RULES:

Do's:

1. DO obey safety instructions given by the person in-charge.
2. DO insulate yourself from earth by standing on rubber mat while attempting to get in contact with live line or apparatus.
3. DO remove the casualty from the cause, render first aid and send for doctor or take the casualty to the nearest hospital.
4. DO break the circuit by opening the power switch and release the victim.
5. DO preach and practice safety at all times.
6. DO eliminate all short-cuts while on duty.
7. DO use correct size and quality of fuse wire while renewing the blown out fuse.
8. DO turn your face away whenever an arc or flash occurs.
9. DO ensure controlling switches are opened & locked or fuse holders are withdrawn before working on lines.
10. DO disconnect the supply immediately in case of fire on or near electrical apparatus.
11. DO keep away inflammables from electrical apparatus.
12. DO report all accidents whether minor or major, fatal or non-fatal, departmental or non-departmental immediately to the person in-charge.

Don'ts:

1. DO NOT renew a blown fuse until you are satisfied as to the cause and you have rectified the irregularity
2. DO NOT disconnect a plug by pulling flexible cable when the switch is on
3. DO NOT use wire with poor insulation
4. DO NOT close any Switch/GOS/Breaker unless you are familiar with the circuit, which it controls and know the reason for its being kept open
5. DO NOT work on energized circuits without taking extra precautions, such as use of rubber gloves and gauntlets
6. DO NOT touch or tamper with any electrical equipment or conductor, unless you have made sure that it is DEAD AND EARTHED
7. DO NOT work on the live circuit without the specific orders of the supervisor and make certain that all safety precautions have been taken.
8. DO NOT disconnect earthing connection or render ineffective the safety gadgets installed on mains and apparatus.
9. DO NOT open or close switch or fuse slowly or hesitatingly.
10. DO NOT touch an electric circuit when your hands are wet, or bleeding from a cut or an abrasion.
11. DO NOT use fire extinguisher on electrical equipment unless it is clearly marked for that purpose.
12. DO NOT throw water on live electrical equipment in case of fire.
13. DO NOT attempt to disengage a person in contact with a live apparatus, which you cannot switch-off immediately.
14. DO NOT touch his body, push him with a piece of dry wood.
15. DO NOT discontinue artificial respiration until recovery or death is confirmed by the Doctor.
16. DO NOT allow visitors and unauthorised persons to touch or handle electrical apparatus or come within the danger zone of H.V.apparatus.

17. DO NOT test circuit with bare fingers.
18. DO NOT trust luck, but trust safety.
19. DO NOT joke, joke begins in fun, and ends in death.
20. DO NOT shorten your life, life is short and precious.

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CHAPTER1: TERMINOLOGY

“SAFETY MATTERS”

1.1 The terms used in this manual shall be interpreted in the most commonly accepted sense consistent with the electrical industry.

- (a) **Authorized person:** One who is authorized to perform specific duties under certain conditions or who is carrying out order from competent authority and as defined under rule 3 of I.E. Rules of 1956.
- (b) **Unauthorized person:** One who is not permitted to work on electrical apparatus except under the personal supervision of an authorized person.
- (c) **Dead:** 'Dead' means at or about earth potential and disconnected from any live system. Provided that the apparatus separated from a live conductor by a spark gap shall not be deemed to be 'Dead'.
Note: The term 'Dead' is used only with reference to current carrying parts, when these parts are not alive.
- (d) **Earth:** 'Earth' means a conducting mass of earth or of any conductor in direct electrical connection therewith.
- (e) **Earthed:** 'Earthed' means connected to earth in such a manner as it will ensure immediate discharge of electrical energy without danger at all times.
- (f) **Emergency:** 'Emergency' for the purpose of this code means an unusual condition which exists that endangers life and/or property.
- (g) **Foreman:** 'Foreman or supervisor' shall mean Assistant Engineer/Junior Engineer/the authorized employee directly in charge of workmen doing the work regardless of title.
- (h) **Live:** 'Live' means electrically charged.
- (i) **Permit issuing Officer:** 'Permit issuing Officer' is a person who is authorized for ensuring that all controlling switches and circuits have been isolated, made dead and inoperative and that adjacent circuits have been made safe for the work to be carried out and who is authorized to issue the 'Permit to work'.
- (j) **Permit to work:** 'Permit to work' means a form of declaration signed by and given by one authorized person to another authorized person in-charge of work to be carried out on or adjacent to any electrical apparatus, mains or service lines, for the purpose of making known to such latter person exactly what apparatus, mains or service lines are made dead and earthed and safe for working.

- (k) **Protective Devices:** 'Protective Devices' means devices such as rubber gloves, rubber gauntlets, line hose, rubber boots or other insulating devices, which are especially designed for the protection of workmen.
- (l) **Low Voltage:** Where the normal voltage is not greater than 250 Volts and in no circumstances exceeds 263 Volts.
- (m) **Medium Voltage:** Where the normal voltage exceeds 250 Volts but is not greater than 650 Volts and in no circumstances exceeds 683 Volts.
- (n) **High Voltage:** Where the normal voltage exceeds 650 Volts but is not greater than 33,000 Volts and in no circumstances exceeds 37,125 Volts.
- (o) **Extra High Voltage:** Where the voltage exceeds 33,000 Volts under normal conditions subject to 12.5% variation.

CHAPTER2: FUNDAMENTALS OF SAFETY

“ALWAYS BE CAREFUL”

SAFETY

- 2.1 Safety is the proper planning of work, proper usage of safety tools, exercise of good judgement and intelligent supervision. Experience proves that majority of the accidents are preventable.

FUNDAMENTALS OF SAFETY

- 2.2 Prevention of accidents requires the whole hearted co-operation of all employees of the organization. A capable mentally alert employee will avoid accidents.
- 2.3 A careless man is a liability to the Organization. He is dangerous to himself, his fellow workers, the public and the Organization.
- 2.4 Accidents do not just happen. Accidents are the result of unsafe acts or unsafe conditions or a combination of both.
- 2.5 **'Unsafe Acts':** Which may cause accidents, include the following:
- (a) Opening and Closing of switches without authority or warning, operating hoists and trucks without warning, failure to place warning signs or signals where needed.
 - (b) Working unsafely such as throwing materials or tools, at another worker, jumping from vehicles and platforms, or unnecessary haste.
 - (c) Making safety devices inoperative.
 - (d) Using unsafe equipment, wrong tools for the job, or using hands instead of hand tools.
 - (e) Working on live electrical equipment that could conveniently be de-energised.
 - (f) Taking unsafe position or posture too close to opening and lifting while in awkward position. (Riding on running boards or other unsafe places of vehicles).
 - (g) Distracting, teasing, practical joking, horseplay, quarrelling or annoying.
 - (h) Failure to use safe clothing or protective equipment such as failure to use rubber gloves, helmet or energized equipment.
- 2.6 **Unsafe conditions:** Which may result in accidents, include the following:

- (a) Unguarded floor openings and excavations, exposed live circuits.
- (b) Improper illumination such as insufficient light or unsuitable location producing glare or objectionable shadows.
- (c) Unsafe design and construction, such as poor scaffolding and structure, structures like platforms should have large safety factors, and their construction and design in general should incorporate safety features.

2.7 All anticipated hazards should be pointed out to workers.

GENERAL INSTRUCTIONS FOR SAFETY

2.8 **Responsibility of Individuals:** Definite responsibility of individuals is to act so as to provide:

- (a) Safety to himself.
- (b) Safety to his fellow employees.
- (c) Protection to the Public.
- (d) Protection to the Organization property.

2.9 Every employee is expected to study the Safety Manual, familiarize himself with its contents and apply them to work. Ignorance of Rules and Regulations will result in accidents to himself and his co-workers.

2.10 Whenever in doubt regarding any rules and regulations, he should consult his Foreman or Supervisor.

2.11 Before attempting any work under conditions that he considers to be unsafe, he is required to bring them to the attention of the person-in-charge of the work and seek his advice.

2.12 It will be the duty of every employee to report promptly to his foreman or Supervisors any dangerous or improper condition of equipment he notices.

2.13 **Personal Conduct:**

- (a) Use of intoxicating liquor while on job is strictly prohibited. No employee shall report for work while he is under the influence of liquor and no foreman or supervisor shall knowingly permit a man to go to work while he is under the influence of liquor.
- (b) Practical joking and horseplay while on the job is strictly prohibited.

- (c) No employees shall distract the attention of another worker from his job unless he thinks that the worker is doing something, which is dangerous to his person, other workman or to the equipment.
- (d) Any employee who endangers his own or other's safety by violating the foregoing requirements of personal conduct shall render himself liable to disciplinary action.

2.14 Always Be Careful (A B C):

- (a) The workman should place himself in a safe position while working to avoid falling, stumbling, or moving backwards against live parts.
- (b) The workman should satisfy himself regarding the safe working conditions before starting the work. The care exercised by others should be checked.

2.15 House Keeping: Workmen are frequently injured by tripping, stumbling, stepping on or bumping into tools, material and other objects left lying around or by carelessly placed objects falling from above. To ensure good housekeeping following precautions should be observed:

- (a) Walks, aisles, stairways, fire escapes and all other passage ways shall be kept clear of all obstructions.
- (b) Tools and materials should not be placed where they may cause tripping or stumbling hazards or where they may fall and strike any one below.
- (c) Puddles of oil and water create a slipping hazard and should be cleaned up promptly.
- (d) Nails in boards, such as those removed from scaffolds, forms and packing boxes, constitute a hazard and should be removed. The boards should be carefully stacked or stored.
- (e) Dirty and oily waste rags should be disposed off as soon as practicable to avoid fire hazard.
- (f) Broken light bulbs, glass, metal scrap and other sharp objects should be dumped in places, provided specially for them.
- (g) Discarded fluorescent and other gas filled tubes shall be disposed off safely.

“Failure to comply with safety precautions is an offence and is a punishable act”

CHAPTER3: RESPONSIBILITY FOR SAFETY

“A LITTLE CARE MAKES MISHAPS RARE”

FOREMAN / SUPERVISOR'S RESPONSIBILITY

3.1 Foreman/Supervisor has the definite responsibility of ensuring the following:

- (a) Safe working condition.
- (b) Necessary equipment and its use.
- (c) Properly maintained tools and equipment.
- (d) Properly planned work performed in a safe manner.
- (e) Application of the general and special safety instructions by their workmen.
- (f) Assignment of employees to jobs, which they are capable of doing safely.
- (g) Immediate steps to correct any violation of safety rules observed or reported to them.
- (h) Foreman/Supervisor will be held responsible for seeing that work under them is done in a safe manner.
- (i) Each Foreman/Supervisor shall make certain that his men understand the following:
 - (i) Work to be done
 - (ii) Hazards that may be encountered.
 - (iii) Proper procedure for doing the work safely.
 - (iv) Frequent periodic inspections of construction, operation and maintenance equipment, work areas, conditions and methods should be made by Foreman / Supervisor as a part of their routine duty. Such inspections are essential to prevent fires and accidents.

EMPLOYEE'S RESPONSIBILITY

- 3.2 This is fully covered under the clause No.2.2 relating to General instructions for safety.

EMPLOYER'S RESPONSIBILITY

- 3.3 The Employer has a definite responsibility of providing proper safety tools and equipments and proper on the job training.

CHAPTER4: ACCIDENTS

“A DANGER FORESEEN IS AN ACCIDENT PREVENTED”

- 4.1 An accident may be defined as a sudden mishap that interrupts the operation of an activity.

CLASSIFICATIONS

- 4.2 **Electrical:** Resulting generally from any of the following causes
- (a) Any person or animal coming in accidental contact with snapped overhead conductor.
 - (b) Any person or animal coming in contact with a metallic line support, stay wire, unauthorized energisation of fencing, frame of electrical apparatus, etc., through which there is leakage of current due to failure of insulation, damaged insulators, etc.,
 - (c) Coming in contact with live overhead conductors during renewal of blown out fuses, replacing street lamps, cutting across live underground cable or touching live overhead conductors with metallic rods, etc.,
 - (d) Climbing up poles or towers and coming in contact with live overhead
 - (e) electrical conductors, maliciously, out of ignorance or with the deliberate intention of committing suicide.
- 4.3 **Mechanical:** Mechanical injury resulting from an electrical shock, such as person being thrown off line support due to electrical shock sustained.
- (a) **Non-electrical:** Non Electrical injury due to reasons such as fall from a pole, structure, tower or roof trusses, etc., hurt caused while handling heavy machinery, while driving vehicles, etc.,
 - (b) **Miscellaneous:** Other causes such as fires, drowning, explosions, etc.

CAUSES OF ACCIDENTS

- 4.4 Those over which we have limited control, like floods, landslides, earthquakes, fires, lightning and other acts of nature.
- 4.5 Those due to improper or defective equipment and failure to provide adequate protective devices

4.6 The human elements or 'Human Factor' is by far the greatest cause of serious accidents.

4.7 **“Failure under Human factor” can be more clearly divided into the following classification:**

- (a) Failure on the part of workmen to observe safety rules made for their protection.
- (b) Failure on the part of Foremen or others having responsibility over workmen to properly instruct those under their supervision as to their duties and insistence upon workmen to observe safety rules.

ACCIDENT REPORTS, RECORDS AND INVESTIGATIONS

4.8 Accident records are essential aids to the prevention of accidents. They show the type of accidents most frequently encountered, where they occur and their relative severity. A study of these records will emphasize common hazards and permits a better understanding of the causes of accidents and most effective methods of preventing them.

4.9 All accidents, which result in injury or not, shall promptly be reported to the Foreman or Supervisor. Many injury free accidents, which are not reported, recur with serious consequences.

4.10 Every Accident should be investigated to determine the cause and what steps are needed to prevent recurrence. It shall be the responsibility of the person in charge of the job to get a complete detailed cause of the accident as soon as possible after its occurrence.

REPORTING OF ACCIDENTS

4.11 **Non-Electrical Accidents:** Foreman or Supervisor in charge of work should furnish immediate information to proper authorities on the occasion of every serious accident and in the case of death on the spot, they should not allow the body to be removed till an enquiry has been held. Fatal accidents to departmental workmen should be reported promptly by the Assistant Executive Engineer / Executive Engineer to the Chief Engineer and a copy of the report should be sent to the Superintending Engineer & Chief Electrical Inspector (CEI). Information should also be immediately furnished to the District Superintendent of Police and concerned Inspector or Sub-Inspector of Police.

4.12 **Non-Fatal accidents:** should also be reported to the Superintending Engineer, the Zonal Chief Engineer, Chief Electrical Inspector, duly indicating the circumstances leading to the accident.

4.13 **Electrical Accidents:** Under Section 33 of the Indian Electricity (Amendment) Act, 1992, all electrical accidents including mechanical injury caused due to electrical shock should be reported by the concerned, within 24 hours to the Electrical Inspector and in case of death, the notice should be sent by telegram/fax or telephone confirmed on the same day in writing. The telephone/fax message should be in the standard form as under Appendix I. The telephone/fax message should also be conveyed to the Superintending Engineer (OP), Circle & Co-operate office of UHBVN and the zonal Chief Engineer, Chief Electrical Inspector (CEI) & Corporate office of UHBVN, Pkla also on the same day.

4.14 A detailed report shall be submitted to the Chief Electrical Inspector as in Appendix II within 48 hours. Information should be furnished to the District Superintendent of Police and concerned Inspector or Sub-Inspector of Police.

Note:

- (1) Correspondence regarding compensation payable and wages due will be dealt at Corporate Office of UHBVN.
- (2) Failure to comply with the above instructions regarding accidents, electrical or non-electrical, fatal and non-fatal is an offence punishable under the Indian Electricity Act of 1910 and Workmen's Compensation Act and the Act makes no distinction between the Corporation and a Private Employer.

CHAPTER5: FIRST AID

“ACT AT ONCE - DELAY IS FATAL”

TREATMENT FOR ELECTRIC SHOCK, SUFFOCATION AND DROWNING

- 5.1 In most of the cases of electric shock and collapse, it is the lungs and the diaphragm (the thin sheet of muscles which lies below the lungs) that have stopped working and there is a very good chance of revival by applying artificial respiration quickly.
- 5.2 In case of severe shock, respiration is seldom established under one hour while three to four hours or more might be found necessary to restore normal breathing. It is therefore, essential that in all cases of electric shock where the condition of the patient is doubtful or the patient is unconscious or not breathing, artificial resuscitation should be continued until the patient breathes normally or until the doctor has pronounced life extinct.

RESUSCITATION DRILL

- 5.3 Every employee shall qualify himself by practical study and drill in the treatment for electrical shock according to the instructions contained in this Chapter, and those given in the Resuscitation Cards hung up at all the Receiving Stations, Sub-stations, Switching Stations, etc., of the Corporation.

REMOVAL FROM CONTACT

- 5.4 If the person is still in contact with the apparatus that has given the shock, switch off the electric circuit at once, if there is switch, fuse or circuit breaker close at hand, if not, lose no time from proceeding to remove the body from contact with the live conductor.
- 5.5 Do not touch the victim's body with bare hands, but if rubber gloves are not at hand, pull him off the live conductor by his coat, shirt, etc., if they are not wet or fold your coat, or some dry article such as a news- paper into three or more folds/ thickness, and using this as a pad, take hold of the body and pull it away from the circuit. An operating rod or a broom handle may be used to raise the body or to detach the wires from it. A good plan is to stand on a dry board or stool or on a few layers of thick newspaper or bundle of dry sacking and remove the victim away from the live apparatus.

PRELIMINARY STEPS

- 5.6 Extinguish any sparks if the patient's clothes are smouldering. Ascertain if he is breathing, and send for a doctor at once. If apparently not breathing, proceed as detailed hereunder:

IMMEDIATE ACTION TO RECOVER THE PATIENT

- 5.7 When a man has received a severe electric shock or been subjected to poisonous gases, or has been removed from the water in a drowning condition, his breathing has usually stopped. In accidents of this kind, speed may save the injured man's life, hence do not waste a second. Send for a doctor at once but do not neglect the patient in doing so.
- 5.8 The first thing to do is, to get the injured man to a suitable place where you can work on him. This may necessitate lowering from a pole, or raising him from a man-hole. This work usually involves considerable danger to the rescuer, because a man-hole may be full of poisonous gases, or the injured man may be in contact with the dangerous circuit on the pole. You must, therefore, work very carefully.
- 5.9 Avoid so placing the patient as to bring pressure on the burns he has sustained, if any. Do not expose the patient to cold. Stimulants should not be administered unless recommended by a Doctor. Cold water may be given in small quantities in cases of electric fire or asphyxiation cases and smelling salts may also be administered in moderation.
- 5.10 Continue artificial respiration without interruption (if necessary for four hours) until breathing is restored. Cases are on record of success after 3 + hours or more of effort. Ordinary tests for death are inconclusive in cases of electric shocks and Doctor's pointed attention must be drawn to this, when necessary.
- 5.11 Resuscitation should be carried on at the nearest possible place where the patient received his injuries. He should not be removed from this place until he is found breathing, normally and then also moved only in lying position. Should it be necessary due to extreme weather conditions, etc., to move the patient before he is breathing normally, he should be kept in a prone position, and placed on a hard surface (door or shutter) or on the floor of a conveyance, resuscitation being carried on during the time that he is being removed.
- 5.12 A brief return of spontaneous respiration is not a certain indication for terminating the treatment. Not infrequently, the patient, after a temporary recovery of respiration, stops breathing again. The patient must be watched, and if normal breathing stops, artificial respiration should be resumed at once.

UPON RECOVERY

- 5.13 When the patient revives, he should be kept lying down and not allowed to get up or be raised under any circumstances unless on the advice of a Doctor. If the Doctor has not arrived by the time the patient has revived, he should be given some stimulant, or a drink of hot ginger, tea or coffee. The patient should then have any other injuries attended to and be kept warm, being placed in the most comfortable position.

FIRST CARE OF BURNS

- 5.14 Burns, if serious, should be treated with a proper dressing. A raw or blistered surface should be protected from the air. If clothing sticks, do not peel it off but cut around it. The adherent cloth, or a dressing of cotton or other soft material applied to burnt surface should be saturated with picric acid (0.5%). If this is not at hand, use a solution of baking soda (one teaspoonful to a pint of water), or the wound may be coated with a paste of flour and water, or it may be protected with Vaseline, carron oil, olive oil, castor oil or machine oil, if clean.
- 5.15 Cover the dressing with cotton gauze, linen, clean waste, handkerchief, or other soft cloth, held tightly in place by bandage. The same coverings should be tightly bandaged over a dry, charred burn, but without wetting the burnt region or by applying oil to it. Do not open blisters.

FIRST AID IN CASE OF ELECTRIC SHOCK

Direct artificial Respiration

- 5.16 Direct Artificial respiration is the method whereby a person ventilates the lungs of an unconscious non-breathing victim by blowing his own breath directly into the mouth or nose of the victim.
- 5.17 Direct mouth-to-mouth breathing is by far the most effective method of artificial respiration, as proven by comparative studies conducted by research groups in the United States.

Mouth-to-Mouth method

- 5.18 The Following needs to be ensured
- (a) Place the victim on back immediately
 - (b) Clear throat of water, mucus, toys, coins, or food.
 - (c) Tilt head back as far as possible.
 - (d) Lift jaw up to keep tongue out of air passage.
 - (e) Pinch nostrils to prevent air leakage when you blow.
 - (f) Blow until you see the chest rise.
 - (g) Listen for snoring and gurgling signs of throat obstruction.

(h) Repeat blowing 10-20 times a minute.

5.19 In case of infants and small children tilt the head fully back, surround the mouth and nose completely with your mouth. Blow with only enough force to produce a visible rise in the victim's chest and no more. Repeat every 3 seconds. Continue direct artificial respiration until victim breathes for himself, or until expert help is obtained. The method is fully described hereunder:

Step (1) Lay the victim flat on his / her back and place a roll of clothing under the shoulders to ensure that his head is thrown well back. Tilt the victim's head back so that the chin points straight upward.

Step (2) Grasp the victim's jaw as in the Figure 1A, and raise it upward until the lower teeth are higher than the upper teeth; or place finger on both sides of the jaw, near the ear lobes, and pull upward. Maintain jaw position throughout artificial respiration to prevent the tongue from blocking the air passage.



Figure 1

Step (3) Take a deep breath and place your mouth over the victim's mouth as in Figure 1A. Making airtight contact. Pinch the victim's nose shut with thumb and forefinger. If you dislike direct contact, place a porous cloth between you and the victim's mouth. For an infant, place your mouth over its mouth and nose.

Step (4) Blow into the victim's mouth (gently in the case of an infant) until his chest rises. Remove your mouth, & release the hold on his nose, to let him exhale, turning your head to hear the out-rush of air. The first eight to ten breaths should be as rapid as the victim responds. Thereafter the rate should be slowed to about 12 times a minute (20 times for an infant).



Figure 2

Note:

- (1) If air cannot be blown in, check the position of the victim's head and jaw and re-check the mouth for obstructions, then try again more forcefully. If the chest still does not rise, turn the victim's face down and strike his back sharply to dislodge obstructions.
- (2) Sometimes air enters the victim's stomach, as evidenced by a swelling stomach. Expel air by gently pressing the stomach during the exhalation period. In any case where external cardiac compression and artificial respiration are being administered Pressure-Cycling mechanical resuscitators shall not be used in lieu of mouth-to-mouth or other approval artificial respiration, because they may not be effective in adequately ventilating the lungs with air (oxygen). Medical research has shown that properly administered mouth to mouth resuscitation is at least as effective as mechanical resuscitator; also, MMR can be performed effectively without the use of airways of any kind. The time delay in waiting for a mechanical resuscitator or an airway to be made available and place in operation could materially reduce or preclude the victim's chance of recovery.

TREATMENT FOR ELECTRIC BURN

- 5.20 If, as a result of electric shock the patient is suffering from burns, the following treatment should be given without hindrance to artificial respiration:
- (a) Remove clothing locally to enable the burn to be treated but do not break blisters.

- (b) Saturate burns with warm solution of one dessert spoonful of bicarbonate of soda to a pint of warm water, or a teaspoonful of salt to a pint of warm water.
- (c) Cover with lint soaked in a similar solution and bandage (lightly if blisters have formed)
- (d) If the above solutions are not available, cover with a sterile dressing.
- (e) Warm, weak sweet tea may be given when the patient is able to swallow.

CARE FOR THE UNCONSCIOUS

- 5.21 Oxygen is the element most vital for survival. Permanent brain damage or death may result within a few minutes from lack of air or oxygen. Therefore a victim's breathing requirements must receive your first attention.
- 5.22 The case of unconsciousness may be obvious, as in the case of drowning, electric shock, smoke or gas inhalation, strangulation, severe injuries, etc.
- 5.23 The cause of unconsciousness may be obscure, as in the case of poisoning, overdose of drugs, alcoholism, heart disease, brain disease, diabetes, uremia, epilepsy etc.
- 5.24 **An unconscious person may be breathing or not breathing:** In either case an open air passage to the lungs must be maintained. The human tongue is as large as a quarter pound beefsteak. The muscles of the tongue relax with loss of consciousness. In certain positions the tongue may fall back, obstructing the throat and cutting off the air passage.
 - (a) **The unconscious person who is breathing:** Many accident victims, especially those sustaining head injuries (common in home and traffic accidents), suffer temporary shock and loss of consciousness. This may lead to death by suffocation. Accidental death may be avoided in such cases by first taking a simple precaution:
 - (i) Place the victim on his side or abdomen with his head turned to one side, and tilted back.
 - (ii) In this position there is less danger of obstruction by the tongue or aspiration of vomitus into the lungs.
 - (b) **The unconscious person who is not breathing:** In such cases the unconscious victim requires immediate artificial respiration. Direct artificial respiration is the most positive and efficient means of ventilating his lungs. The indirect or manual chest compression methods of artificial respiration

(Holger-Neilsen, Schafer, etc.) depend on negative pressure, and are unsatisfactory unless provision has been made to establish and maintain an open air passage to the lungs.

- (c) **The Unconscious person whose breathing is very slow or shallow:**The victim may be assisted by direct artificial respiration, timing the air inflation with the patient's breathing efforts.

SPECIAL CARE SITUATIONS

- 5.25 Direct artificial respiration must be started as soon as the victim's head can be kept above the water.
- 5.26 Do not waste valuable time waiting to bring the victim ashore or by attempting to drain the stomach or throat before hand. This may be done after artificial respiration has been started.
- 5.27 If the stomach is distended, lower and turn the victim's head to the side and then apply moderate pressure with the palm of the hand over the distended stomach. Any air or water in the stomach will be then belched up.

Inhalation of Foreign bodies

- 5.28 If the victim is a child, turn him over your knees in the "spanking position", with his head lower than his hips; slap him between shoulder blades in an attempt to dislodge the foreign body by causing him to cough it out. If the object is not dislodged and the child is in distress, quickly clean the throat with the fingers and begin direct artificial respiration.

Infant and Child Victims

- 5.29 The technique of direct artificial respiration is essentially the same in cases involving children and adults. However, in the case of infants and children:
 - (a) Only a small volume of air is required to inflate the lungs. Over-inflation may produce damage. Short puffs of air are all that are required, sufficient to produce a noticeable rise in the infant's chest with each inflation.
 - (b) The inflation rate should be at least every 3 seconds, twenty times per minute.
 - (c) An over-distended stomach in infants interferes with ventilation as well as normal heart action. This may be reduced by applying pressure over the infant's abdomen, care being taken to avoid aspiration of the fluid brought up in this manner by turning the head to one side.

CHAPTER6: PERMIT TO WORK

“PROVIDE SAFE WORKING CONDITIONS PROTECT PRECIOUS LIVES”

WORK ON LIVE APPARATUS AND MAINS

- 6.1 No employee shall carry out or attempt any work on live apparatus and mains except under authorisation from the Asst. Executive Engineer, Asst. Engineer, Junior Engineer, who is on duty in a Power Station / Sub Station or in charge of the overhead or under ground distribution taken on a 'Permitto- work' form vide Appendix III and under the direct supervision of an authorised person, termed 'Supervisor'
- 6.2 Where, in the interest of continuity of supply, it is necessary after taking due precautions, to work on live electrical equipment for cleaning and repair work, particularly in receiving Stations and Sub-stations, such work shall be carried out only under the personal supervision of an officer.

APPLICATION FOR PRE-ARRANGED SHUT DOWN

- 6.3 Except for emergencies, all work for repairs, maintenance and construction on or in close proximity to live apparatus and mains shall be pre-arranged and programmed. Accordingly, applications for pre-arranged shut-downs shall be submitted by the Supervisor to the Officer in charge, in the prescribed form, vide Appendix IV which when duly approved, will be presented to the concerned Permit Issuing Officer for switching out the apparatus and issue of 'Permit-to work'. These applications shall be made sufficiently in advance to enable the Permit Issuing Officer to carry out necessary load transfers, if any, and other operations in connection with the work. The duration and nature of work must be clearly explained to the Permit Issuing Officer before getting a permit.

AUTHORISATION

- 6.4 An Authorised person shall be:
 - (a) A Permit Issuing Officer not below the rank of a Supervisor.
 - (b) A competent employee authorized in writing by a responsible Officer not below the rank of an Executive Engineer/Assistant Executive Engineer, to carry out specific duties incidental to the position held by him.

- 6.5 No person shall be deemed to be authorized unless the same has been entered in the list maintained at the Office of the authorizing Officer and the entry has been attested by the person so authorized.
- 6.6 A list of authorized persons shall be maintained at the Office of the respective Executive Engineers and at each center of activity by the respective Assistant Executive Engineers. The list shall clearly define the extent of all such authorization. Such list shall be furnished to the respective Deputy Electrical Inspector.
- 6.7 Duties to be performed only by an Authorized person are:-
- (a) Issue and receipt of permits for working on transmission lines, distribution lines, service lines, underground cable, and all equipment installed in the Generating Stations, Receiving Stations, Sub-stations, Distribution System etc.
 - (b) Discharging permits issued under (1) above.
 - (c) Operating air break switches when alive.
 - (d) Renewal of fuses on H.T. sides of transformers.
 - (e) Work on live equipments, or live lines, where the voltage to earth does not exceed 250 volts AC or DC like renewal of street bulb, renewal of aerial fuse, cut-outs, fuses and consumer fuses, renewal of L.T. fuses of transformer and L.T. feeders.
 - (f) Testing consumer's installations and effecting service of L.V. installations.
 - (g) Repairing or connecting L.T. equipment such as meters, time switches, etc.
 - (h) Possession of keys / switches / kiosks /RMUs / Isolators and equipment.
 - (i) Inspection, testing and maintenance work.

Issue of Permit to Work

- 6.8 Before any work or testing is carried out on live mains and apparatus connected to distribution system, a 'Permit-to-work' in the prescribed form covering the apparatus and mains to be worked on or tested must be issued, except in extenuating circumstances such as for the purpose of saving life or plant in the event of any emergency. In such cases, the action taken is reported to the concerned Power Station or the Executive Engineer without the least delay.

- 6.9 The staff authorizing the work shall issue to the Supervisor necessary authorization in the prescribed form and this will only become valid after the Permit Issuing Officer, who is responsible for the power supply to the Distribution system, has signed on the form and returned it to the Supervisor.
- 6.10 The issue of the 'Permit-to-work' form by the Permit Issuing Officer to the authorized person gives the line clear and authority for the Supervisor to proceed with the work. The Supervisors shall keep in his possession the 'Permit-to-work' form throughout the duration of the work.
- 6.11 If, for any reasons, the pre- arranged shutdown work cannot be completed within the period applied for, intimation will be given to the Permit Issuing Officer and duration of permit, extended suitably on the permit Form.
- 6.12 In the case of work on consumer's installations, the consumers should be advised of such extensions, sufficiently in advance to avoid inconvenience.
- 6.13 When written permits cannot be given, line clear should be given and taken over the Phone. In such cases substances thereof shall be repeated by the person who receives the line clear message and shall be confirmed by the sender to ensure that both parties are quite clear as to its purpose. Such instructions shall be recorded only in the line clear permit books at both sending and receiving ends. The issue of line clear over phone should be confirmed by some other Board Employee to the Supervisor over phone and the name of the person who confirms issue of line clear / permit to work should be recorded in the line clear permit Book.
- 6.14 Duplicate copies of the line clear should be sent by post as soon as possible for record at either end after duly cancelling the same.

SPECIAL INSTRUCTIONS TO PERMIT ISSUING OFFICERS

- 6.15 The Permit Issuing Officer shall not issue the permit before:-
- 6.16 The switch/circuit breakers/Isolators or switches have been opened and are completely isolated on both sides; links and fuses opened, apparatus and mains discharged and earthed, and all adjacent live parts adequately protected. Where possible the switches/Isolators shall be locked out and keys kept in safe custody. Isolators/switch at control panels shall also be fixed with 'HOLD', 'LINE CLEAR ISSUED' boards.
- 6.17 "HOLD BOARDS" and 'MEN ON LINE' boards should be attached to apparatus.
- 6.18 An entry is made in the log sheet or Register to the effect that the apparatus and mains under the permit have been made dead, on no account shall the apparatus and mains again be made alive until the return by the Supervisor of the 'Permit-to-Work'.

- 6.19 Where Sub-permits are issued by the Supervisors to competent persons working in different sections, such Sub-permits should only be accepted for cancellation by the Supervisor and under no circumstances should the Permit Issuing Office of the original permit, accept Sub-permit for cancellation.
- 6.20 The Permit Issuing Officer shall, take necessary steps in the circumstances, to ensure that in the event of any tripping of automatic switch / circuit breaker, when the section is switched in such switch / circuit breaker shall not be re-closed until the section/apparatus is thoroughly checked.

SPECIAL INSTRUCTIONS TO SUPERVISORS

- 6.21 No employee shall be ordered or permitted to carry out any work, other than that for which he is specially, authorized in writing by the Executive Engineer Ele., Assistant Executive Engineer Ele./ Section Officer.
- 6.22 The authorized person termed the Supervisor in charge of a working party (employees) shall keep with him a complete list of all persons who are detailed to work on the particular job. All other persons shall be warned to keep away from the area and no one shall be allowed to enter the area unless under a permit. This list shall be kept on record for any further reference.
- 6.23 The Supervisor, before allowing any Workmen to commence work on the lines, mains or apparatus shall:
- (a) Explain to the workmen the nature of work and the precautions taken by the Permit Issuing Officer, to ensure the safety of the workmen and also the precautions to be taken by them during the whole time, when the work is in progress.
 - (b) Satisfy himself that the switch or switches Isolators controlling the mains and apparatus have been isolated, discharged, properly earthed where possible and tested for pressure with a discharge rod and that caution or Danger Notice have been placed at conspicuous places.
 - (c) Warn the workmen and the public of the danger that exist in the vicinity of the area covered by the 'Permit-to-work'.
 - (d) Create a safety zone by short circuiting together all the conductors and adequately earthing on either sides of the place of work.

TRANSFER OF PERMIT TO WORK FORM

- 6.24 Transfer of permit-to-work from one Supervisor to another, is strictly prohibited. If there is more than one working party, separate permits should be issued to the Supervisor in charge of each working party and a written record should be kept of the number of such permits issued for each work.
- 6.25 If work is of such a nature and duration that it has to be carried out continuously, but under the supervision of more than one Supervisor on shift duty, the 'Permit-to-work' form shall be endorsed by the Permit Issuing Officer, cancelling the name of the Supervisor to whom it was originally issued and substituting the name of the second or subsequent Supervisor to whom the permit will now become valid. The time of each endorsement should be noted on the 'Permit-to' Work' form and it's duplicate.

ISSUE AND RECEIPT OF 'PERMIT-TO-WORK' BY THE SAME PERSON

- 6.26 In cases where the same person who has to issue the permit, has also to carry out the work covered by the permit, a 'Permit-to-Work' form shall be issued on himself before he undertakes the work and the form should be subsequently cancelled after the work is completed.

CANCELLATION OF 'PERMIT-TO-WORK' FORMS

- 6.27 'Permit-to-work' form issued to the Supervisor shall be returned to Permit Issuing Officer only after all the works are complete, and earth removed so that the apparatus, mains and overhead lines are safe in all respects for charging and after all the workmen are withdrawn from the working area and are suitably warned that it is no longer safe to touch or approach the apparatus within the said area.
- 6.28 Under no circumstances shall any work be attempted after the return of the 'Permit-to-work' form duly discharged. A fresh permit shall be obtained for completing the balance of work subsequently.
- 6.29 The return of the 'Permit-to-work' form duly discharged will authorize the permit issuing officer, to resume normal operation.
- 6.30 The Supervisor will not allow his staffs to disperse before the permit issuing officer has tested the apparatus and advice the Supervisor that he has found the apparatus/ line is satisfactory for commissioning, so as to avoid any unforeseen difficulties in re-commissioning the apparatus and lines.

MAINTENANCE OF 'PERMIT-TO-WORK' AND APPLICATION FOR PREARRANGED SHUT DOWN BOOKS

- 6.31 A duplicate of every 'Permit-to-work' and application for 'Pre-arranged Shutdown' shall be retained in the Office of the permit issuing officer for at least 3 months after issue.
- 6.32 The books should be treated as important record. The sheet and the books themselves should be serially numbered. No page should be detached or used for any but bona fide work.
- 6.33 If any paper is inadvertently detached or found to be missing, a detailed and initiated statement must be then and there recorded in the book by the Permit Issuing Officer.

Register of Message

- 6.34 All messages and instructions to issue of permit to work, the operation of switches, and other important communication shall be recorded in the strict sequence in the log sheet and Register of messages maintained by the person responsible for the operation of power supply to the transmission or distribution system.
- 6.35 The Supervisor responsible for the execution of the work shall also likewise record all messages and instructions relating to the operation of switches / circuit break / isolator and other important communication concerning the work, in a register of message maintained by him for the purpose.
- 6.36 The final issue or return of permit shall be logged in the book in ink underlined when change of shift occur during the pendency of permit, the outgoing permit issuing officer shall inform his reliever about the existence of all permits, and show him the relevant entries. The incoming Permit Issuing Officer shall also sign in the log book while taking over charge to acknowledge that he has noted the pendency of the permits.

CHAPTER7: SAFETY PRECAUTIONS

“PREVENTION OF ACCIDENTS CALL FOR EXTREME DISCIPLINE”

GENERAL SAFETY PRECAUTIONS

- 7.1 All voltages shall be considered dangerous even though it may not be high enough to produce serious shock.
- 7.2 All electrical circuits are to be treated as live and no work (maintenance, repairs, cleaning) is to be carried out on any part of electrical apparatus or circuit unless such parts are:
 - (a) Dead
 - (b) Isolated and all practicable steps taken to lock off from live conductors.
 - (c) Efficiently connected to earth between such points and points of work.
 - (d) Released for work by issue of permit.
 - (e) By checking that equipment for its de-energised condition.
- 7.3 Working Conditions requiring more than one workman:-
- 7.4 On some hazardous work it is not desirable for one man to work alone. The Foreman/Supervisor shall determine when additional men are needed to protect workmen against accidents or to render assistance in case of unforeseen circumstances.
- 7.5 On especially hazardous jobs where close clearance or difficult working conditions are encountered, an observer may be required. On any job which in the opinion of the Foreman / Supervisor requires an observer, the Foreman / Supervisor or a man appointed by him will act as an observer. The observer should not engage in any activity that the Foreman / Supervisor consider will interfere with the duty of the observer.
- 7.6 Under no circumstances shall an employee hurry or take un-necessary chances when working under hazardous conditions; neither shall he attempt to perform hazardous work when extremely tired or exhausted.
- 7.7 Employees must use the Standard protective equipment intended for each job.
- 7.8 Only experienced persons shall be permitted to go behind guardrails or to clean around energized or moving equipment.

- 7.9 Employees working in an elevated position should use a suitable safety belt or other adequate means to guard against falling.



Figure 3: UHBVN Employees at work with Safety Belt/helmets

- 7.10 Circuits should be tagged, marked or lettered unless clear identification by other means exist.
- 7.11 As per IE Rules 1956 the minimum clearance required between a live and section for safe working is 2.6 Mts. for 11 KV.

- 7.12 However no employee should go or take any conducting objects within the distance given below from any exposed live part at the voltages specified 11 KV 2.6 Mts.
- 7.13 Telephone conductors and ground wires of lightning arresters, though they may be at or near ground potential are liable to develop high-induced voltage under fault conditions. Suitable precautions should be taken when working on or near such circuits.
- 7.14 When fighting fires near exposed live parts, employees should avoid using fire-extinguishing liquids, which are not insulating. If necessary, all neighboring equipment may be killed or made dead.
- 7.15 Do not depend upon tripping of circuit breaker for isolation of lines and equipment for supply mains. The isolation must be in air media by an air break switch or isolator preferably visible.
- 7.16 No signal system like waving hands, flags, and whistle should be resorted to, to communicate intelligence or convey instructions.
- 7.17 Insulation-Adequate insulation should be provided where any part of the body is likely to come in contact with live lines or equipment.
- 7.18 Parts of equipment or apparatus, which may develop dangerous potential due to surges, arcs or insulation failure though such parts may normally be at or near ground potential.
- 7.19 Do not use bare fingers or hands to determine whether a circuit is live.
- 7.20 Do not depend upon insulation of cables for safe working.
- 7.21 In handling portable apparatus or lamps, first make sure that the extended metal frame is not live by contact with or leakage from live parts within. Have such portable equipment inspected at least once daily during the period of their use. Do not attempt to make any alterations or adjustments in portable equipment without cutting off supply.

SAFETY PRECAUTION FOR WORK ON OVERHEAD MAINS, SERVICE LINES AND TELEPHONE LINES.

- 7.22 Working on Dead line and Equipment: No person shall work on line supports or conductors unless they are discharged and earthed as follows:
- 7.23 The circuit or conductor to be worked on shall be made dead by switching off or opening the isolator links or fuses and by locking isolator/links in the off position. A danger notice board with the words "DO NOT CLOSE", 'MEN ON LINE' should be fixed securely, below the switch or links/isolator.

- 7.24 After switching off the supply, before touching the lines, every one of the conductors shall be tested for pressure (voltage) by a discharge rod. The discharge wires should be kept at least two feet away from the body. The procedure is necessary in order to make sure that the line to be worked on is actually the line that has been isolated. Rubber gloves or preferably gauntlets should be used on both hands.
- 7.25 All the conductors shall then be short circuited together and adequately earthed; this shall be done at the points on each side of the place thereby creating a safety zone where the work is carried out. Rubber gloves or gauntlets shall be used while doing this work. Poles on which work is actually to be carried out should also be earthed.
- 7.26 A working section at either end of which the conductors are earthed shall not exceed 1.5 km in length. In the case of lines meeting or crossing at any pole which forms the site of work, all the lines crossing or ending at that pole shall be earthed as stated above unless work on the one line with any or all the remaining lines alive is otherwise permissible and so specified in the permit-to-work.
- 7.27 Ensure that there is no possibility of back feed.
- 7.28 All phases shall be earthed even if work is to be carried out on one phase only.
- 7.29 When work is to be carried out on lines of all insulated conductors where grounding points are not provided at point of work, temporary, grounds shall be connected at point of work to an efficient portable earth straight driven into the ground. The line shall also be grounded at the nearest line grounding point on either side of the point of work.
- 7.30 Where two or more crew are working independently on the same line or equipment, each crew shall properly protect them by placing their own temporary grounds.

Working on lines and equipment adjacent to live equipment or lines

- 7.31 When working near live lines or apparatus, each man should plan his moves and take extreme care in moving from one position to another.
- 7.32 Where impractical to erect barriers between men at work and live parts within reach of their hands and objects being handled, continuous watch shall be kept by the Foreman/ Supervisor or someone specifically designated by him for that purpose.
- 7.33 When a truck is used near live parts, all workmen except the driver should stay away from the truck. Driver should see that truck is clear from live lines before leaving and entering the truck.

**Work on Double Circuit Overhead lines with one Circuit alive shall not be carried out
Repair work on H.T.Lines and Equipment**

- 7.34 Handling and working on live electric circuits are hazardous occupations and shall be done only by workmen who are qualified by training and experience to do the work safely and only after authorization.
- 7.35 Repair work on H.T.lines on poles where L.T is also running under H.T. should be carried out only after switching off the L.T. effectively. Work on the L.T.lines should not be carried out unless there is an efficient earth screen between H.T. and L.T.lines or in the absence of such a screen, unless the H.T.line is switched off or in the opinion of the Supervisor, the work is otherwise safe.
- 7.36 Any line wherein the pressure does not exceed 250 V to earth may be worked on live line by an authorized person provided the person
- (a) Uses a safety belt.
 - (b) Wears rubber gloves or gauntlets
 - (c) Has not to push any part of the body, except that portion of the arms protected by the gauntlets or gloves through any conductor other than that worked upon.
 - (d) Is accompanied by an assistant with an effective torch light if working at night.
 - (e) Before a lineman undertakes any work on a pole or any other line support, he should first make a complete inspection from the ground of the position of all live wires, in order to determine the amount of precautions to be adopted and should inspect his insulating equipment and operating tools and tackles for their good condition before he attempts to do the actual work.

Telephone lines

- 7.37 Work on telephone lines whether run on same supports as H.T.lines or on separate supports should be carried out only after taking necessary permits and discharging and earthing the same as per regulations for H.T.Lines.

Work on Poles and Towers

- 7.38 Before climbing an elevated structure every employee shall first assure himself that the structure is strong enough to sustain his weight safely.

- 7.39 If poles or cross arms are apparently unsafe because of decay or unbalanced tensions of wires on them, they shall be properly braced or guyed before they are climbed.
- 7.40 In choosing the climbing side, the side of the pole where the ground wire is attached should not be used.
- 7.41 The workman should avoid using conductors, insulators, pins and so forth as hand holds and should not rest on street light fixtures or other apparatus on the poles or structures.
- 7.42 Linemen shall wear their safety belts while working on the poles and towers.
- 7.43 Wire hooks shall not be attached to linemen's belts or safety straps.
- 7.44 Safety straps should be placed above the top cross arm when it is at the top of the pole.
- 7.45 When two or more men are ascending a pole the second man should not start climbing until the first man is in a safe position or when descending until the first man is on the ground.
- 7.46 On arriving at the working position, the lineman should put his safety belt around the pole or some other suitable supports and make sure that the belt is properly secured. Care should be taken to prevent the straps on safety belt coming in contact with anything that may open the snap and thus release the safety belt. Safety belts should not be attached to insulator pins, span wires, guy wires etc.
- 7.47 Linemen's tools should be so secured that they will not fall out of the tool belts. A lineman should carry only the minimum number of tools in his belt. All other tools should be kept on the ground until they are required and then raised by means of a material bag attached to a hand line.
- 7.48 Ordinarily no lineman should work vertically below another lineman on the same pole except under emergencies. When this condition is necessary, extreme care should be taken to prevent tools or other objects being dropped upon the man below.
- 7.49 When transferring wires and equipment from an old pole to a new pole, the old pole should either be locked to the new pole or guyed or both, as the condition may demand.
- 7.50 Before a Lineman cuts an overhead conductor he should make sure that it will fall clear. Where there is a possibility of the falling line coming in contact with another wire or doing other damage, it should be lowered with a rope.

- 7.51 All light equipment and tools to be used aloft should be raised and lowered by means of a hand line and canvas bucket, or other suitable container. Men on the ground should stand clear of overhead work to prevent being struck by falling objects.
- 7.52 Tools and materials should not be thrown from the ground to a lineman working aloft, nor should lineman throw tools and materials from working place to the ground.
- 7.53 No man shall work in such a manner that his arms or any tools extend beyond the body of tower when working on the live side.
- 7.54 Broken insulators or other sharp edged material shall not be left in vacant lots, along the right of way or in the location where the hazard of cutting feet could be caused for men or animals.
- 7.55 When stringing wires across streets and highways, avoid interfering with traffic or causing injury to workmen or pedestrians. Danger signs should be erected on both sides of the work location and where conditions warrant, flag-men should be stationed.
- 7.56 Hand lines, materials, tools or equipment must not be scattered around streets, side walks, highways, etc., but must be kept in a neat and orderly manner where they will not be liable to cause accident.
- 7.57 In handling wires on a pole, they should be raised or lowered with a dry hand line and extreme care should be exercised to prevent them from coming in contact with live lines and equipment.
- 7.58 A leather belt should be used when working on overhead locations. In its absence, belts of flexible hemp or manila rope may be permitted round the waist of the workman and tied to cross arm or pole as an alternative to the use of leather belt, under exceptional circumstances. The ropes should be kept in good condition and scrapped when not safe. It is necessary that the rope is twisted round the pole once or twice in order that release of tension on the pole may not cause it to slip down the pole.
- 7.59 Use ladders of suitable lengths to go up the poles to renew fuses or to carry out other minor works on feeders and wherever possible or necessary, dry hickory rod should also be used.

Construction works on Lines

Hauling Poles

- 7.60 Poles must be securely held on trucks to assure that the binders will not be released in rough going.

- 7.61 The speed of trucks hauling poles must be restricted to a point assuring safety to the operators of trucks and the traveling public.
- 7.62 A red flag by day and a red light by night must be attached to the end of poles being hauled. The red light must be visible in any direction.

Pole Storage

- 7.63 When poles are stored on pole racks they shall be properly blocked, to keep them intact on the rack. Poles of different sizes should not be mixed but stored separately.
- 7.64 When poles are stocked temporarily near a road, they should be placed as close as possible to the edge of road. They should not be stored at points in the road where there are short turns. Poles stored on the high- ways should not have cross arms attached.

Excavation of Pole Pits

- 7.65 The pole pits should not be excavated much in advance of erection as the pits cannot be left without being back-filled immediately.
- 7.66 Within town and village limits the pits excavated should be covered with planks so that no one accidentally falls into it. Danger lamps should also be put up during night time.
- 7.67 In distribution as far as possible, the pit is to be excavated without resorting to blasting as it is dangerous to the adjacent buildings and roads where there is traffic. If blasting is unavoidable, special precautions should be taken by covering the pit with bamboo's and planks carrying out blasting at a time when there is no traffic on the road.

Erection of Poles

- 7.68 This should be done under direct supervision of Foreman/ Supervisor.
- 7.69 Care should be taken to see that the ropes used are in sound condition and they are tied securely to the pole and tackle.
- 7.70 When side guys are used in the setting of poles or structures, they shall be attached to crow bars driven into the ground.
- 7.71 The Supervisor shall not assist in the setting of poles, but must give his entire attention to the Supervision to assure that the work is being safely performed.

- 7.72 In obstructing a highway during the erection of poles, suitable signs or warnings shall be used on each side of the work to advise approaching traffic of the obstruction. Where traffic is heavy flag-men should be used for this purpose. Signs or signals must be moved along as the work progresses.

Installation of Guy Wires

- 7.73 When insulators are used they should be connected into the guy wire line before the guy wire is set in place. Rubber gloves should be worn while installing guy wires through live circuits.
- 7.74 In new work, guys should generally be installed before line wires are strung. In reconstruction work guys should be installed before any changes are made in the line wires and care must be taken not to place excessive pulls on the pole and wires already in a position.
- 7.75 Guys should be so installed as not to interfere any more than necessary with the climbing space and should clear all high tension wires as far as practicable.
- 7.76 Guy strain insulators should be provided wherever necessary to secure the required amount of insulation.
- 7.77 Guys should be carefully installed on poles to prevent them from becoming loose. Where necessary a guy hook may be used to prevent the guy from slipping down the pole. These hooks should not interfere with climbing and should be so placed that they will not be used as steps. Where guys are liable to cut into the surface of a pole, the pole should be protected at the point where the guy is attached by a guy plate. The guy plate must be well secured to the pole to prevent the possibility of injury to a lineman climbing up or down the pole.
- 7.78 All guys who are anchored should be installed so that the guy does no interfere with street or highway traffic. Where these guys are located near street or highway, they should be equipped with traffic guards (traffic guards are sometimes called anchor shields).
- 7.79 Guy wire should be so installed that it will not rub against any messenger or signal cable carried under supply lines.
- 7.80 Guy wire, containing snarls or kinks should not be used for line work. Guy wires should not contain any more splices than absolutely necessary. Standard guy clamps or other positive clamping device should be used in making all stiff steel guy wire splices.

Removal of Guys

- 7.81 Before wires and guys are removed, the condition of the pole must be determined. If the pole is found to be weak, it should be securely braced before any changes in pole strain are made.

Foreign Wire Attachments

- 7.82 Foreign wire attachments, such as signal lines, signal equipment and so forth, should be considered live and should be avoided at all times, unless otherwise protected. While a lineman is working on high tension lines, he should be careful not to disturb foreign lines and equipment which may be attached to the same pole.

Back Filling

- 7.83 Side guys, etc., should not be removed until sufficient stamping has been done to prevent the falling of the pole.

Dismantling Poles

- 7.84 All poles must be guyed at least three ways by means of guy ropes before any other work proceeds on the pole. This can be done by:
- (a) Make two turns around the pole with a sling and tie securely.
 - (b) Tie three guy lines around the sling at the proper angles.
 - (c) Insert a pike pole under two sides of the sling and work the sling well up the pole.
 - (d) Snub off securely by means of crow bars driven into solid ground on any other substantial snub.
 - (e) Lineman may then climb up the pole safely and release all conductors and to her equipment and the pole may then be slowly brought down.

Stringing Wires

- 7.85 In stringing of wires, care must be taken not to put kinks into any part. Kinks reduce the strength of the wire and may result in snapping of wire later on.
- 7.86 In handling and stringing of weather proof covered wires, care must be taken not to injure the weather proof covering.
- 7.87 A lineman must not change the strains on a pole by adding wires until he is satisfied that the poles will safely stand the altered strain.

Tree Trimming

- 7.88 The public shall be protected against hazards of tree trimming along public streets and highways by placing danger signals and signs.
- 7.89 Before climbing, the limbs or branches should be carefully inspected to make sure that they will hold the trimmers weight. Dead or decayed limbs are not safe to support any weight.

Right of Way Clearing and Trimming

- 7.90 When walking through slush, use ankle high canvas boots to prevent injury to feet from broken insulators thorny undergrowth, shells, etc.,
- 7.91 Trees should be carefully felled to prevent them falling on transmission lines or adjacent buildings.

Patrolling Lines

- 7.92 Emergency line patrol, trouble shooting on transmission lines and similar work should always be done with the greatest caution. Patrol men should be particularly alert at night to avoid walking into the fallen wires or metal fences which may be energized by fallen conductors.
- 7.93 Be careful with lighted cigarettes and matches, which may cause a fire along transmission line right of way. Break matches and crush cigarettes butts into earth on discarding.
- 7.94 PATROLMEN should be alert from stumbling hazards and from poisonous plants and snakes.

Line Work under Adverse Weather Conditions

- 7.95 In the event of the near approach of lightning storm all work on overhead lines shall cease immediately.

SAFETY PRECAUTIONS FOR WORK ON UNDERGROUND MAIN / CABLES

Work on Live Low Voltage Mains

- 7.96 Only, competent, experienced and authorized persons may work on live low voltage mains and testing Apparatus.

Use of Insulating Guards

- 7.97 Any employee shall not work on low voltage main with live conductors (UG Cable) alongside him until all those conductors are insulated for a distance at least 900 mm on each side of his body with the insulating hose or mats provided for the purpose.
- 7.98 The neutral shall be regarded as a live conductor.

Work on Dead Low Voltage Mains

- 7.99 Unless an employee is authorized to work on live low voltage mains and testing apparatus, all low voltage mains testing apparatus to be worked upon, shall be isolated from all sources of supply, proved dead, and measures shall be taken against the inadvertent energizing of the mains and apparatus.

Testing Low Voltage

- 7.100 An employee shall not apply low voltage, for test purpose, to any mains, unless he has received a permit to work from and warned all persons working on the mains of the proposed application of low voltage for test. Where any part of the mains which will then become live is posed, the Supervisor in charge of the test shall arrange for an employee to stand by at the exposed part during the whole period of the tests.

Work on High Voltage Mains

- 7.101 While working on High Voltage underground mains, the following shall be complied with:
- (a) The dead cable should first be identified by approved means.
 - (b) Before working on underground cable, all its conductors shall be effectively discharged and earthed at both ends and the earthing switches wherever installed shall be locked up.
 - (c) The neighboring cables, if any, should be adequately protected.
 - (d) Before cutting the dead cable, a steel wedge shall be carefully driven through it at the point where it is to be cut.

Minimum Working Distance

- 7.102 No employee shall work within the minimum working distance, which is normally, 4/1.2 Mts. From the exposed live high voltage mains.

7.103 Under certain conditions, for special work and in an emergency, an employee may work within the minimum safe working distance where the work is directly and specifically sanctioned by the Supervisor responsible for the work and employee is fully experienced and aware of the dangers that exist.

7.104 In all such cases, the employee shall be accompanied by another employee who is also aware of the dangers which exist and who is capable of rendering First Aid and Artificial Respiration.

Devices for proving Dead High Voltage Mains

7.105 Only devices approved and issued for the purpose shall be used:

7.106 The High Voltage Neon Lamp contact indicator rod may be used for proving dead exposed high voltage mains. Each rod is fitted with an indicating Neon tube which should glow when the contact end of the rod is applied to exposed live high voltage mains. Each rod is clearly marked for the maximum voltage on which it may be safely used and must not, under any circumstances, be used on higher voltages.

7.107 High Voltage contact phasing rods are provided for phasing and proving dead exposed high voltage mains. A set consists of two rods connected in series by a length of insulated cable. Both rods are fitted with contact tips and indicating tubes. When the contact tip of one rod is applied to exposed live high voltage mains and that of the other to earth or other exposed live high voltage mains and when there is a sufficient difference of potential from that to which the first rod applied, the indicating tubes should glow. Each set of rods is normally marked for the maximum voltage on which it may be used and must not, under any circumstances be used on higher voltages.

Use of High Voltage Contact Indicator and Phasing Rods

7.108 While using the high voltage contact indicator and phasing rods, the following shall be complied with:

7.109 Ensure that the rod is clean and dry.

7.110 Check the rod by applying it to known live mains of the correct voltage - the indicating tube must glow.

7.111 Apply the rod to each phase of the mains to be proved dead. The indicating tube must not glow. Be very careful to be in a position to see the glow in the indicating tube, if any, should appear.

7.112 Again, check the rod by applying it to live mains as in (b) above. Again, the indicating tube must glow.

Note: All the above operations shall be carried out, at the same place and time. If no live high voltage mains or apparatus are available on the site, rods up to 11 KV may be tested by applying them to the top of a spark plug in running motor car engine. If the rod is in order, the indicating tube will glow each time the plug sparks. Therefore, the glow will be intermittent, but the indicating tube must glow on this test or the rod is useless as a means of proving dead. Remember; Test the Rod before and after use.

Work on Cubicle Type High Voltage Panels

- 7.113 If draw out cubicles are the ones on which work is programmed, these cubicles shall be drawn out after switching off circuit breakers, and the draw out panels effectively discharged before any work is done over the same.

Safety Procedures to be observed while working on Ring Main Units (RMU)

- 7.114 While working on ODs (in-comers) it has to be ensured that the OD cables are completely dead (isolated). All the VLs (out-going) are also to be kept in open condition. All the ODs and VLs shall be earthed and the cables be discharged using proper earthing device to avoid shock due to static charges in the cable. The GOS provided for cable (if any) shall be kept open, duly ensuring that all the blades are opened out.
- 7.115 The conventional oil circuit breakers have been replaced by V.C.Bs in most of the RMUs. If not the operating handle of the oil switch shall be carefully used with all interlocks to avoid inadvertent operation.
- 7.116 While working on a VL, the concerned cable shall be isolated from the bus and shall be earthed after opening at either end of the cable.
- 7.117 After the OD/VL are opened for line clear purposes, the breaker of OD/VL shall be invariably lowered and placed in earth position before any work is taken up on such cable or terminations.

TEMPORARY EARTHING

- 7.118 This covers the detailed procedure for providing temporary earths while carrying put operation and maintenance works on the already existing lines or construction of new lines for the protection of workmen and property.

Temporary earths

- 7.119 Temporary earths are those applied at the actual location of the work during repair or construction of installations for the protection of workmen and property.
- 7.120 Following features of temporary earthing equipment shall be kept in view by persons using it:

- 7.121 Earthing devices shall be of approved types, comprising properly designed clamps attached to insulated sticks of sufficient lengths to enable the clamps to be securely clamped to the conductors being earthed without an employee's hand approaching closer than the minimum safe working distances. Each such line clamp is to be connected by a flexible copper earthing lead or of equivalent copper section of aluminium cable to an adequate earth clamp or other device for attaching to a permanent connection or to a temporary earthing spike.
- 7.122 All earthing jumpers shall be of annealed bare and stranded copper equivalent aluminium conductor. Earthing leads for use at sub-stations and lines for use at sub-stations and lines shall have a cross-section of at least 0.645 Sq.cm. (0.1 sq.inch) copper equivalent.
- 7.123 Earthing connections shall be continuous.
- 7.124 Electrodes for installation of temporary earths shall be of iron or steel rods at least 1.905 cm. (3/4") in diameter and 1.524 Mts.(5 ft.) in length. These shall have clear metal surfaces free from rust or any coating of paint or any other poor conducting material and be driven to a depth of at least 0.914 meters (3 ft.) in a spot considered to give good earth.
- 7.125 Chain used for earthing shall be examined by the employees every time before use.

General Precautions to be taken in connection with the application of temporary earths

- 7.126 No electric apparatus or line shall be earthed until all reasonable precautions have been taken to ensure that it has been disconnected from all sources of supply.
- 7.127 The connections for earthing of an apparatus or line shall be applied or removed only by competent persons.
- 7.128 Earthing leads shall be connected to the system before being secured to the conductors.
- 7.129 Earthing leads shall not be applied in any cell or compartment in which there is an exposed live conductor.
- 7.130 When it is necessary to cut a line, busbar or loop or to repair a broken conductor or damaged loop, earths shall be placed on both sides of the work.
- 7.131 Before working on underground cables, they shall be disconnected from the source of energy, discharged and then earthed. To discharge them, use an earthed wire and make contact with it to each terminal in turn repeatedly.

- 7.132 When removing earthing leads they shall be disconnected from the line conductors first and the earth system last. The removal shall be carried out in a reverse order to that adopted for the connection of various conductors to earth.
- 7.133 All works on dead circuits shall be done between two sets of temporary earths.
- 7.134 Earths shall never be attached or removed with bare hands. Rubber gloves, gauntlets or approved protective equipment shall always be used.
- 7.135 In so far practicable, the person applying the earths on poles and structures shall maintain his position below the level of conductors to be earthed in order to keep the body away from any arc that may occur when the earthing device is applied.
- 7.136 Employees shall keep off the earth wire.
- 7.137 No temporary earths shall be removed from the equipment while the work is in progress.
- 7.138 Employees shall not touch any conductors from which protective earths have been removed.
- 7.139 Earthing of one conductor does not render other conductors safe for work. All phases shall be earthed even if work is to be carried out only on one phase

CHAPTER8: SAFETY DEVICES/EQUIPMENTS

“DO NOT TAKE CHANCES WITH YOUR LIFE USE SAFETY DEVICES”

CARE, MAINTENANCE & USE OF WORKMAN’S SAFETY DEVICES

8.1 The following are the minimum requirements of safety devices and special tools;

- (a) Rubber Gloves, Gauntlets and Rubber Mats
- (b) Safety Belts
- (c) Leather Protective Gloves
- (d) Hand lines
- (e) Ladders
- (f) Ropes
- (g) Hand Tools



Figure 4 Use of Rubber Gloves, Safety Belts, Ladder while operating Gang switch etc

WORKMEN'S SAFETY DEVICES

- 8.2 Rubber gauntlets, gloves, mats, boots and galoshes, insulated platforms and stools, safety belts, hand lines, tower wagons and other special insulated devices shall be used as required by employees working on electrical apparatus, underground mains and overhead lines as precaution against accidental electric shock.
- 8.3 Pliers and other tools insulated with brittle materials or otherwise liable to have the insulation damaged when in use, shall not be used.
- 8.4 The Supervisor in charge of the work will be responsible to test and ensure proper use of the safety equipment, supplied to the gang of workmen under him and see that it is maintained at all times in efficient condition and must immediately bring to the notice of his superior officer any equipment which is liable to be broken in use, when arrangements will be made immediately for their replacement.

LINEMAN'S, FITTER'S OR CABLE JOINTER'S CLOTHING

- 8.5 Lineman while working on lines shall avoid wearing loose clothing, rings, metal chains, etc., which may contact a live portion and cause hazard. They shall use rubber gloves, safety shoes, head gear, goggles wherever available.



Figure 5 Fuse wire, Bushing connection by UHBVN Employees

INSPECTION OF SAFETY EQUIPMENT

- 8.6 All safety equipment shall be thoroughly inspected:
- (a) Monthly, by the T&P holder
 - (b) Quarterly, by the Assistant Executive Engineer,
 - (c) Once in six months, by the Division Officer for its being in good condition.

RESPONSIBILITY IN USING SAFETY DEVICES

- 8.7 It is the responsibility of the employee to make use of safety devices properly.

RUBBER GLOVES AND GAUNTLETS

- 8.8 Rubber gloves should not be rough handled as to be damaged. After the work they should be cleaned, and powdered with French chalk and stored in a safe place.

TESTING RUBBER GLOVES AND GAUNTLETS

- 8.9 Before using, the gloves should be checked for cuts, weak spots, pin holes, by an "Air Test". This is done by rolling the gloves tightly from the gauntlet end, and noticing if any air escapes. If air leaks the gloves should be discarded. If the right hand glove is found to be unserviceable the pair itself should be discarded. A left hand glove should not be used on right hand.

CARE OF RUBBER EQUIPMENT

- 8.10 Rubber equipment should be kept clean and free from oil. They should not be stored near a source of heat, or exposed unnecessarily to sun's heat. They are best stored in protective containers, and should not be tied by cords or threads which may cut it.
- 8.11 Use of Rubber gloves should be insisted on
- (a) When inspecting the Transformer or its H.T. & L.T. leads
 - (b) When connecting wire near a live conductor or equipment.
 - (c) While removing or replacing fuses of H.T. installations.

- (d) A combination of gloves and hickory rod or fuse pole rods should be used where the voltage exceeds 5,000 volts.
- (e) While opening and closing isolators.

CARE OF SAFETY BELTS

- 8.12 Safety belt should be properly handled, and periodically treated with oil to prevent its becoming hard. Care should be taken to see that sharp tools or edges do not cut dents and holes in it. Extra holes should not be punched as it weakens the belt. It is best preserved in a separate case.

LEATHER PROTECTING GLOVES

- 8.13 Protective leather gloves may be worn over rubber gauntlets when wires are being spliced or when solder or hot compound are being handled when it is necessary for the person to move about a lot during working, or when line wires are being tied on to insulators or when any other work is being done which might render the gauntlet liable to tear and consequent danger to the wearer.

HAND LINES

- 8.14 Hand lines should have minimum diameter of $\frac{1}{4}$ " and should be twice as the height where work is being done. They should always be kept clean and dry, free from grease, solder, oil, etc.,. Ends should be tied to prevent unraveling of the strands. Hand lines should not have metal reinforcement. When jointing the hand lines a splice should be made. No metallic clamps or wire should be used for joining. Hand line should be carried up a pole, uncoiled and attached to the body belt. The hand line must be strong enough to carry the weight of a person. Hand lines should not be allowed to become wet, and should be dried before being stored. A spare hand line should always be available in an emergency. Hand lines should be kept away from street and vehicle traffic.

LADDERS

- 8.15 Ladders must be of strength to carry double the strain of the heaviest load that would be placed upon them.
- 8.16 Defective ladders must never be used.
- 8.17 A clearance space of not less than 12" must be provided between ladder rungs. A minimum clearance space of 36"/90 cms must be provided in front of ladders where space permits.
- 8.18 When straight, portable ladders are used on hard surfaces, they must be held or firmly locked in addition, anti-slip shoes must be used where provided.

- 8.19 Ladders must be kept free from dirt, grease, and paint-spots.
- 8.20 Ladders must be stored upon brackets and in sheltered locations.
- 8.21 Ladders must not be placed in front of doors opening towards the ladder, or against window sashes.
- 8.22 Step-ladders must be fully opened before being used.
- 8.23 Two ladders must not be spliced together.
- 8.24 Employees must face ladders when ascending or descending over them, and must have both hands free.
- 8.25 Employees must not slide down or try stunts on ladders.
- 8.26 Ladders must be periodically inspected; when found defective; they must be repaired or disposed off.
- 8.27 Straight, portable ladders must be placed at safe angle about 75 degrees with the horizontal. In other words, place the foot of a 12¹/₄ Mts ladder 3¹/₁ Mts. from the object it leans against.

ROPES

- 8.28 Fibre ropes are made principally of manila fibre, sisal fibre and hemp. Frequent inspections are required in the use of rope as the interior fibers may be broken or ground to powder, while the exterior fibres may indicate that the rope is little worn.
- 8.29 Pure manila rope is the strongest and most reliable of fibres ropes. It is of a yellowish colour with silvery or pearlish luster and has a silky feel when drawn through the hand. Rope with brown or black fibre is of inferior grade. Sisal rope has about 6.7% of the strength of manila rope. It is yellowish white, sometimes with a greenish tint. The Fibres are hard and stiff, with a tendency to splinter. Hemp rope is nearly as strong as manila and is slightly more resistant to atmospheric deterioration. It is of a dark grey colour and is much softer than manila rope.

- 8.30 Rope must be so uncoiled as to avoid kinking, since even a moderate strain on a rope in which there is a kink may over-stress the fibres at the kink. Wet rope deteriorates rapidly unless dried properly. It should be hung up in loose coils so that dry air can be circulated through them. Heat should never be applied as it dries out the oil and thus shortens the life of the rope. Wet rope has a tendency to form kinks. No load should be applied until all kinks are removed. All ropes are easily damaged by acids and alkalis. Any rope known to have been exposed to acids or alkalis (sometimes indicated by discoloration or strains) should be used with caution.
- 8.31 In making a rope fast, an object with a smooth round surface should be selected. When rope is running over a sheave or pulley internal wear is caused by friction. The life of the rope is greatly prolonged by using blocks with sheaves of large diameter.
- 8.32 Fibre rope should always be cleaned before being placed in storage and shall be stored in a dry, airy place. It should never be stored in the same room with acid or caustics.

HAND TOOLS

- 8.33 Using hand tools improperly, neglecting to keep them in safe working condition and carelessly leaving them around where they may endanger persons are frequent causes of accidents. Proper tools should always be used for the work.
- 8.34 All tools shall be maintained in good working conditions. Burred heads shall be promptly redressed. Broken, cracked or otherwise damaged handles shall be replaced. All tools with sharp edges should be kept in sheaths, shields, tool chests or other containers, when not in actual use.
- 8.35 A screw driver should never be used as a chisel. Screw drivers with full length metal tong or shank through handle must not be used for electrical work. Other tools such as pliers, wrenches, etc., whether insulated or not insulated shall not be used without rubber gloves while working near live parts of any voltage.
- 8.36 All files shall be fitted with substantial handle; workmen should keep files cleaned as this reduces the slipping hazard and prevents skinned hands.
- 8.37 Never use metal tapes, rulers, or cloth tapes with metal strands or wood rulers with metal ferrules or joints near energized equipment.
- 8.38 Avoid use of long saws among wires as a short circuit may be caused.
- 8.39 Belt-tools must be well secured to the belt. Only pliers, hammers, wrench and connectors should be carried. All other tools should remain below until needed and then hoisted in bag.

CHAPTER9: SAFEGUARDING PUBLIC

“PUBLIC SAFETY IS OF EQUAL CONCERN”

- 9.1 Every effort should be made to protect the public at all times where company’s work is in progress by the use of signs, barricades or personal warning.
- 9.2 When working on customer’s premises or public property, every effort should be made to avoid hazards to persons or unnecessary property damage.
- 9.3 Barriers shall be placed around all open manholes, exposed open ditches and excavations.
- 9.4 Authorized visitors shall not be left to find their own way.
- 9.5 Public shall be encouraged to report dangerous situation which may come to their notice.
- 9.6 Visitors shall be provided proper Personnel Protective Equipments wherever required.

CHAPTER10: 5S PRACTICES

“FOLLOW THE PROCESS”

PRINCIPLE OF 5S

10.1 The concept of “5S” originated in Japan. It is an integral tool of TQM which lays a very strong foundation for quality movement within the organization. The 5S are pre-requisites (basics) for any improvement programme. 5S Philosophy focuses on effective work place organization, simplifying work environment, reducing waste while improving quality and safety. There is no other way for improving efficiency or quality in work place.

10.2 The five S stands for the five first letters of these Japanese words:

Japanese Term	English Equivalent
Seiri	Sort
Seiton	Set In Order
Seiso	Shine
Seiketsu	Standardize
Shitsuke	Sustain

MEANINGS

Seiri

10.3 Sorting, keep the necessary in work area, dispose or keep in a distant storage area less frequently used items, unneeded items are discarded. Seiri fights the habit to keep things because they may be useful someday. Seiri helps to keep work area tidy, improves searching and fetching efficiency, and generally clears much space. Seiri is also excellent way to gain valuable floor space and eliminate old broken tools, obsolete jigs and fixtures, scrap and excess raw material.

Seiton

10.4 Systematic arrangement for the most efficient and effective retrieval. A good example of Seiton is the tool panel. Seiton means tidily putting things away after you have used them. Putting things away requires following three rules: Decide where things belong; decide how things should be put away; Follow the put-away rules to leave things where they can be quickly and properly found next time they are needed

10.5 Seiton saying would be: "A place for everything and everything on its place."

Seiso

- 10.6 Cleaning, after the first thorough cleaning when implementing 5S, daily follow-up cleaning is necessary in order to sustain this improvement. Cleanliness is also helpful to notice damages on equipment such as leaks, breakage and misalignment. These minor damages, if left unattended, could lead to equipment failure and loss of production. Regular cleaning is a type of inspection. Seiso is an important part of basic TPM; Total Productive Maintenance and Safety matter through cleanliness is obvious.

Seiketsu

- 10.7 Standardizing- Once the first three S have been implemented, it should be set as a standard without which, the situation will deteriorate right back to old habits. Have easy-to-follow standards and develop a structure to support it. Allow employees to join the development of such standards. Thus the 3 first S are often executed by order. Seiketsu helps to turn it into natural, standard behaviour.

Shitsuke

- 10.8 Finally, to keep first 4 S alive, it is necessary to keep educating people maintaining standards. By setting up a formal system; with display of results, follow-up, the complete 5S get insured to live, and be expanded beyond their initial limits, in an ongoing improvement way. The effect of continuous improvement leads to less waste, better quality and faster leads times.

Need For Cleanliness

- 10.9 Today electronics and other machinery demand very high levels of precision and cleanliness. Just a spot of grime can cause a computer to crash. Filings and burrs can mean that things do not fit tightly. Dropping things on an assembly line can mean that the wrong parts are put together or that the product is shipped to the wrong client. There are all kinds of major problems caused by seemingly minor "5S" lapses. It is clear that the 5S's are prerequisite to quality, and this cannot be overemphasized.

- 10.10 Problems discovered in the cleaning process are as follows:

- (a) Filings in the conveyance chutes lead to scratching.
- (b) Scraps in the die lead to faulty pressings.
- (c) Things fall off the equipment and get into the products.
- (d) Things get dented or bent in conveyance.
- (e) Filings and other particles contaminate the resin.

- (f) Dirty coolant leads to clogging.
- (g) Dust and other substances ruin the paint jobs.
- (h) Bad connections are made because the electrical contacts are dirty.
- (i) Fires are caused because garbage shorted the electrical equipment.

Equipment

10.11 Although you will need a detailed and exhaustive checklist for each piece of machinery, it is possible to mention some of the main items common to most equipment.

- (a) Cleaning: Grime, clogging, rust, leakage etc.
- (b) Heat: Oil tanks, heaters, control planes, washing or cleaning water etc.
- (c) Breakage: Breakage, meters that do not return to zero, cracked glass, handles that have come off, broken switches or buttons, cables or bundles of wires that have come unraveled, things that are misshapen, etc.
- (d) Electrical: Control panel covers, control panel interiors, lamps, light bulbs, switches, etc.
- (e) Tools and measurement devices: Tools, measurement devices, gauges etc.
- (f) Equipment-specifics: transport equipment, etc.

Launching of 5S – Operative Activities

10.12 Recording the present situation - Before launching into 5S activities, the very first thing to do is to take photographs around the workplace. These will be very useful for comparison purposes when 5S is in full swing.

10.13 Identifying abnormalities by visual control- Because it is people who control and manage things, it is essential that your people be able to tell the difference between normality and abnormality and be able to act accordingly. Yet, as seen in industrial defect rates, the possibility of abnormalities occurring is generally 1% or less, and most of the time things will be operating as normal with no problems. It is in the midst of this normality that people must identify abnormality.

10.14 Visual management – an answer

10.15 How can you best make sure that abnormalities surface? In our everyday work, we use our minds to remember things and all five senses to do our best work. What is important here is to transform these static senses into dynamic awareness and to make them come alive for us. And it is the visual sense-the sense of sight-that is the most important. It has been estimated that 60% of all human activity starts with sight. Of course, we also learn from our sense of hearing and our sense of feel, and it is also important to make the fullest possible use of these senses as well, but it is our sense of sight that dominates. That is why visual management is sometimes referred to as the embodiment of visual awareness.

10.16 Points to remember in making visual control tools

- (a) Make them easy to see from a distance
- (b) Put the displays on the things they are for
- (c) Make them so that everyone can tell what is right and what is wrong
- (d) Make them so that anybody can use them easily and conveniently
- (e) Make them so that anybody can follow them and make the necessary corrections easily
- (f) Make them so that using them makes the workplace brighter and more orderly

Checkpoints

10.17 Clearly determine the position each picture was taken from, so that you will be able to have before and after photographs

10.18 Date all photos. If possible, use a camera which prints the date on the negative

Analyzing Why and What

10.19 Every piece of equipment fulfils specific functions, and understanding these functions will make you a better inspector. This understanding can be vastly enhanced if you ask yourself why for each of the problems and minor defects that you identify.

10.20 Ask yourself

- (a) Why is this important?
- (b) Why has this been overlooked or ignored?
- (c) What can be expected to happen if we leave this the way it is? What impact will it have? What are the principles and mechanisms involved here?

- (d) Why has this gone so long before being detected? What could have been done so that it would have been detected earlier?
- (e) Why is it this way? Does anybody know about this? Does everybody know about this?

10.21 By constantly asking yourself the whys and whats, you will get to the core of the problem and will be able to involve the small-group (quality circles) as well as management in finding and implementing solutions. Inspections are all well and good, but they are not the end of the process. The purpose of an inspection is to find problems and then to solve them so that they do not show up on the next inspection.

The Differences 5S make

10.22 Although the “5S” movement obviously results in major improvements in 5S areas, it is even more important in changing the way people approach their work and what they do.

10.23 It is impossible to mount a “5S” campaign with just one or two people. You need to have everyone actively involved. Each of the individual things that need to be done is simple enough in itself. The difficult thing is to keep doing them. This requires determination, persistence, and cooperation. But that combination in turn creates a new sense of team identity and a better corporate climate.

10.24 It is important to start by doing. No matter how well you understand the theory, the theory does not produce results. Only doing does. And this doing has the power to change the way people look at things. It has the power to transform them.

10.25 Every part of the “5S” process is important. Every step has the potential for opening our eyes. The 5S’s are the best way to eliminate waste.

The Pledge

- I will not get things dirty.
- I will not spill.
- I will not scatter things around.
- I will clean things right away.
- I will rewrite things that have gotten erased.
- I will tape up things that have come down

“5S - It's a way of building business”

APPENDIX I

TELEPHONE/FAX MESSAGE

ACCIDENT REPORT

- 1. Name of the Section/Sub-Section:
- 2. Date and time of occurrence:
- 3. Name of the casualty, address, sex and age:
- 4. Fatal/non-fatal (if non-fatal state condition:
- 5. Departmental or non-departmental
(If departmental, details of Ch.No. and
designation etc., to be furnished) :
- 6. Voltage, name of the feeder and place
of accident :
- 7. State the occurrence in brief :
- 8. Date and time of reporting :

APPENDIX II

FORM FOR REPORTING ELECTRICAL ACCIDENTS

1	Date and Time of accident						
2	Place of accident (Village / Town, Tehsil / Thana, District and State)						
3	System and voltage of supply (Whether EHV/HV/LV line, sub-station/generating station/consumer's installations/service lines/other installations)						
4	Designation of the Officer-in-charge (in whose jurisdiction the accident occurred)						
5	Name of owner/user of energy in whose premises the accident occurred.						
6 Details of victim(s)							
(a) Human							
S.No.	Name	Father's Name	Sex of victim	Full Postal Address	Approx. Age	Fatal / Non-Fatal	
(b) Animal							
S.No.	Description of Animals	Number(s)	Name(s) of Owner(s)	Address (es) of owner(s)	Fatal / Non-Fatal		
7	In case the victim(s) is /are employee(s): (a) Designation of such person(s) (b) Brief description of the job undertaken, if any. (c) Whether such person/persons was/were allowed to work on the job.						
8	In case the victim(s) is/are employee(s) of a licensed contractor (a) Did the victim(s) possess any electric workman's permits(s), supervisor's certificate of competency issued under Rule 45? If yes give number and date of issue and the name of issuing authority. (b) Name and designation of the person who assigned the duties of the victim(s)						
9	In case of accident in the Distribution Licensee system, was the Permit To Work (PTW) taken?						

10	Describe fully the nature and extent of injuries, e.g. fatal /disablement (permanent or temporary) of any portion of the body or burns or other injuries. In case of fatal accident, was the post mortem performed?	
11	Detailed causes leading to the accident (To be given in a separate sheet annexed to this form)	
12	Action taken regarding first-aid, medical attendance etc. immediately after the occurrence of the accident (give details)	
13	Whether the District Magistrate, Police Station concerned and Chief Electrical Inspector have been notified of the accident (if so, give details)	
14	Steps taken to preserve the evidence in connection with accident to the extent possible.	
15	Names and designation(s) of the person(s) assisting, supervising the person(s) killed or injured.	
16	What safety equipments were given to and used by the person(s) who met with this accident (e.g. rubber gloves, rubber mats, safety belts and ladders etc.)?	
17	Whether isolating switches and other sectionalising devices were employed to deaden the section for working on the same? Whether working section was earthed at the site of work?	
18	Whether the workmen conducted proper earthing as per prescribed guidelines on either side of the work place?	
19	Whether the work permit was undertaken by authorised person(s)? If so, the name and the designation of such person(s) may be given.	
20	Whether the artificial resuscitation treatment work on live lines was undertaken by authorised person(s)? If yes, how long was it continued before its abandonment?	
21	Names and designations of persons present at and witnessed the accident.	
22	Name and designation of person held responsible for the accident as per detailed investigation report.	
23	Any recommendation regarding safety procedures pertaining to corrective and preventive actions for avoiding future accidents.	
25	Whether investigation report of CEI has been received and the same is attached?	
24	Any other information/remarks.	
Place		
Time		
Date		
Signature		
Name		
Designation		
Address of the person reporting		

Note: Copy of the duly filled form has to be forwarded to the following people:

1. Reporting Division office
2. Reporting Circle office
3. Reporting office of the Chief Engineer in charge
4. Director Operations/Head office
5. Training institutes

APPENDIX III

A SAMPLE PERMIT FORM

PERMIT TO WORK ON 11 KV DISTRIBUTION SYSTEM

I, hereby declare that the following Electrical equipment/line is dead and isolated from conductors.

A caution notice has been affixed to the controlling Device
(Here state exactly the Electrical Equipment/line on which it is safe to work)

Signature with date, time and designation when permit is issued over phone, the name of the authorised person at opposite end must be recorded.

(Issuer)

(Receiver)

Serial Number of the permit:
(when permit is issued over phone)

(Sending end/Receiving end)

Note:

(1) This card after being signed by an authorized person for the work to proceed, is to be handed to the person in charge of the work and retained by that person until the work is completed or stopped by an authorized person.

(2) The Electrical equipment mentioned hereon must not be again made live until this has been signed and returned by the person in charge of the work to an authorized person.

I hereby declare that all men, earthing and materials under charge have cleared the equipment/line and men have been warned that it is no longer safe to work on the electrical equipment specified on this card.

Signature
(date and time)

Designation

I hereby declare this card cancelled.

Signature
(date and time)

Designation

Appendix IV

APPLICATION FOR PRE ARRANGED SHUT DOWNS

- 1. Name of the applicant:
- 2. Designation and address:
- 3. Section of line or feeder or equipment on which shutdown is required
- 4. Time, date and duration of shutdown:
- 5. Purpose of shutdown:
- 6. Consumers affected by shutdown:
- 7. Whether concurrence of competent authority obtained or not
- 8. Nearest contact No.

Signature of applicant recommending

Signature of UHBVN Officer recommending

Signature
Approved by Officer-in-charge of station

(1) The applicant shall not be below the rank of a Junior Engineer. The application duly approved by Officer-in-charge of Station will be forwarded to the concerned operator on duty for shutdown and this form will be retained by him as a record.