



## **CODE OF SAFETY RULES**

## P R E F A C E

The APTRANSCO desires to revise the Safety procedures. Accordingly, a committee containing a Chairman, two Conveners and 24 members among Electrical Engineers of APTRANSCO was formed so as to study 1) APSEB safety rules-1968, 2) CEA safety regulations 2010, 3) Recommendation on safety procedures & practices IS 5216 part-I & II, 4) AP Transco technical Ref. Book 1 & 2, 5) Manual of safety rules & Safety instructions of Gujarat & Maharashtra states and any other Manual related to safety and recommended necessary revision of topics if any suitable for the present times to bring out a Safety Manual in APTRANSCO.

Based on the recommendations, the code of Safety Rules book 1968 is revised. Also, in the second safety committee meeting, the members with added strength of Safety officers are once again informed to review the revised material for recommendations/ Suggestions. In final, an Over view committee formed with a Superintending Engineer and Two Executive Engineers to review the books and furnish recommendations / Suggestions to compile Safety Manual that is applicable to APTRANSCO in particular. Hence the committee after going through various books as mentioned above, recommended certain additions and corrections in the present context of APTRANSCO. Finally, revised code of Safety Rules book is completed and is adopted in APTRANSCO for Safety measures.

The revised code of Safety Rules book deserves to be owned by all employees of APTRANSCO and to be made available in all offices of APTRANSCO and also in web site to study and get thoroughly familiar with those rules, to improve & develop a sense of safety awareness which concern them in every EHT Sub Station.

The Employees, in any situation including an emergency, are expected to use good judgment and care in doing their jobs duly ensuring safety of themselves, their fellow employees, the public and equipment. This is where the Revised Code of Safety Rule plays a vital role in achieving the targeted safety. Time is important in carrying out work, but not at the risk of human life. The safety must come in first place at our works.

# INDEX

Chapter 1		
GENERAL RULES FOR ALL EMPLOYEES		
Rule No.	Description	Page No.
1.1	<u>Safe Working Procedure</u>	10-12
1.2	<u>Supply of Manual</u>	12
1.3	<u>General duties of all employees</u>	12-13
1.4	<u>Responsibility of Supervisor &amp; Field Engineers</u>	13
1.5	<u>Emergency Rules and Modifications</u>	14
1.6	<u>Posters, safety cards etc.</u>	14
1.7	<u>Personal conduct</u>	14
1.8	<u>Physical condition</u>	14
1.9	<u>General precautions</u>	14
1.10	<u>Permission to operate</u>	15
1.11	<u>Lifting loads</u>	15
1.12	<u>Fire prevention</u>	15
1.13	<u>Fire extinguishers and equipment</u>	15
1.14	<u>Safety meetings</u>	15
1.15	<u>Check your tools</u>	15
1.16	<u>Good housekeeping</u>	15
1.17	<u>Clothing</u>	15
1.18	<u>Smoking</u>	16
1.19	<u>Special Jobs need experience</u>	16
1.20	<u>Avoid Haste</u>	16
1.21	<u>Exhaustion is No time to work</u>	16
1.22	<u>Visitors</u>	16
1.23	<u>The list of authorized persons to work on lines</u>	16
1.24	<u>Identity cards to staff</u>	16
1.25	<u>Safety meetings at camps</u>	16
1.26	<u>Demarcation of Working and Testing Areas</u>	16
Chapter 2		
GENERAL SAFETY RULES		
Rule No.	Description	Page No.
2.1	<u>Live equipment</u>	17
2.2	<u>Permission to start work</u>	17
2.3	<u>Planning the works</u>	17
2.4	<u>Pre-arranged shutdowns</u>	17
2.5	<u>Safe distance for work near live electrical apparatus</u>	18
	i. Personnel, small tools and material	
	ii. Use of cranes	
2.6	<u>Handling material and equipment near live apparatus switch boards or panels</u>	18
2.7	<u>Work on multiple circuits</u>	18-19
2.8	<u>Protection for work</u>	19
2.9	<u>Last minute decisions</u>	19
2.10	<u>Limitation of work by unqualified men</u>	19
2.11	<u>Operating instructions</u>	19
2.12	<u>Rectification without line clear</u>	19
2.13	<u>Advance planning of works</u>	19
2.14	<u>Safety and protection</u>	19

2.15	<u>Safety sergeant</u>	20
2.16	<u>Caution boards</u>	20
2.17	<u>Safety appliances</u>	20
2.18	<u>Line clear</u>	20
2.19	<u>Procedure for line clears</u>	20
2.20	<u>Protection tags</u>	20
2.21	<u>Discharging and earthing</u>	20
2.22	<u>Work on heights</u>	20-21
2.23	<u>Electrical layouts and diagrams</u>	21
2.24	<u>Provision of lighting</u>	21
2.25	<u>Inspection lamps and extension lights</u>	21
2.26	<u>Test lamps</u>	21
2.27	<u>Testing supports</u>	21
2.28	<u>Work on roads and streets</u>	21
2.29	<u>Work on lightning arrestors</u>	21
2.30	<u>Identification of Circuits</u>	21
2.31	<u>Precautions to be taken before issuing line clear</u>	21-22
2.32	<u>Permanent grounds on equipment</u>	22
2.33	<u>Handling cartridge type fuses</u>	22
2.34	<u>Potential test indicators</u>	22
2.35	<u>Lightning in the vicinity of work</u>	22
2.36	<u>Artificial Respiration</u>	22
2.37	<u>Vibration near switchboards, relay panels or gas relays</u>	23
2.38	<u>Storage batteries</u>	23
2.39	<u>Do not test live condition of equipment by touch method</u>	23
2.40	<u>Wide Publicity by Tom- Tom before Energizing New lines</u>	23
2.41	<u>Danger Boards</u>	23
2.42	<u>Rectification of defective supply</u>	23
2.43	<u>Insulation of Wires</u>	23
2.44	<u>Reference letter on Line clear on line/ equipment</u>	24-26

### Chapter 3

#### SAFETY DEVICES AND TOOLS

Rule No.	Description	Page No.
3.1	<u>Use safety devices which are in safe working condition and of approved type</u>	27
3.2	<u>General use and care of rubber protective equipment.</u>	27
3.3	<u>Rubber gloves and gauntlets</u>	27-28
3.4	<u>Inspection and testing of gloves and gauntlets</u>	28
3.5	<u>Ladders</u>	28-29
3.6	<u>Safety belts</u>	29
3.7	<u>Fiber ropes</u>	29-30
3.8	<u>Wire Steel/Ropes</u>	30
3.9	<u>Hand lines and tools</u>	30-31
3.10	<u>Eye protection</u>	31
3.11	<u>Personal tools</u>	31
3.12	<u>Electrical hand tools &amp; portable electrical equipment</u>	31
3.13	<u>Taped handles</u>	31
3.14	<u>Jacks</u>	31
3.15	<u>Chains</u>	31-32
3.16	<u>Slings</u>	32
3.17	<u>Canvas bags</u>	32
3.18	<u>Fire extinguishers</u>	32-33

3.19	<u>Precautions relating to common type of class 'A' fires</u>	33
3.20	<u>Precautions relating to common type of class 'B' fires</u>	33
3.21	<u>Precautions relating to common type of class 'C' fires</u>	33
3.22	<u>Types of fire extinguishers.</u>	33-34
3.23	<u>Present work Practices</u>	34-35
3.24	<u>Recommendations</u>	35
3.25	<u>Tools for safe earthing &amp; Working</u>	35-36
3.26	<u>Earth Discharge rods</u>	36
3.27	<u>Portable Earth Discharge Rods</u>	36-38

## Chapter 4

### ISSUE AND RECEIPT OF LINE CLEARS WHEN WORKING ON LINES AND EQUIPMENT

Rule No.	Description	Page No.
4.1	<u>Line clear</u>	39
4.2	<u>Issue of line clear for work</u>	39
4.3	<u>Self line clear</u>	39
4.4	<u>Line clear (permit) books.</u>	39
4.5	<u>Permits by phone</u>	39
4.6	<u>Authorized persons</u>	39-40
4.7	<u>Special authorization</u>	40
4.8	<u>Procedure for issue of line clear</u>	40-41
4.9	<u>Receipt of line clear</u>	41-42
4.10	<u>Return of line clear</u>	42
4.11	<u>Special case</u>	42
4.12	<u>Line clear (permit) to work on electrical equipment/line.</u>	43
4.13	<u>Return of line clear.</u>	43-44
4.14	<u>Discharging and earthing</u>	44
4.15	<u>Procedure for earthing</u>	44-45

## Chapter 5

### SUB-STATIONS AND LINES

Rule No.	Description	Page No.
5.1	<u>Sub-Station yard.</u>	46
5.2	<u>Numbering of equipment</u>	46
5.3	<u>Lighting in the Sub - Station</u>	46
5.4	<u>Admission to switch yard</u>	46
5.5	<u>Exclusion of animals</u>	46
5.6	<u>Changing shifts</u>	46-47
5.7	<u>Operating records</u>	47
5.8	<u>Authority necessary for operating apparatus</u>	47
5.9	<u>Emergency duties</u>	47
5.10	<u>Reporting for duty in an unfit condition</u>	47
5.11	<u>Assistance from operators not on duty</u>	47
5.12	<u>Register of movements of staff</u>	47
5.13	<u>Routine inspections.</u>	48
5.14	<u>Interchanging shifts</u>	48
5.15	<u>Reading on duty</u>	48
5.16	<u>Knowledge of the equipment</u>	48

5.17	<u>Kiosk</u>	48
5.18	<u>Current transformers</u>	48
5.19	<u>Potential transformers</u>	48
5.20	<u>Trip circuit</u>	48
5.21	<u>Temperature of hot oil</u>	49
5.22	<u>Isolators</u>	49
5.23	<u>Switching IN and switching OFF loads</u>	49
5.24	<u>Back feeding</u>	49
5.25	<u>Authorized persons only to operate</u>	49
5.26	<u>Departmental telephones</u>	49
5.27	<u>Meggering of high capacity equipment</u>	49-50
5.28	<u>Line lightning arrestors and care to be taken</u>	50
5.29	<u>Working near live supports or equipment</u>	50
5.30	<u>Switching off In case of fire</u>	50
5.31	<u>Pits and trenches</u>	50
5.32	<u>Caution notices.</u>	50-51
5.33	<u>Safety and protective devices</u>	51
5.34	<u>Public hazards.</u>	51
5.35	<u>Safety measurements for operating Maintenance of transmission distribution on system</u>	51-52
5.36	<u>General Clearances</u>	52
5.37	<u>Lines crossing or approaching each other &amp; lines crossing street &amp; road.</u>	52-53
5.38	<u>Additional safety requirements for GIS</u>	53
5.39	<u>Earthing equipment of GIS</u>	54
5.40	<u>Handling GIS apparatus for carrying out shutdown work or testing Precautions to be observed</u>	54-57

## Chapter 6

### LIVE LINE WORKS

Rule No.	Description	Page No.
6.1	<u>General safety rules for work on live lines</u>	58
6.2	<u>Safety rules for hotline maintenance</u>	58-62
	a. General rules & Precautions	
	b. Safety rules for Supervisor	
	c. Safety rules for Hotman.	
6.3	<u>Care and storage of live line tools.</u>	62-63

## Chapter 7

### VEHICLES

Rule No.	Description	Page No.
7.1	<u>License required to drive Board vehicles</u>	64
7.2	<u>Driving regulations</u>	64
7.3	<u>Motor vehicle accidents</u>	64
7.4	<u>First aid kits</u>	64
7.5	<u>Condition of vehicle</u>	64
7.6	<u>Transportation of personnel</u>	64
7.7	<u>Passengers</u>	64
7.8	<u>Courtesy</u>	65

7.9	<u>Rail road crossings</u>	65
7.10	<u>Rules for the care and operation of the vehicles</u>	65-66

## Chapter 8

### TREE CUTTING

Rule No.	Description	Page no.
8.1	<u>Tree Cutting</u>	67
8.2	<u>Lowering severed branches from trees</u>	67
8.3	<u>Working above the level of live conductors</u>	67-68
8.4	<u>Public relations</u>	68

## Chapter 9

### SAFETY PRECAUTIONS IN CONSTRUCTION WORK.

Rule No.	Description	Page No.
9.1	<u>Transport of materials</u>	69
9.2	<u>Erection work</u>	69-72
9.3	<u>Energization of lines and equipment</u>	72
9.4	<u>Safety Points in the Transmission Line Construction</u>	72-73
9.5	<u>Safety point for line maintenance</u>	73-74

## Chapter 10

### FIRST AID AND SHOCK TREATMENT

Rule No.	Description	Page No.
10.1	<u>First aid kit, its location, and maintenance</u>	75
10.2	<u>Contents of the first aid kits</u>	75-76
10.3	<u>Electrical burns and first aid treatment</u>	76
10.4	<u>Chemical burns</u>	76
10.5	<u>Clothing on fire</u>	76
10.6	<u>Shock Treatment</u>	76-77
10.7	<u>Removal from contact</u>	77
10.8	<u>Artificial respiration</u>	77-78
10.9	<u>Various methods of artificial respiration.</u>	78
10.10	<u>Neilsen's armlift back pressure method</u>	78
10.11	<u>Schafer's Method</u> (Refer Fig No.7)	78
10.12	<u>Silvester's method</u> (Refer Fig No.8)	79-81
10.13	<u>Arrange for a stand-by operator</u>	81
10.14	<u>Treatment after recovery</u>	81
10.15	<u>Images</u>	82-87
	Electric Shock & Treatment Images	82
	Artificial Respiration	83
	Resuscitation	84
	Burns & Scalds	85
	Electric Shock	86
	Emergency Resuscitation	87
	CPR	86
10.16	<u>Pressure points</u>	88
10.17	<u>Annexure (Leaf let)</u>	89-93

## Chapter 11

### ACCIDENTS

Rule No.	Description	Page No.
11.1	<u>Electricity – Indian Electricity act 2003- Report of Accidents</u>	94
11.2	<u>G.O.No.43 (Energy Services) Department Dated: 19-11-2011</u>	94-95
11.3	<u>Preliminary report of accident</u>	95
11.4	<u>Detailed investigation</u>	95
11.5	<u>Time limit to be adopted by various officers while sending accident reports.</u>	96
11.6	<u>Annexure</u>	97-98

## Chapter 12

### MISCELLANEOUS

Rule No.	Description	Page No.
12.1	<u>Grounding Practices</u>	99
12.2	<u>Review of Accidents</u>	100
12.3	<u>Case studies</u>	100-101
12.4	<u>In Rainy Season</u>	101
12.5	<u>Shock</u>	101-102
12.6	<u>Body resistance</u>	102
12.7	<u>Reflex action</u>	102
12.8	<u>Let- Go Threshold</u>	102
12.9	<u>Shock Thresholds</u>	103
12.10	<u>Human resistance values fir various skin –contact conditions.</u>	103
12.11	<u>Current range and effect on 70kg person.</u>	103-104
12.12	<u>Batteries</u>	104
12.13	<u>Chemical Hazards</u>	104-105
12.14	<u>Operation &amp; Maintenance</u>	105
12.15	<u>Hazards</u> <ul style="list-style-type: none"><li>• Shock Hazards</li><li>• Short Circuit Hazards</li><li>• Explosion Hazards</li><li>• Other Hazards</li></ul>	105-106
12.6	<u>What to do in case of Traumatic (Physical Shock)</u>	106-107
12.17	<u>Fractures</u>	107-108
12.18	<u>Injuries to Spine</u>	108
12.19	<u>Common Poisonous Plants</u>	108
12.20	<u>Prevention</u>	108-109
12.21	<u>Treatment</u>	109
12.22	<u>Injuries to extreme of Heat and Cold</u>	109-110
12.23	<u>Bruises, Strains and Sprains</u>	110-111
12.24	<u>Bites</u>	111
12.25	<u>Injuries To The Head</u>	112
12.26	<u>Infections</u>	112

12.27	<u>Transportation</u>	112
12.28	<u>Injuries to the Eyes</u>	113
12.29	<u>House Keeping</u>	113-114
12.30	<u>Electric &amp; Acetylene Welding</u>	114
12.31	<u>Use of Pneumatic tools</u>	114-115
12.32	<u>Mouth- to – Mouth (or) Mouth – to – Nose Technique of Artificial Respiration Introduction</u>	115-118
12.33	<u>Annexure-I (Slogans can be displayed)</u>	119-120
12.34	<u>Annexure-II (Extracts from safety posters)</u>	121-122

## Chapter 1

### GENERAL RULES FOR ALL EMPLOYEES

#### **1.1: Safe Working Procedure:**

In order to work safely in electrical system, the following procedures, popularly known as ABCDE of Safe Working shall be followed.

##### **A – Aware**

Before starting any work, the team which is going to carry out the work has to be aware of the following. It is necessary that all the individual irrespective of cadre must be aware of it.

- Where to work.
- What is the nature of work
- Sources of Supply available at the work spot.
- Whether supply is under normal feeding or back feeding.
- Where to isolate
- Whether LC is required.
- Materials required for the work
- Time required for the work
- Brief description on the procedure to carry out the work safely and in an efficient manner.

##### **B – Break:**

We don't have a practice to work on live electrical equipment / circuits that could conveniently be de-energized. Hence breaking the supply to the work spot is an essential step to carryout safe working. Therefore, it is necessary to

- Switch off the correct circuit on which the work has to be executed.
- If AB Switch/Isolator has to be opened to break the supply, then proper gloves have to be worn and also it must be ensured that the Operating rod is earthed properly.
- If the work spot is away from the transformer structure then “Men at Work Do Not Close” board (In English & Telugu) has to be placed at the handle. In addition to that a lock may be provided at the handle to lock it in Open condition.
- If Line Clear (LC) has to be obtained then it must be obtained by Field Engineer after following the standard LC procedure defined in this manual.
- Safe LC has to be taken as per field requirement/ conditions.

##### **C – Confirm:**

Any work has to be carried out only after proper confirmation and on receipt of permission from the concerned authority.

- Ensure that Circuit Breaker is opened before opening Isolator.
- If AB switch/Isolator is opened to break the supply then it must be confirmed that all

the three blades are completely opened and necessary clearance between the blade and contact is available.

- If LC is obtained then before commencing the work it must be ensured in the field that the supply has been interrupted only for their cause and not because of any faulty feeder trip / Load shedding / breakdown of any other equipment.
- Before commencement of work the field condition like proper clearances, any abnormal wire cuts etc., must be observed and then only the work has to be started.

#### **D-Discharge:**

Even though supply to a circuit has been interrupted, there will be stagnation of electric charge which will be sufficient to flash on an individual who comes into contact with it, hence it is necessary that after breaking a supply & isolating line discharging has to be done safely.

- Discharging has to be done by using a standard discharge rod standing at ground level.
- Care must be taken to ensure that the discharge rod wire is at least 0.75 m away from the body.
- The discharge rod shall be brought near to the circuit slowly and if any arcing or flash over is noticed then it shall be withdrawn immediately.
- A report on such arcing / flash over shall be made to the person who issued the LC.
- Each & every one of the conductors shall be discharged as above.
- The leads used for discharging shall be tested for continuity before use and is of stranded flexible conductor instead of solid wire, preferably of copper.

#### **E – Earthing:**

Earthing is a very important step which protects an individual in the event of any accidental charging of the circuit in which a work is carried on. But unfortunately, it is noticed that many workers ignored to do earthing before commencement of work.

It must be clearly kept in mind that any work however small it may be, it has to be carried out only after proper earthing. The standard procedure of earthing is explained in chapter (11) of this manual, and this has to be strictly followed.

- Earthing shall be done on both the sides (incoming & out going) at the place of work.
- Short circuiting shall not be treated as a substitute for earthing and standard Earthing rods shall be used.
- The earthing and discharging shall be done by an authorized person only.
- The earthing kit consists of 3 No wooden rods with clamps on top of each, designed for securing and holding tightly with the line or droppers. From each of the above top clamps' leads are brought down and bunched together. These are connected directly to an earth pipe.
- If there is no earth nearby, a temporary earth shall be provided by driving a metal conducting spike of depth at least 3 feet.
- While removing the earthing, the earth rod shall first be removed from the spot and after all the earth rods are so removed, the connection to the earth pipe shall be removed finally.
- The earths shall be placed in such a manner that they will not be detached in advertently due to movements of men and other causes.

- In the case of lines meeting or crossing at any towers/poles on which work is to be taken up, all the lines crossing or ending at this towers/poles shall be earthed as per field conditions.
- Stay wires shall not to be used for the purpose of earthing.
- All conductors shall be treated as alive until they have been grounded properly.
- Earthing shall never be fixed or removed by bare hands

## **1.2: Supply of Manual**

This code shall be supplied to all the staff of APTransco. In addition, each field Engineer has to maintain a copy of this code of safety rules for the use of other educated/qualified staff. This code shall be placed in APTransco website and shall be circulated in WhatsApp groups periodically.

- (a) Each employee shall carefully study and comply with these rules. Failure to know these rules will not be an acceptable excuse for violation.
- (b) Any violations of rules shall be reported immediately.
- (c) In case of a difference of opinion regarding interpretation of these rules, the matter shall be referred to the competent authority immediately.
- (d) The onsite field engineer will be held responsible for enforcement of these safety rules.
- (e) All employees shall be required to learn all the Artificial respiration methods and shall know the location and use of first aid equipment, fire extinguishers and telephones and the procedures to be followed in case of accident.
- (f) Under no circumstances shall an employee take, or be required to take, unnecessary chances while working under hazardous conditions.
- (g) Employees not on regular duty at stations and sub-stations shall report to the Operator on duty and intimate the purpose of their presence.
- (h) Employees shall not go up and down stairs with hands in pockets. Hand rails shall be used where provided.
- (i) Carbon tetrachloride shall not be used for cleaning purposes except under circumstances where no satisfactory substitute has been found. All such use shall be approved by the competent authority.
- (j) All tools and plant shall be periodically inspected. If tools are found to be defective, they shall be condemned and shall not be used until repaired or replaced and approved as safe for use by the section officer.
- (k) Ropes, Chains, slings, cranes, hoists, and other tackle shall be regularly inspected by the concerned field engineer and checked by the employee before being used. Hooks or blocks that have the broken faces shall be discarded.
- (l) Employees shall stand away from the ropes, cables, chains under tension. In lifting heavy machinery, only standard safe loads for ropes, cables or chains shall be used. Slings shall be of an approved type. Workmen shall not ride on or stand under heavy loads. Loads shall not be lifted over workmen until they have been notified and allowed to stand away from the load.
- (m) All works shall be left in a safe condition as far as possible. Before leaving the work, employees shall correct or arrange to give warning of any condition which might result in injury to a fellow workman unfamiliar with existing conditions.
- (n) Extreme care shall be exercised by both workmen and onsite field engineer when attracting the attention of a person working in a hazardous place.

## **1.3 General Duties of All Employees**

- a. All employees shall exercise intelligence and constant care and shall use the safety appliances provided to protect themselves, their fellow employees and the public from

accident and shall at all times endeavor to further the best interests of APTransco.

They shall do their utmost to:

Carry out their duties with great skill, foresight, regularity, promptness,

- (a) Thoroughness and care in order to eliminate as far as practicable the accidental injury of employees or of the public and to avoid interruptions or impairment of service and damage to apparatus or property.
- (b) Extend their knowledge and prepare themselves for unusual circumstances under which they may be required to assume responsibility beyond the ordinary.
- (c) Guard against theft, depredations and spoilage of all kinds and promptly report to their field engineer any such acts of which they have knowledge.
- (d) Familiarize themselves with the location and operation of the various types of fire-extinguishers and guard against loss of fire by elimination of unnecessary fire hazards.
  1. All employees shall promptly report observed abnormal conditions in apparatus or in any matters of importance relating to operation or maintenance to the man in charge of such equipment or apparatus.
  2. If any employee has reported for duty or is on duty in a condition, which in the opinion of an employee renders him unfit to perform his regular duties safely and efficiently, the condition shall be reported to his field engineer and if he agrees with this opinion the employee shall not be permitted to work.
  3. Employees can submit through proper channels any constructive suggestions or criticisms of the Rules.

#### **1.4 Responsibility of Supervisor and Field Engineers**

##### **1. SUPERVISORS AND FIELD ENGINEERS SHALL;**

- (a) Be responsible for carrying out work in accordance with standard practices and seeing that all safety regulations and precautions are observed.
- (b) Issue Rule Books, booklets and instructions where required and instruct and examine the men in the knowledge of the APTransco Rules. Section Officers shall constantly keep employees aware of the contents of the Rule Book and shall check periodically to see that the information has not been forgotten or disregarded.
- (c) Exercise or provide adequate supervision over their men at all times.
- (d) Enforce all the Rules. They are the authority to take suitable action against an employee who willfully and knowingly disobeys the Rules.
- (e) Guard against the use of defective safety appliances, tools, material etc.
- (f) Study the safest, most effective and efficient methods of doing the work in accordance with the rules before undertaking it and apply it during progress of work.
- (g) See that all safety devices supplied by the APTransco are properly used and maintained.
- (h) See that no person is permitted to do work for which he is not qualified.
- (i) See that First Aid kits for use by workmen are kept in the prescribed condition with contents complete in accordance with the requirements.
- (j) Make certain that all fire extinguishing equipment under their jurisdiction is kept in its proper place properly filled and ready for instant use.
- (k) Assign a sufficient number of qualified men to do each job safely.

### **1.5 Emergency Rules and Modifications:**

1. In any emergency not provided for herein, employees shall act according to their best judgment. Under such circumstances when quick action is necessary in order to safeguard life or property, all employees are authorized to do anything which they thoroughly understand but under no circumstances shall they attempt to do anything concerning which they are in doubt.
2. Any unusual action taken in an emergency shall be promptly followed by a report, stating clearly the action taken and the reasons for it.

### **1.6: Posters, Safety Cards etc.:**

A copy of the rules for first aid, the card showing methods of artificial respiration etc., shall be kept at a conspicuous location, at all sub—stations. Posters inviting attention to safety and also indicating important safety slogans should be displayed. Properly equipped first aid kits should be maintained on all vehicles, and sub - stations.

### **1.7: Personal Conduct.**

1. Drinking intoxicants while on duty is strictly prohibited. No employee shall while on duty, be under the influence of such drink or drugs since it renders him incapable of discharging his duties properly and efficiently.
2. Employees shall be courteous and considerate towards the public and towards each other. They should be disciplined particularly when engaged in work.
3. Employees shall not needlessly enter other departments or places where they have no business unless permission to do so is first obtained.
4. Indulgence in practical jokes, mocking, betting, scuffling, flippant conversation and wrestling while on duty or when off duty on APTransco's properties or in APTransco's vehicles, is forbidden. Avoid unnecessary talk and keep your mind on work.

### **1.8: Physical Condition.**

Employees who are known to be subject to weak spells of any sort shall not, under any circumstances, work on structures, scaffolds, ladders or in any elevated location where the danger of falling exists or in the vicinity of dangerous water or rotating equipment.

### **1.9: General Precautions.**

1. Care shall always be taken while cleaning, dusting etc., not to come in contact with live apparatus nor to disturb sensitive equipment such as relays.
2. Special care shall be taken when it is necessary to use wiping rags close to moving parts of motors, generators, pumps or in any place that a rag might be caught and cause personal injury or damage to the equipment.
3. Unnecessary running up or down stairways, standing or sitting on handrails and the unnecessary climbing of buildings & structures is prohibited.
4. The staff should take care that the conducting material such as ladders, steel tape etc. should not be used in the switchyard, however if it is to be used one should take care that it should not come within the induction zone while movement of such material. Also, staff should avoid use of umbrella in the switchyard.
5. Cellphones shall not be permitted while working on heights.

**1.10: Permission to operate.**

No person shall operate any apparatus, equipment or vehicle without permission or instructions from the competent authority.

**1.11: Lifting Loads.**

Do not attempt to lift loads beyond your capacity. Care should be taken when lifting loads to use the heavy leg and thigh muscles to best advantage keeping the back straight to avoid injuries.

Whenever possible, accessories such as blocks, tackle, jacks, bars, etc., should be used instead of lifting by hand.

**1.12: Fire Prevention**

All materials that easily catch fire like oil soak and paint covered waste, strings and packing rubbish should not be accumulated loose in control rooms, switch yard, switchgears and battery rooms. They should be stored in covered bin and disposed of.

**1.13: Fire extinguishers & equipment.**

All employees should be familiar with and know how to operate various types of firefighting equipment. The fire extinguishers meant for general fires, oil fires and electric fires should be segregated and caution letters as to what type of fire they would handle should be painted on them conspicuously.

**1.14: Safety Meetings.**

The Section Officer shall arrange Safety Meetings and First Aid drills (demonstrations and practice by all authorized persons etc.) at least once in a calendar month. It shall be the duty of all employees engaged in the Constructions, Operation, and Maintenance etc. to attend to these meetings.

**1.15: Check your Tools.**

Check if all the required tools and tackles are in good working condition before taking up the work. Proper tools shall be used for each job. Each tool must be visually inspected before and after use. Defective tools should be rejected.

**1.16: Good Housekeeping.**

1. All APTransco premises shall, in the interest of safety, fire prevention and appearance, be kept clean and orderly at all times.
2. Each workman shall be responsible for leaving his work area clean and orderly. Tool, material, ends of wire, tape, chipped concrete, scrap material, etc., shall not be left lying around.

**1.17: Clothing.**

1. Employees should wear clothing suitable to the job being done.
2. Loose or flowing garments such as unbuttoned sleeves, etc. shall not be worn while working in the vicinity of rotating machinery or live equipment. Pockets shall be kept free of rags and other material having loose ends. Well fastened or tucked dress is therefore essential.
3. Employees shall not wear key chains etc. Serious consideration should be given as to the advisability of wearing rings, bracelets wrist watches etc. since these articles are a definite hazard under certain circumstances.

**1.18: Smoking**

Avoid smoking while on work as it causes a fire somewhere without your knowledge.

**1.19: Special Jobs Need Experience**

Experienced employees only shall be permitted to go behind guard rails or to clean around energized or moving equipment.

**1.20: Avoid Haste**

Haste is not speed. Do not be in a hurry and do not take chances when working on lines or equipment.

**1.21: Exhaustion is no Time to Work**

Do not attempt to perform hazardous work when extremely tired or exhausted.

**1.22: Visitors**

Visitors to sub-station, Power Houses etc. may be admitted only with the proper authorization of the competent authority.

When visitors are admitted, the following will apply:

- a) All visitor deputed by the APTransco shall be treated with courtesy and politeness.
- b) The operator on duty shall ensure that visitors and unqualified persons are not allowed into the control room or near any equipment that is being opened out for inspection and maintenance and should not allow them to interfere with operating plant and gear.
- c) It is the duty of the operator in charge of the shift to see that visitors are not allowed in the control room during trouble or times of stress.  
He shall also see that they are escorted safely through the station and not permitted to enter any danger area.
- d) Visitors, including APTransco Employees not on duty, shall be required to sign the station register which shall be conveniently located at the entrance at every fully attended station.

**1.23 List of authorized persons to work on lines**

A list of persons under every Section Officer should be maintained and exhibited in Section office with details of name, designation and the extent to which he is authorized to work on lines and the reference to Authority given.

**1.24 Identity Cards to staff**

Every staff member working in all wings of APTransco should be issued an identity card giving the particulars of the holder and also the extent of authorizations with regard to work duly signed by Assistant Executive Engineer.

**1.25 Safety meetings at Camps**

Safety meetings should be arranged by Assistant Executive Engineer and Executive Engineers at their camps.

**1.26 Demarcation of Working and Testing Areas**

- 1) Demarcate the work area with caution tape & display red flags to warn the outsiders. No person should be allowed to stand/station directly under place of work at height.
- 2) Where necessary, physical protection must be provided to prevent Danger to persons in a demarcated area from adjacent system hazards.

## **Chapter 2**

### **GENERAL SAFETY RULES**

#### **2.1: Live Equipment**

All apparatus shall be treated as live unless it has been covered for work and safe working clearance and the apparatus is removed from live apparatus with no ready means of connection.

#### **2.2: Permission to start work**

No work on any equipment in the substation or line shall be commenced unless permission from the authority in charge of the equipment or line, is obtained. Proper line/equipment clearance shall be taken from the authority in charge by the concerned field engineers as per the protocols mentioned vide Lr.No.CE/Trans/ SE/Trans/ O&M/EME3/ D.No.220/11, Dt. 10.06.2011. (enclosed annexure at the end of the chapter)

The authority in charge of the equipment or line shall

- 1) Ensure the line/equipment on which line clear is being issued. A proper message may be obtained from the requisitioning officer and maintained in the register.
- 2) Issue the clearance to the competent authority duly obtaining NBFLC from the other end.
- 3) Ensure proper earthing of the equipment/line before issuing LC duly following safety protocols.

The requisitioning officer shall

- a) Ensure whether the LC is issued on the requested line/equipment or not. A message may be obtained from the issuing authority and may be recorded.
- b) Ensure the line/equipment is in de-energized condition and earthed properly with a HV voltage detector etc.

#### **2.3: Planning the Work**

Many an accident had occurred in the department due to the fact that the work had been taken up without any proper program. The Officer in charge of the works shall be responsible for proper planning. Even while attending to emergencies like breakdowns/equipment failure etc. the Officer in – charge shall arrange the plan of action and direct his workmen with clear instructions as to what they should do.

All the workmen & manning contract supervisor should be told about the work to be done at least a day in advance wherever possible so that the speed generally accompanying shut down works does not result in accidents.

#### **2.4: Prearranged Shutdowns**

The Officer in charge shall ensure in advance that necessary approval is obtained from the competent authorities for any prearranged shutdowns required. He/She must make out a list of items of work to be attended as per the department manuals/Equipment manuals and assess the scope and extent of each with reference to the number of men required, time etc. He/She must list out the tools/spares required for the works and examine them as to the soundness of their condition before the commencement of the work. He/She must also ensure that the workmen to be entrusted with the work are authorized to do the same work. They should know thoroughly how the work is to be done. Enlisting the cooperation of outsiders for want of adequate men on the spur of the moment has been a cause of more than one accident, involving non-departmental people also.

## **2.5: Safe Distance for Work near Live Electrical Apparatus**

### **(i) Personnel, Small Tools and Material.**

A safe distance from live electrical apparatus must be maintained by all persons; this safe distance must also apply for any conducting material or tool handled by workman.

Particular care must be exercised in watching body and tool or material movements when working near live apparatus to avoid accidentally coming into the danger zone. As a guide to the distance which should be maintained, the following table shall apply for qualified individuals.

<b>Highest System Voltage (kV)</b>	<b>Safety Working Clearance (Metres)</b>
12	2.6
36	2.8
72.5	3.1
145	3.7
245	4.3
420	6.4
800	10.3

Under some circumstances, work can be safely performed within closer distances. But only qualified workman will be allowed to perform such work and then only under the direction and responsibility of the Officer in charge. Under no circumstances shall unqualified individuals and temporary employees be allowed to work closer to live electrical apparatus than the distances outlined in the above table. It must be realized that there will be some instances where it will be quite unsafe to allow unqualified individuals to work even this close to live electrical apparatus.

Where applicable, approved protective devices such as rubber gloves, hose, hoods may be used to provide protection for approaching live apparatus closer than the distances outlined in the above table.

### **ii) Use of Cranes**

A minimum distance of 10ft. for lines up to 132 K.V. and 15 ft. up to 220 K.V. shall be maintained during the use of cranes.

## **2.6: Handling Material and Equipment near Live Apparatus, Switchboards, or Panels**

1. Care shall be taken at all times to observe and note clearances from live parts before starting to move any material or equipment.
2. When handling materials such as long pieces of metal pipe or bars etc., in the vicinity of switchboards or panels or near any live apparatus, at least two men shall be employed, one at each end, so as to eliminate the chance of accidental contact with live equipment.
3. Using mobile phones is strictly prohibited while handling the material.

## **2.7: Work on Multiple Circuits**

In particular, if any work is taken up on support carrying more than one circuit, of which one may be live, it must be ensured that it is adequately supervised and all the safety rules implemented and workmen made aware of the availability of supply from the other source at the location. Special precautions have to be taken as detailed in Chapter-V on SS and Lines.

The onsite supervisor shall give proper instructions to the manning staff about the availability of supply from the other source at the location and ensure/monitor the work is being carried out safely duly guiding them from time to time.

### **2.8: Protection for Work**

No work shall be done on any electrical apparatus unless protection is provided by one or a combination of the following: -

- a) Approved live line equipment and procedure,
- b) The apparatus is isolated and de-energized and covered by a line clear permit.
- c) The apparatus is obviously isolated; physically removed from the immediate vicinity of any live electrical apparatus, and having no ready means of connection to live apparatus.

### **2.9: Last-Minute Decisions**

Last-minute decisions to take up maintenance work should be discouraged as they are more than responsible for misunderstanding, confusion, etc. resulting in an accident.

### **2.10: Limitation of work by Unqualified Men**

Work near live electrical or mechanical equipment requires special caution which in many instances is only acquired through job training. Workmen inexperienced in working near live apparatus must be carefully supervised when live apparatus is involved. Unqualified men shall not be permitted to work in close proximity to live parts at any time. There is even a remote chance of them coming in contact with live apparatus.

Restrict unauthorized entry into the switch yard by providing appropriate means including warning signs and no entry signs.

### **2.11: Operating Instructions**

Even while attending breakdowns the relevant operating instructions are to be recalled before starting and it should be seen that they are implemented.

Standard operating procedures/Instructions for substation/line equipment are to be provided at the substations.

### **2.12: Rectification without line Clear**

The tendency to rectify a visible fault on the lines without obtaining a line clear is too dangerous and should never be done as such.

### **2.13: Advance Planning of Works**

Every work shall be planned in advance and shall be carried out as per the program. It shall be ensured that the workman entrusted with the work is competent to discharge the same and also specifically authorized to carry out the work. The workman should have full knowledge of the work which is entrusted to him.

### **2.14: Safety and Protection**

All workmen shall work in such a manner as to provide

- a) Safety for themselves.
- b) Safety for the fellow workmen
- c) Protection for the public and
- d) Protection of the APTRANSCO's property.

**2.15: Safety Sergeant**

For every work there must be a safety sergeant. He shall continuously watch all the persons and ensure their safety by giving suitable warnings.

**2.16: Caution Boards**

The beginning and end of safety zones shall be demarcated by caution boards. Caution tape may be used for the above.

**2.17: Safety Appliances**

The standard safety appliances like gloves, gauntlets, Electrical Safety shoes, helmets, etc., shall be utilized invariably for operating A.B. Switches, earthing rods, fuses, etc. Each piece of protective equipment must be visually examined before use.

All the safety equipment shall be made available at the substation. The safety/ protective equipment shall be as per IS/IEC only.

**2.18: Line Clear**

No person shall get up a tower/structures or work on any apparatus which has been in service or even if it is energized at least once unless the man in direct and immediate charge of the work has the necessary permit for the work. This is called the “line-clear” and it must be in the form given in the chapter on line clear.

**2.19: Procedure for Line Clears**

Line clear must be taken only by authorized persons and must be issued only by authorized persons. (A Chart is appended in the Chapter on line clears indicating the Officers competent to issue or receive line clear, as per their rank and the voltage of equipment concerned. The procedure for issue and receipt of line clear is elaborated in that Chapter).

**2.20: Protection Tags**

“Self- protection tags such as “Danger”, “Men on line” etc., must be attached by a competent person on any electrical apparatus or mechanical equipment. Such apparatus shall not be handled or interfered with while it is under the tag. Such tags shall not be removed by anybody other than the person who attached it or without his specific permission. Danger Tags must be affixed on all isolation points.

**2.21: Discharging and Earthing**

After due receipt of the line clear, the line or substation equipment must be discharged and earthed effectively on either side of the work spot. The earthing on either side should remain till the work is complete. The discharging rod and leads must be carefully inspected before use and continuity shall be ensured. All safety equipment like safety helmets, Gloves, safety shoes, etc., must wear by workmen before the commencement of work and also during the progress of work. The discharge wires should be kept at least two feet away from the workman. Earth rods of sufficient length (9 feet) with the proper thickness of copper strip to be provided at both ends of the work zone (i.e. at both ends of equipment) to provide a safe discharge of induction voltage. Voltage detectors are to be used by all CBD Gangs to prevent accidents.

**2.22: Work on Heights**

Commencement of work on towers/during breakdowns/substation equipment or Structures should not be taken up without safety belts and ropes. When working on heights, safety belts or safety ropes must be mandatorily used. Immediately upon reaching the working position,

the workman shall secure himself to the structure with a safety belt or a safety rope.

**2.23: Electrical Layouts and Diagrams**

Electrical layouts and diagrams showing the arrangement and location of the electrical equipment and lines shall be kept in the control room or on the table of the operator. The same is to be updated. A copy shall be available with the workman and concerned staff.

**2.24: Provision of Lighting**

All stairs, passages and dark spots shall be illuminated continuously day and night. Proper illumination has to be provided in the switchyard area for safe access to EHT equipment in the switchyard during night times/emergencies. Lighting shall be arranged while executing work on the line during night emergencies. In addition, battery-operated focus lights shall also be used as necessary.

**2.25: Inspection Lamps and Extension Lights**

Tough Rubber sheathed/ PVC cable leads shall be provided for all inspection lamps. All extension lighting shall be of standard type.

**2.26: Test Lamps**

Proper test lamps duly following safety measures, shall be used.

**2.27: Testing Supports**

Poles, structures, scaffolds, ladders, trees etc. shall be tested for strength before these are utilized as supports for works. All weak supports shall be reinforced. Metallic supports may be avoided. Instead of metallic supports, insulating supports (FRP material, etc.) shall be used.

**2.28: Work on Roads and Streets**

Whenever work on roads and streets is involved, barrier guards shall be erected before commencing the work. Also, danger signs, red lamps or red flags shall be instilled at the ends of the work spot. Whenever necessary, men shall be stationed to caution the public and also to divert the traffic suitably. The danger sign boards shall be placed right from 100 meters from either side of work spot.

**2.29: Work on Lightning Arrestors**

The ground wires of Lightning Arrestors are liable to develop dangerous induced voltages under fault conditions. Hence all precautions shall be taken during work on such equipment. Working on Lightning Arrestors should not be taken up unless they are in de-energized condition i.e., disconnected from all live parts and all parts need to be discharged to the ground effectively.

**2.30: Identification of Circuits**

Whenever work on multiple circuits is involved, each circuit shall be marked, tagged, lettered or painted individually so that mistakes will not occur at the time of work. Bay identification boards (or) Glow sign board stickering are to be provided for all equipment of feeders/power transformer bays. Bay identification boards are to be painted with Yellow back ground paint with Black letters for easy identification. Updated Electrical single Diagrams are to be provided at each substation to avoid accidental operation of the Switchgear equipment.

**2.31: Precautions to be taken before issuing Line clear**

Whenever work on lines or equipment is decided to be taken up, the concerned Circuit

breaker shall be tripped and subsequently the related A.B. Switches, links isolators shall also be opened out. The lines or equipment shall then be earthed as per the standard practice. All these precautions shall be observed before issuing Line Clear. Rule 52 should be taken into consideration.

### **2.32: Permanent Grounds on Equipment**

Note: In accordance with specifications all substation equipment/structures such as circuit breaker tank, air break switch handles, lightning arrestor handles, etc., should be permanently grounded.

1. Before touching any electrical apparatus, employees shall make sure that it is adequately grounded. When such apparatus is not adequately grounded it shall be treated as live.
2. Employees shall be careful at all times not to open permanent grounding connections except when required to do so in the course of their duties. Should they at any time find a ground disconnected or inadvertently cause one to be disconnected, it shall be reported to the proper authority without delay.
3. Equipment which is required by engineering specifications to be permanently grounded before energizing.

**Note:** All the groundings shall be done as per Indian Electricity Rules and IS 732/ IEEE 80. It shall also be ensured that all the groundings are periodically tested and found effective and the results recorded.

### **2.33: Handling Cartridge Type Fuses**

1. Approved fuse pullers shall always be used to place or remove cartridge-type fuses.
2. When a fuse must be replaced, the circuit shall first be opened at a switch if possible.
3. The switch should be left open until after the fuse is replaced.
4. All Cartridge type fuses shall be replaced with MCCBs.

### **2.34: Potential Test Indicators**

1. Only approved potential test indicators shall be used when testing fuses and circuits.
2. Potential test indicators and other testers shall not be used beyond the voltage limits for which they are designed.

### **2.35: Lightning in the Vicinity of Work**

- 1 When operators have Knowledge of lightning passing over or nearby a line on which work is in progress, it shall be their duty to notify the batch or batches concerned, when communication is available.
- 2 Live line work shall be suspended and the workmen warned to stay clear off the circuit whenever the staff is informed or otherwise made aware that an electrical lightning is in the vicinity of the line.
- 3 Work covered by a Line Clear shall be suspended and the workmen shall be warned to stay clear off the apparatus covered.

### **2.36: Artificial Respiration**

- 1 Artificial respiration shall be practiced at least once in 3 months by all members of the staff.
- 2 Artificial Respiration practices shall be recorded in a Register. Each employee shall personally sign in this register after taking part in the practice.

**2.37: Vibration near switchboards, Relay Panels or Gas Relays**

Excessive vibration when chipping, drilling or handling tools and material on or near switchboards, relay panels, or gas relays shall be avoided. Permission must first be obtained from the operator in charge before starting such work.

**2.38: Storage Batteries**

1. Smoking in battery room is strictly prohibited.
2. No employee shall use an open flame in a battery room.
3. Care shall be taken not to cause a spark or flash while cleaning batteries or working on battery equipment.
4. When servicing batteries, all equipment used such as the tools, containers, etc., shall be of approved insulated design.
5. Workmen should use goggles, side shields, acid-resistant gloves, protective aprons, and electrical safety shoes while handling the batteries.
6. Portable or stationary water facilities to be made available for rinsing eyes and skin in case of contact with acid electrolyte.
7. Class-C fire extinguishers must be made available near to battery room.
8. In case of any acid spillage, bicarbonate soda is to be used to neutralize.
9. Ensure that the exit of the battery room is unobstructed and the entry area is properly illuminated.

**2.39: Do not test live condition of equipment by touch Method**

Bare fingers and hands shall not be used to determine live condition of circuit or equipment.

**2.40: Wide Publicity by Tom -Tom before Energizing New Lines**

Before energizing new lines, wide publicity shall be given by Tom -Tom in all villages within 5 miles distance from the line. The publicity shall also be given through print media/ electronic media etc.

**2.41: Danger Boards**

On all towers/structures erected near villages, townships, road/highway/railway crossing, water ponds etc., Danger Boards shall be provided with the word “DANGER” both in English, Telugu, and Hindi and with some pictorial representation like skull and bones etc.

**2.42: Rectification of defective supply**

After rectifying a defective circuit, it shall be ensured that the fault has been detected correctly and attended to rectification work properly. Also precautions and adequate steps shall be taken to avoid recurrence of such faults in future.

**2.43: Insulation of Wires**

1. The insulation on conductors and cables operating at a voltage above 300 Volts, phase to phase, shall not be depended upon for protection unless enclosed in a grounded material sheath or in and approved insulating sheath.
2. All other conductors, including those with weather – proof cover, shall be treated as bare conductors.
3. If a conductor of a power line is found broken, the conductor shall be treated alive and shall not be touched until protection is arranged. Its location shall be reported at once to the most convenient Operating Authority.

## 2.44: Reference letter on Line Clear on Lines/Equipment

### TRANSMISSION CORPORATION OF ANDHRA PRADESH LIMITED

Vidyut Soudha: : Hyderabad

From  
Chief Engineer/Transmission  
Vidyut Soudha,  
Hyderabad-82

To  
The Chief Engineer/Warangal/Zone  
Chief Engineer/Metro Zone/Hyderabad  
Chief Engineer/Rural Zone/ Hyderabad  
Chief Engineer/Zone/Vijayawada  
Chief Engineer/Zone/Kadapa  
Chief Engineer/Zone/Visakhapatnam

**Lr.No. / CE/Tr / SE/Tr.(O&M)/ EME-3 /D.No. 220 /11.dt. 10.06.2011**

Sir,

Sub: Protocols for taking LCs on lines/Equipments in substations to the communicated a fresh to field –Reg.

Ref: Note No. CMD/APTRANSCO/124/2011, Dt.12.5.2011.

\*\*\*

During the Quality Assurance review held on 5.5.2011, CMD has instructed to communicate afresh the protocols for taking LCs on EHT Lines/Equipment in substations in view of accidents reported in the recent past.

The procedure for issue of line clear and the authority competent to issue LC at various voltage levels and the responsibilities of the receiver of LC and rules to be followed when returning of LC along with precautions to be taken before cancellation of LC up on completion of works is enclosed.

All zones Chief Engineers are requested to cause suitable instructions to the concerned field officers to strictly follow the procedure while taking LC on EHT line/equipment in SS with immediate effect. Further, it is requested to arrange to keep a copy of LC procedure on shift table of control room of each EHT substation and obtain confirmation from the concerned for apprising to higher authorities.

Sd/-

**Chief Engineer/Transmission**

Copy to.

DE(T) to director (Transmission)/APTRANSCO/V.S./Hyderabad- for information.

Divisional Engineer/Quality Assurance/Vidyut Soudha/Hyderabad.

## LINE CLEAR ON LINES/EQUIPMENT

A line Clear is a permit to work on any electrical equipment or line it will be issued by an authorized person to another authorized person. If there are more than one gang working under the same supervisor, each gang should take sub-line clears from the supervisor who has taken the line clear. In case, if the line clear has to be issued for himself, he shall take self-line clear, all the precautions that are to be followed in issue and return of line clear shall be followed

Line clear books are very important records. Pages in these books should be serially numbered, no paper from this book should be used for any other purpose. If any other purpose, if any, page is to be destroyed, the custodian should specifically mention the reasons for doing so. It should be attested by his dated signature. The line clear books shall be reviewed periodically by the followed Executive Engineer.

Line clears can be issued/received over telephone. It is desirable that the issuer/receiver recognize each other's voice. The requisition for line clear and the line clear issue message shall be repeated by both the parties to ensure that line clears are issued/received on the equipment in which it is intended. A secret code number shall be followed in such cases.

### **Procedure before issue of Line Clear:**

1. Approval of the competent authority for shut-down of line/equipment should be verified.
2. Line/equipment shall be switched off.
3. No back-feed certificates wherever necessary shall be obtained.
4. The issuer should personally see and ensure that all the blades of the AB Switch are physically in open condition and locked and also particular circuit breaker in open condition.
5. The line/equipment shall be earthed by discharge rods.
6. A 'Danger Do not operate board shall be exhibited on the concerned control panel a 'Men on line' board shall be exhibited on the outdoor AB/Switch/Equipment.
7. All operations for issue of line clear shall be done personally by the issuer or it shall be done under his personal supervision.
8. After following all the precautions, the Line clear book shall be filled up carefully without leaving any column left unfilled. It shall be signed with date and time by the issuer and issued to the receiver. Signature with date and time of the receiver shall be obtained on the duplicate and this shall be kept in safe custody.

Assistant Engineer/Assistant Executive Engineer authority for Line Clears for up to 132k Voltage level and Dy.Exe.Engineer for line clear for equipments/lines for 220kV and above voltages.

### **Responsibilities of the receiver**

1. The receiver should very clearly indicate the specific equipment/line which he wants to work when requisitioning for L.C.
2. If the receiver is at the same place as that of the issuer he shall follow all the operations being conducted so as to ensure that line clears are being issued on the correct line/equipment.
3. At the work spot, after receiving line clear, he shall earth the line/equipment on either side of the work spot.

4. In case if any other power lines are crossing near to work & spot the line on which LC is received, he shall also obtain LCs on all such lines to avoid induction.
5. He shall write down on the duplicate form the number of persons engaged on the work.

**Rules to be followed when returning of L.C:**

1. The person who has received the LC only should return it.
2. He shall personally ensure that there are no men, material or earth on the line
3. He shall inform all the workmen that it is no longer safer to work on the line as the line clear is being returned.
4. The Line/equipment shall not be charged until the LC is cancelled.

**Before cancellation of LC the following precautions shall be taken:**

- a) The returned LC shall be carefully examined, it shall be ensured that all the certificates required are furnished.
- b) 'Men on Line' 'Danger do not operate' boards shall be removed.
- c) It shall be ensured that no other LC is pending. All men maternal are removed. Earthing is removed.
- d) All no back-feed certificate, shall be returned.
- e) After charging the line/equipment check should be made for unusual sound/noise.
- f) All the workmen/supervisor shall be permitted to leave the work spot only after the normalcy is restored.

It shall be ensured that LC books are arranged at all substations. All the concerned shall be instructed to invariably fill up all the columns in the LC form before issue of Line Clears (Permit to work). Instructions for issue of LCs and safety tips may be arranged to be printed on the back side of LC forms for ready reference.

## Chapter - 3

### SAFETY DEVICES AND TOOLS

#### **3.1: Use Safety Devices which are in safe working condition and of approved type**

Adequate protective equipment and devices necessary to protect workmen during their assigned work shall be provided and their proper use by the workmen shall be insisted upon in order to prevent the accidents occurring due to non-utilization of the safety devices and tools. It will be the duty of the technical training centers and inspecting officers to see that the staff is familiar with the use of safety equipment. Each workman shall satisfy himself that all the protective appliances used by him are in safe working condition and of approved type.

#### **3.2: General use and Care of rubber protective equipment**

Rubber goods shall not be used as protection on circuits having voltages in excess of 3000 volts to ground or 5000 volts phase to phase.

All rubber protective equipment shall be inspected before being used. Any equipment found defective shall not be used.

All rubber protective equipment shall be thoroughly dried before being stored.

They shall be protected from oil, paint, creosote, gasoline, kerosene or acids.

They shall be stored in closed boxes where it will not be exposed to direct sun rays, light or excessive heat and covered with French chalk.

They shall not be stored in a sharply bent position. Rubber gloves shall be worn while the men are on the electric work only.

#### **3.3: Rubber Gloves and Gauntlets**

- 1) Rubber Gloves and gauntlets shall be used when.
  - a) working on or near J lines with voltages not exceeding 5000 V phase to phase or 3000 volts to ground,
  - b) Using operating rods under damp or adverse weather conditions.
  - c) Cutting primary and common neutral ground wires to install grounding connecting plate.
  - d) Attaching or detaching leads when using a telephone set and.
  - e) The Supervisor or workman considers it necessary.
2. Rubber gloves shall be used preferably with leather covers. The covers shall be used only with the rubber gloves and never as work gloves.
3. The right-hand gauntlet wears out more quickly than the left hand one. In such a case both the gauntlets forming a pair should be condemned. Under no circumstances should a left-hand gauntlet be allowed to be used on the right hand. If allowed it is cumbersome and the workman is likely to discard it and meet with accidents.
4. Gloves should be kept away from tools or line materials while transporting these in Lorries or while carrying them in pockets.
5. Rubber gloves should not be used as carry bags to carry small tools in them.
6. Don't cover isolator handles with rubber gloves instead wear the gloves to hands.
7. Rubber gloves shall be stored in a dry place in a flat position sprinkled with chalk powder.

8. Where gloves have become soiled with insulating compound, tar, paint and the like, which require some solvents like spirit, kerosene, tetrachloride etc., for their removal, great care should be taken in using the solvents which greatly weaken the mechanical strength of rubber. Kerosene penetrates as rapidly as other solvents, but it is the slowest to evaporate and its use should be avoided. Only very small quantity of solvent should be used and the solvent should be washed off immediately with water. Water at a temperature above 150° F should not be used for this purpose.

#### **3.4: Inspection and testing of gloves and gauntlets.**

1. Rubber equipment shall be examined for scratches, cuts, abrasions and holes before and after use.
2. Any gloves found defective should not be used. They should be returned to the section officer for safe custody and survey report.
3. All rubber glove shall be tested as per IS 4770 with Latest amendments.

#### **3.5: Ladders.**

- (a) No employee or any material or equipment shall be supported or permitted to be supported on any portion of a tree, pole, structure, scaffold, ladder or any other elevated structure unless the support is adequately strong and properly secured in place.
  - (b) All supports shall have adequate factor of safety.
  - (c) Every ladder should be of good construction, sound material and of adequate strength for the purpose for which it is used.
  - (d) Ladders should be equipped with safety hooks or shoes.
  - (e) No ladders with any defective or missing rung or with, any rung which depends for its supports on nails, spikes or other similar fittings shall be used.
  - (f) Ladders should neither be left leaning against a tree when not in use nor should it be placed upon a box, barrel or other movable insecure object.
  - (g) Ladders should be in a safe position before they are climbed. The best angle for a ladder is 75° with the horizontal i.e. the distance of the base of the ladder from the wall, pole structure etc., as the case may be, should, be 1/4 its length.
  - (h) Ladders shall not be placed in front of doors or windows opening towards the ladder, unless the doors or windows are locked.
  - (i) While going up or down a ladder, always face the ladder and use both the hands.
  - (j) Wooden ladders for outdoor use shall be given a suitable coating of clear varnish or linseed oil.
  - (k) Two ladders must not be tied together as far as possible, where it is inevitable they should be tied together properly to ensure rigidity. Extra parallel members at the point of jointing may be added to each of the main members of the ladder.
  - (l) Ladders should be stored upon brackets and in sheltered locations. They should be hung vertically for storage. Where this is not possible and if they are to be stored in horizontal position, they should be properly supported at intervals to prevent sagging.
  - (m) Ladders shall not be painted. They shall be kept free from dirt and paint which may conceal patch work, defects etc. in the material.
- Borrowing a ladder should be avoided if possible. Where it is necessary to borrow a

ladder, it shall not be used until it has been thoroughly inspected and found to be in good condition.

### **3.6: Safety Belts.**

- (i) Employees working on poles or structures over eight feet from ground, except when working on suitably fenced platforms, shall use lineman's belts. The belts may be equipped with leather straps or pockets for carrying tools. Chains and wire hooks shall not be used for this purpose.
- (ii) Belts must be fastened around the waist so that the person wearing is secure in his belt.
- (iii) Safety belts should be inspected carefully periodically for condition of leather near holes, rivets, stitches, buckles, rings, straps etc.
- (iv) Safety belts made of leather must be kept pliable by treating them occasionally with suitable penetrating oil like castor oil.
- (v) Safety belts shall be so stored that these do not come in contact with hard ware or sharp objects.
- (vi) Defective belt or belts which are accidentally cut should be discarded immediately.
- (vii) **Care of Safety belts:**
  - (a) No changes and alterations (including punching of extra holes) shall be done to belts or straps without authorization.
  - (b) Belts and straps shall not be dropped or thrown from an elevation.
  - (c) Belts and straps shall be given a treatment of marse oil or any other oil suitable for the purpose periodically.
  - (d) Belts and straps shall be wiped with clean cloth after work in rain and allowed to dry in ambient temperature.

### **3.7: Fiber Ropes.**

- (i) Fiber ropes are made principally of manila fiber, sisal fiber 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 fibers may indicate that the rope is little worn.
- (ii) Pure manila rope is the strongest and most reliable of fiber ropes. It is of a yellowish colour with a silvery or pearlish luster and has a silky feel when drawn through the hand. Rope with brown or black fibers is of inferior grade. Sisal rope has about 67% of the strength of manila rope. It is yellowish white, sometimes with greenish tinge. The fibers 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.
- (iii) When safety slings or life lines are used, every rope must be thoroughly inspected before each use. Discard the usage of questionable rope.
- (iv) Kinking is one of the main causes of injury to rope and should be avoided especially when the rope is wet.
- (v) A rope should not be 'burned' by allowing it to run through a pulley too rapidly. Care should be used to avoid dropping cigarettes on a rope.
- (vi) Rope which has become wet should be dried thoroughly before being stored.
- (vii) Rope should be kept coiled when not in use. It should never be stored or transported

where sharp tools cut it. It should never be stored in the same room as acids or caustics, as rope is easily damaged by them.

- (viii) Rope should never be dragged over rough surfaces. Avoid sharp bends over unyielding objects. When sharp bends cannot be avoided, soft padding by gunny bags wrapped round the edge may be provided and the rope taken over the same.
- (ix) Only the best quality Manila rope shall be used.
- (x) Care shall be exercised never to overload manila rope.
- (xi) All rope shall be carefully inspected before using each day for defects such as cuts or broken strands, wear, abrasions discoloration or rotting.
- (xii) All practical precautions shall be taken to keep the rope clean and dry.
- (xiii) Care shall be exercised to choose sheaves of sufficient diameter and groove size for the diameter of the rope being used to avoid excessive bending.
- (xiv) Every precaution must be taken to stand at a safe distance while manila rope is under load.

### **3.8: Wire/Steel Ropes.**

1. Care shall be exercised to avoid overloading wire rope.
2. Care shall be exercised in unreeling or uncoiling wire rope to avoid kinks.
3. Care shall be exercised when spooling wire rope to see that advantage is taken of the rope lay, particularly on winch drums.
4. Care shall be exercised when coiling wire rope to coil in the direction that will avoid taking the twist out of the rope.
5. Wire rope shall be cleaned and lubricated at regular intervals, depending upon the usage, to avoid excessive wear from abrasion and to avoid corrosion from rusting.
6. Care shall be exercised to avoid short bends around loads and small hooks. The rope shall be padded at points of contact with sharp edges.
7. Care shall be exercised to use sheaves of sufficient diameter and groove size for any particular wire rope to avoid excessive wear and fatigue.
8. Defective wire rope shall not be used. Defects such as corrosion or pitted surface of wire, excessive wear, kinks, fatigue indicated by broken wires, or mechanical abuse such as pinched or partially cut strands shall be considered sufficient reason for removing wire rope from service and disposing of it.
9. Care shall be exercised to avoid exposing wire rope to corrosive fumes or liquids.
10. Workmen shall maintain a safe distance from winches and winch cables when they are in use. Gloves shall be worn at all times when handling the winch or cable.

### **3.9: Hand Lines and Tools.**

- a) All tools, protective equipment and light material shall be raised or lowered by means of hand lines or canvas buckets. No tools shall be tossed up or down.
- b) Hand lines shall be at least inch medium or hard twist manila and equipped with 4 inch single-sheave blocks.
- c) Hand line strings should be of the adjustable type and must not be of less diameter than rope in hand line.
- d) A hand line should be attached to the pole or to some attachment on the pole as soon as the lineman has reached his working position and belted himself to the pole.
- e) A hand line should not be hung on a conductor.

- f) There shall be at least one hand line on each pole on which linemen are working.

### **3.10: Eye protection.**

1. Suitable eye protection, approved for the purpose shall be used, when:
  - a) Using a grinding wheel.
  - b) Using a pneumatic drill.
  - c) Holding drills while hand-drilling rocks.
  - d) Chipping concrete, masonry, paint, cast iron and other metals or drilling concrete and masonry.
  - e) Sand and corn blasting, welding or spray painting.
  - f) Blowing out machines or equipment with compressed air, blowing out soot from boilers and handling ashes in steam power plants.
  - g) Using wood chippers and power saws.
  - h) Handling or using acid, strong alkalis, arsenic trioxide and refrigerant gas.
  - i) Working under trucks or other mobile equipment in garage work.
  - j) Operating cut-outs.
  - k) Replacing potential transformer high voltage fuses.

### **3.11: Personal Tools.**

- i) All employees shall use the right tool for each job. Tools which developed defects while in use shall not be used until the defects have been rectified. They shall therefore be subjected to frequent inspection.
- ii) All tools shall be maintained in good working condition. Tools with sharp edges should be kept in sheath, tool chests or other containers when not in actual use to protect the tool, the worker and other persons.
- iii) Portable electric tools shall be equipped with 3 wire cord having the ground wire permanently connected to the tool frame with means for grounding the other ends.
- iv) Pliers, wrenches etc., whether insulated or not shall not be used without rubber gloves while working near live part. Pliers should not be used in place of wrench or hammer.
- (v) Metal measuring tapes and rules should not be used in the vicinity of live apparatus.
- (vi) Impact tools such as chisels, drills, hammers and wedges with mushroom heads shall not be used until they have been reconditioned.

### **3.12: Electrical Hand Tools and Portable Electrical Equipment.**

The frames and other non-current carrying parts of electrically driven hand tools and portable electrical equipment shall be grounded.

### **3.13: Taped Handles.**

Handles of pliers and other tools taped or otherwise covered must not be depended upon as electrical insulation.

### **3.14: Jacks.**

1. Only jacks which are in good working condition shall be used.
2. The rated capacity of the jack shall not be exceeded.

### **3.15: Chains.**

1. Chains must not be overloaded.

2. Chains which are used for hauling poles and material shall not be used as lifting tackles. Chains used for lifting or for binding poles shall be reserved for these purposes and so identified.
3. Knots and kinks shall be removed before loading.
4. Sudden or abrupt application of loads to chains should be avoided.
5. Chains shall not be thrown to the ground from poles or structures.
6. Chains shall not be repaired by splicing the ends together with a bolt or be shortened by passing one link through end ring link and inserting a bolt to hold it. Only approved repair links shall be used.
7. Chains shall be inspected regularly before using, for battered or bent links, stretch, wear, open welds, hammered or polished surfaces etc. which indicate hardening of the metal.
8. Repaired chains shall not be used for hoisting or heavy hauling. Chains that have been stressed excessively or otherwise damaged so as to make them unsafe shall be scrapped.
9. Extreme care shall be exercised in the use of grab hooks.
10. Chains shall be cleaned regularly to avoid excessive wear at the interlink points. Before storing for long periods, chains shall be thoroughly cleaned and lubricated.
11. Every precaution must be taken to stand away from the load while chains are under load.
12. Care shall be exercised to avoid sharp bends around loads.
13. Chains with bent hooks, or deformed rings and end links shall not be used until the defective attachments have been replaced and the chain carefully examined.

### **3.16: Slings.**

1. All slings shall be carefully inspected before using each day. Defective slings shall not be used.
2. Guy wire must not be used for slings.
3. All employees who are required to use tackle shall familiarize themselves with the use of slings with respect to size and safe loads for various loading angles.
4. Slings shall never be used at an angle less than 30 degrees to the horizontal.
5. Load must be evenly distributed when multiple slings are used and care shall be exercised never to overload slings.
6. Kinks shall be removed from slings before placing them under load.
7. Slings shall not be placed around sharp edges of loads unless adequate padding is placed to avoid damaging the sling.

### **3.17: Canvas Tool Bags.**

An approved tool bag secured to a hand line shall be used for raising tools, Insulators etc. to workmen on poles, trees or structures. These articles shall not be thrown to the workman and shall not be thrown or dropped to the ground. The bag shall not be suspended from the lineman's belt.

### **3.18: Fire Extinguishers.**

Fires are broadly classified in the following categories based on the kind of combustible material involved.

- a) CLASS 'A': - Ordinary material e. g. wood, paper, textile and rubbish.
- b) CLASS 'B': - Fires of inflammable liquids e. g. oils and greases, paints and allied products.
- c) CLASS 'C': - Fires of live electrical equipment where the extinguishing agent is a non-conductor.

**3.19: Precautions relating to common type of "Class A" Fires are as Follows:**

- a) Glowing Cigarette butts, and matches shall not be thrown into waste baskets, oil rack cans and other places of fire resort.
- b) Smoking and use of open flames shall be prohibited in the oil filtration and storage rooms, storage battery rooms.
- c) Before starting welding and cutting operations, it shall be ensured that sparks arising there from do not lodge in woodwork or ignite other combustible materials in the area.

**3.20: Precautions relating to common type of Class ' B ' fires are as follows:**

- a) Oil drums shall be so located that fire and smoke from the oil is not likely to do any damage.
- b) Curb or floor drums and loose stone jelly shall be provided near oil storage rooms.
- c) When a vehicle is refueled or petrol transferred from one container to the other, no smoking or open flames shall be permitted in the vicinity.
- d) Places where paints, varnishes, lacquers, thinners etc. are stored or used, shall be kept scrupulously clean.

**3.21: Precautions relating to Common type of Class ' C ' fires are as follows:**

- a) Battery rooms shall have no loose connections and there shall be no sparking devices like bells, buzzers, relays, fuses or switches in the room. Smoking shall be prohibited and rubbish and other consumables shall not be permitted to accumulate in the battery room.
- b) In all electrical equipment, it should be ensured that arcs, due to poor contacts in switches, fittings and worn out insulation do not occur.

<b>Rule-3.22: Types of Fire Extinguishers.</b>					
Sl. No.	Type of Extinguisher	Class A	Class B	Class C	General
1	Carbon dioxide	Suitable for small surface fires only	Suitable. Does not leave residue or affect equipment or food stuff.	Suitable. Non-Conductor and does not damage equipment.	These extinguishers are made in variety of sizes. Liquid CO2 contained in a strong cylinder is released by the valve or trigger and sends out a shower of gas or "snow" which both cools and stops fire.

2	Dry Chemical	Suitable for small surface fires only.	Suitable. Chemical releases smothering gas and fog and shields operation from heat.	Suitable. Chemical is a non-conductor, fog ordinary chemical shields the operator from heat.	
3	Foam.	Suitable. Has both smothering and wetting action.	Suitable. Smothering blanket does not dissipate, floats on top of spilled liquid.	Unsuitable. Foam being a conductor should not be used on live equipment.	Extinguishment is by blanketing or smothering the fire with a heavy layer of a foamy substance consisting of largely of tiny bubbles of CO <sub>2</sub> .
4	Water.	Suitable. Water saturates material and prevents rekindling	Unsuitable. Water will spread and not put it out.	Unsuitable. Water being conductor should not be used on live electric equipment.	
5	Carbon Tetra chloride.	Suitable. To a limited extend on Class 'A' Fires.	Suitable. Releases heavy smothering gas on fires.	Suitable. Non-Conductor and will not damage equipment.	These are available in one quark size and above and are of the pump or pressure type. The liquid is pumped on to the fire and extinguishes the fire by smothering it.
<p>Note: (i) Even if premises are equipped with an automatic sprinkler installation, it is also necessary to have portable fire extinguishers as these may enable an outbreak to be extinguished before the automatic sprinkle comes into operation.</p> <p>(ii) Portable foam, soda acid or water firefighting equipment is intended for non-electrical fires and shall not be used on electrical apparatus fires unless such apparatus has been made dead.</p>					

### 3.23: Present work practices.

Line men climb on the equipment to reach work areas which are generally the conducting parts of Instrument transformers, Switchgear like Circuit Breakers, Isolators and Transformer bushings.

This free climbing on porcelain petticoats is done barefoot by using the toes as foot grips. This is risky and extremely dangerous when the porcelain is wet due to fog or rain.

Once, the workmen reach the work area, for staying in position, linemen tie a rope around their waist to the porcelain insulator which holds them in position so that they can carry out work. However, the person cannot adjust his position as and when required.

Further, while working, there is a possibility of the person slipping and falling down in a sliding action resulting in grievous injuries. There is no fall arrest system to arrest the fall of the workmen.

The safety belts being used have no padding. When a person becomes unconscious while strapped in a safety harness, he must be lowered in a time not exceeding approximately 9 minutes, failing which “suspension Trauma” with irreversible damage to nervous system will happen. So, there must be a fall rescue system in place to quickly recover workmen from heights in a safe manner.

Overall, there is an immediate need to adopt a rope-access system to meet the above situations. Such kind of Rope- access system is being used all over world, where workmen safety is a priority.

### **3.24: Recommendations:**

Rope- access system shall be introduced into maintenance activities. All necessary material shall be incorporated into tender specifications for all upcoming projects in such a manner that sufficient material is procured for meeting the requirements of the existing substation also in a phased manner. All workmen shall be trained with IRATA level 1, 2, 3 Certification. The following minimum material shall be supplied to each person working at heights (Pictures attached).

#### **All equipment shall be compliant with latest Indian/International standards.**

1. Full body safety harness with Arc Flash compliant standard.
2. Work positioning seating.
3. Work positioning lanyard.
4. Working rope
5. Fall arrestor rope.
6. Fall arrestor lanyard.
7. Rope ascender with adjustable and foot loop webbing.
8. Self- Braking Rope descender ID with panic safety.
9. Chest ascender.
10. Safety helmet.
11. Head lamp.
12. Double tongue lanyard for tower climbing.
13. Telescopic pole System with sub-assemblies or equivalent.
14. ASAP Lock fall arrestor with locking function with absorber lanyard.
15. Low stretch high strength Kernmantle rope for rescue.
16. Hooks and carabiners – 1 set
17. Rescue ID.
18. Rescue rope.
19. Retrieval retractable block PCGS 30 R

### **3.25: Tools & Tackles for safe Earthing and working.**

1. Portable telescopic A type ladder - 2 Nos.
2. Portable telescopic earth discharge rods
3. Tarpaulin and bag for rope access equipment.

4. Non-Contact type Live line detector with FRP hot-stick the choice of selectable sensing voltage, can choose between – 230V/415V/ 6.6kV/11kV/ 33kV/66kV/132kV/220kV and 400KV with Hot-stick from extended length 55 feet - 12 sections).

The manning contractor shall arrange Training and certification at IRATA member institutes in rope- access techniques for the workmen deployed by him so that effective and safe adaptation of rope- access techniques is implemented in APTransco. The estimates for manning contracts maybe suitably amended to include expenditure for training.

### **Training facility**

1. A 400 KV short span with two tension towers and a suspension tower shall be erected at one of the 400 KV substations to train workmen on various aspects of rope access, with safety nets and sand to reduce injury in case of accidental fall. This facility shall be utilized for familiarizing the rope access techniques and adequate practice and training.
2. One complete bay shall be erected for regular training practice.  
The workmen shall be trained in the following activities.
3. Free climbing wearing safety shoes and safety harness with double forked lanyards..
4. Rappelling up and rappelling down a rope in double rope method with chest croll, Rope ascender and rope descender with ASAP lock fall arrestor (working rope and safety fall arrestor rope).
5. Replacing insulators.
6. Replacing a downed conductor.
7. Rescuing a person suspended in air from the line conductor using rescue descender.
8. Rescuing a person suspended in air from the line using the rescue winch
9. Applying and removing portable earths on the substation equipment and line using FRP earth rods.
10. Using a work positioning lanyard to stay at a fixed position on the tower and on porcelain insulator of substation switchgear like CT, PT etc.
11. Standing on the foot loop while suspended in air to reduce suspension trauma.

### **3.26: Earth-discharge rods**

The purpose of temporary earth is to protect the working personnel from hazardous induced voltages and also to protect them in case of accidental energization of the line under Line clear. Hence, the temporary earth shall be tested for short-circuit current for which the primary system is designed i.e. 40/50/63 KA for 1 sec. for 400KV, 50KA/1sec. for 220KV, 40KA/1 sec for 132KV and 31.5KA/1 sec for 33 KV use. Further the Earth discharge rods shall be made of FRP and tested for One minute power frequency withstand test at the BIL of the system voltage.

### **3.27: Portable Earth Discharge Rods**

It may be noted that Pultrusion process is considered the best process for FRP tube manufacturing. Boron free ECR class glass rowing is considered the best among available

fiber for electrical purposes. Further, many resins are available for bonding purpose, among which; the epoxy resin is considered the best.

Necessary tests to prove glass content and type of fiber are to be carried out.

Material of pipe: Fiber reinforced polymer made of Boron free ECR glass rowing

Process of manufacture of pipe: Pultrusion process

Glass Content: Minimum 60 %

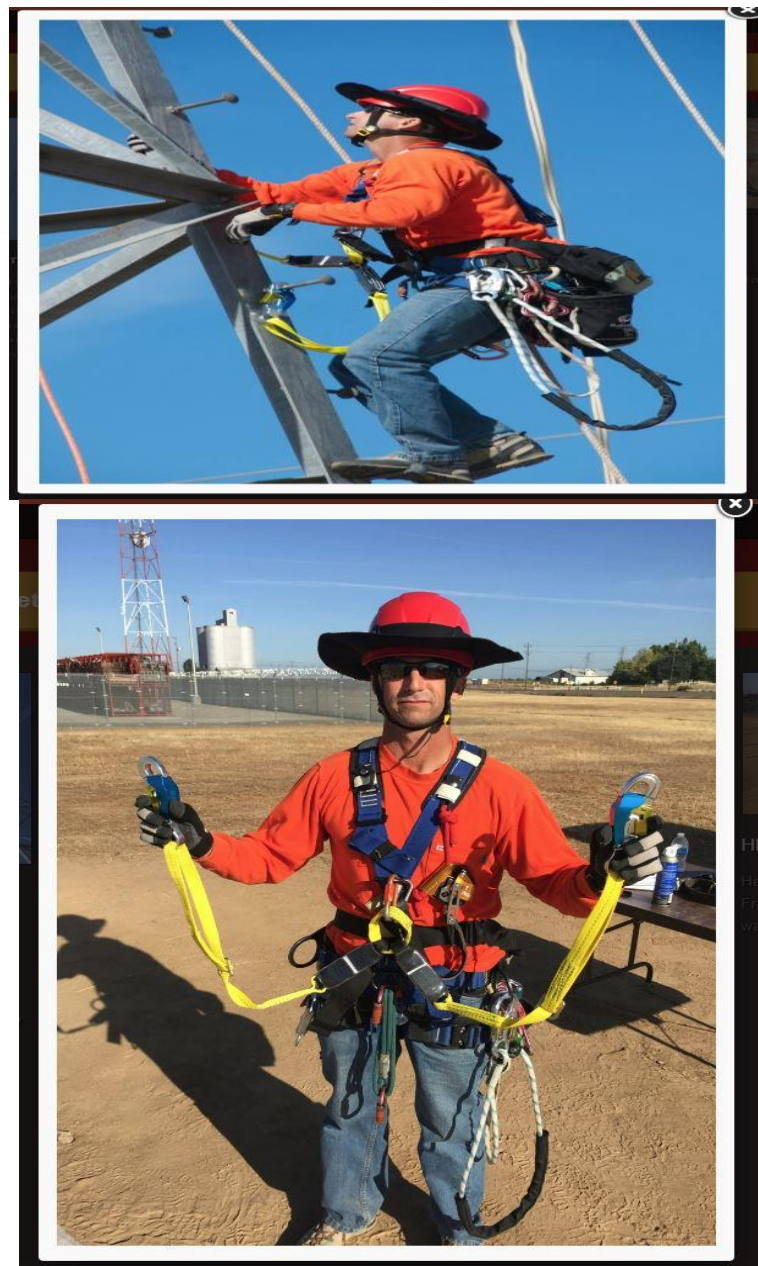
Resin: Epoxy

Minimum thickness of epoxy resin: 100 Microns

Type test: suitable for use in 400KV/220KV/132KV/33KV system at ERDA/CPRI

Design: Telescopic

The bottom section to be sealed with rubber to prevent entry of moisture and sufficient hand grips of rubber to be provided. Suitable petticoats maybe provided on the top section.



# Earthing Rods

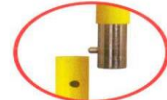
Telescopic Operating/Earthing/HT/LT/Discharge Rod



## Locking System



Threaded Coupler



Push Button Type



Telescopic Push Boton



Isolator Blade On/Off HotStick

Section: 1/2/3/4  
Length: 6ft to 18ft



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## CHAPTER 4

### ISSUE AND RECEIPT OF LINE CLEARS WHEN WORKING ON LINES AND EQUIPMENT

#### 4.1: Line clear.

Line clears are permits issued for working on lines or equipment which are in service, but disconnected from mains or supply for the purpose of the work. They should be in the form as appended to this Chapter. No other form shall be used.

#### 4.2: Issue of line clear for work.

Line clear shall be issued by an authorized person and shall be received by an authorized person in charge of the work. Every working party should have a separate line clear from the authorized person in charge of operation. Under no circumstances work must be done by one party taking approval from another party who have received line clear.

#### 4.3: Self line clear.

Where the person to work is the same as the person to isolate the line or equipment he will issue and receive a self-line clear in writing and follow similar procedure while returning.

#### 4.4: Line clear (Permit) Books.

Line clear (Permit) Books should be treated as important records. The sheets and the books themselves should be serially numbered. No page should be detached or used for any but line clear work. If any paper is inadvertently detached, a dated and initialed statement must be then and there recorded in the book by the person responsible for it. Duplicate copies should be taken with carbon paper only. The Permit Books shall be reviewed periodically by the Controlling officer.

#### 4.5: Permits by Phone.

Where written permits cannot be issued and taken, line clear should be given and taken by phone. In such cases an SMS shall be given by the requisition officer from his official mobile phone to the official cell phone available on the concerned S.S. in addition oral requisition over phone. Both the sender and receiver of SMS must be authorized persons only. They should be able to recognize each other's voice for issuing and receiving line clear.

#### 4.6: Authorized Persons.

Any work in the APTransco which involves handling of electrical equipment, lines, etc., shall be taken up only when the employee attempting the work has the necessary authorization in this regard. A few of the works requiring authorization are indicated below:

1. Issue and receipt of line clears.
2. Discharging and earthing.
3. Operating A. B. switches, isolators, circuit breakers, etc.,
4. Inspection, testing and maintenance works.
5. Renewal of Station Transformers H.G. fuses.

The authorization for obtaining and issuing L/Cs with in APTransco is as follows up to

- 1) 132kV Voltage Assistant Engineer/ Assistant Executive Engineer and above
- 2) 220kV and above voltages Dy. Executive Engineer and above
- 3) If LC is requisitioned by Discom authorities on any 33kV feeders. That authorized

person AE/AEE & above cadres are responsible for obtaining NBFLCs on the concerned feeder.

**Note:** In accordance with Indian Electricity Rule 44 (3), it should be ensured by the authorizing officers that all authorized persons are acquainted with and are competent to apply the instructions regarding treatment of Electric shock and all the methods of Artificial Respiration.

#### **4.7: Special Authorization.**

Where persons of lower rank have to perform duties prescribed for a higher rank, special authorization should be given by the Executive Electrical Engineer by name. Such special authorization should be given only to competent experienced and senior members of staff. It should also be ensured that the person so authorized has full knowledge of the works for which authorization is given to him.

#### **4.8: Procedure for Issue of Line Clear.**

Line clear should be issued by authorized person only. The instructions contained in the line clear shall be carried out scrupulously before issuing the line clear.

A danger foreseen is an accident prevented.

- i) Isolate the equipment or line from the supply and ensure that there is no back feed.
- ii) The person issuing the line clear shall see personally that the isolator or A. B. switch blades are opened fully. They shall be locked in the open position (or 'off' position). The key shall be kept carefully in the custody of person issuing line clear.
- iii) After switching off, every one of the conductors or equipment shall be tested for pressure (voltage or charge) by a discharging rod. The discharge wires should be kept at least two feet away from the person. All conductors shall then be shorted together and adequately earthed on the outgoing side of the switch. Rubber gloves or gauntlets shall be used for discharging and earthing.
- iv) 'Men on line' boards shall be placed on the switch or isolator. In addition, a line clear tag also be attached. This may be a card-board and shall contain the following information.
- v) All operations in connection with the issue of line clear should be done by the person issuing line clear or under his immediate presence on the spot and directions.
- vi) After all the above items are attended to properly, the line clear form should be filled in correctly not omitting to fill up any of the clauses. It shall be signed by the issuer and given to the person receiving the line clear, obtaining his signature on the duplicate.

**DANGER: (Red Tag)**

- a) Name of Officer issuing L.C.
- b) Name of receiver:
- c) Time:
- d) Date:
- e) Duration:
- f) Description of the equipment on which L.C is issued:
- g) Line Clear Number:

Any consumer/ General/ PGCIL/Railways requisitioned for L/C/NBFLC.  
The concerned lines/ maintenance Engineer (as the case applicable) will obtain LC/ NBFLC and in turn provide LC / NBFLC to the requisitioned consumer.

### SELF PROTECTION TAG

Name of the undertaken

SELF PROTECTION TAG

DO NOT OPERATE

MEN WORKING

APARATUS ISOLATED

-----

NATURE OF WORK ON HAND -----

AUTHORISED BY -----

PLACED BY -----

DATE-----

#### **FRONT SIDE**

TO BE FILLED IN AFTER  
COMPLETION OF WORK

REMOVED BY -----

DATE----- TIME-----

REMARKS-----

SENIOR AUTHORISED PERSON

NOTE: THIS TAG SHALL NOT BE USED AS SUBSTITUTE  
FOR PERMIT TO WORK SANCTION FOR TEST OR  
STATION GAURENTEE

#### **BACK SIDE**

#### **4.9: Receipt of Line Clear.**

- i) Every person seeking a line clear on a line or equipment, shall apply in writing, to the person competent to issue it, specifying clearly the portion of line or equipment which he wants to be cleared from supply and declared safe for working.
- ii) He shall follow the operations carried out by the officer issuing the line clear and ensure that isolation, discharging, earthing etc., are properly carried out. Then only he shall sign in the receipt column of the line clear form; except while taking line clear over phone.

- iii) At the site of the work, he shall test the line or equipment on which he has received line clear for pressure with a discharge rod and then earth on either side of the work spot.
- iv) If the work on a line involves the possibility of the conductor coming into contact with the neighboring line or any other line crossing the line, line-clear must be taken on the other lines also from the person in charge of those lines.
- v) He shall also record on the line clear form the number of persons who are attending the work. Then only he should begin the work.

#### **4.10: Return of Line Clear**

The following rules should be observed in returning the line clear.

- i) The authorized person who received the line clear only should return it.
- ii) He should personally see the line, equipment, etc., are free from MEN and MATERIALS and ANY EARTHING DEVICES and SHORTING DEVICES etc.,
- iii) All the men should be duly informed by the authorized person that the line clear is being returned and be made to understand and say that they will no longer work on the line or equipment.
- iv) The lines and equipment's for which permits are issued should not be charged until after all the permits or line clears are duly cancelled. The following rules shall be observed when a line clear is returned before charging the line or equipment.
  - a) The returned line clear shall be examined and ensured that all the certificates are furnished.
  - b) 'Line clear tag' for this line clear shall be removed from the switch or isolator.
  - c) It must be ensured that there are no other line clears on the particular line or equipment. When all the line clears are returned and when there are no more 'Line clear tags' to be removed, the line or equipment is to be examined at the supply and for MEN, MATERIAL and EARTH. If OK the earthing provided by the issuer and 'Men on line' board may be removed.
  - d) Any line clears taken from the other persons for the purpose of ensuring that there will be no BACK FEEDING of the particular equipment or line shall be returned. Then the line or the equipment may be energized.
  - e) It shall be checked if it stands OK and that there are no unusual sounds.
  - f) The next receiver's station is to be informed of the fact that the line or equipment has been re-charged.
  - g) After the line or equipment is energized and normal operating conditions are restored, then only the members who worked on the line/equipment should leave the work spot.

#### **4.11: Special Case.**

When an authorized person who has taken a line clear for a work on a line or equipment, is obliged to leave the place of work due to an emergency, he should arrange another authorized person to take another line clear for the very same work and thereafter return his line clear and then only leave the spot.

**4.12: Line Clear (Permit) to Work on Electrical Equipment Line.**

1. I hereby declare that the following electrical equipment or line is dead and isolated from all live conductors. (Back feeding points under my control are isolated and back feeding not under my control are covered by line clears received by me). Thus, there is no back feeding. Line Clear Tag is provided on the switch handle or isolator. Earthing has been made as detailed below:

A caution notice 'MEN ON LINE' has been affixed to the controlling switches.

- 2. Here state exactly the electrical equipment or line on which it is safe to work. (All other parts are dangerous).
- 3. Here state exactly at what points the electrical equipment or line is connected to earth.
- 4. Reference of Superior Officer in which the Line Clear applicant was authorized to take up the particular work.

5. Name, signature with date, Time and signature	}	-----
		-----ISSUER
	}	-----
		-----RECEIVER
6. Serial No. of Line Clear (Permit) on the line or Equipment for that day	}	sending end
		receiving end

**Note: 1.**

- (a) This Card after being signed by the authorized person for the work to proceed is to be retained by the authorized person who received line clear until the work is completed. If the line clear is by phone, the message shall be written down, dated, timed, signed in the line clear book at both ends. Any other form will not be authorized for working on line or equipment.
  - (b) Immediately necessary tag must be provided only by the authorized person issuing line clear on the equipment or line for each line clear indicating the name of the authorized person on work and to whom the line clear has been given.
- 2. The electrical equipment mentioned herein must not be again made alive until this card has been signed and returned by the authorized person who took the line clear. In cases of the operation where more than one gang of men are working on the same apparatus, it must not be again made alive until similar forms have been signed and returned by all the authorized persons in charge of the work.
  - 3. Before charging, the authorized person must make sure that all the line clears on the equipment or line are received back. Check that all the tags provided on the equipment or line also are taken out and are available with him.

**4.13: Return of Line Clear.**

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

Signature  
(Date and time).

Designation.

Verified all line clears are returned out, all the line clear tags are removed and available with me. Re- moved 'MEN ON LINE' board and earth. I hereby declare this card cancelled. The number offline clears still pending on this equipment or line is \_  
\_\_\_\_\_

Signature  
(Date and time)

CHARGED O.K.

Signature  
(Date and time)

Reviewed By

Designation.

Designation.

ASST. ENGINEER/ ASST. EXE. ENGINEER

#### **4.14: Discharging and Earthing.**

The equipment or line on which work is to be taken up should be discharged and earthed effectively only after disconnecting from source of supply. Even after they are disconnected from the source of supply, some equipment (and also long transmission lines) retain a charge which makes it dangerous to touch. They shall be discharged by a suitable discharging rod. Usually sparks are noticed while discharging. It is also likely that the line which is being discharged may actually be live. To avoid danger to the person in such cases it is necessary to use gloves on both hands for handling the discharge rods. The wires should be kept 2 ft. away from the body. As far as practicable the person discharging the lines or equipment shall maintain his position well below the level of conductors to be earthed in order to keep the body away from any arc that may occur while discharging. The discharging rod shall be brought near the circuit slowly and if arcing or flashover is noticed, it should be withdrawn immediately and the matter brought to the notice of the person issuing line clear. Every one of the conductors should be discharged as above.

All the conductors after discharging shall be short circuited together and earthed effectively. Earthing shall be done on all the sides (incoming and outgoing) at the place of work. The leads used for discharging and earthing shall be tested for continuity before use. 25Sq. mm multi stranded copper cable shall be used. The discharging rod shall be of a standard design to ensure good contact with the conductor and the earth. It should be tested for insulation at least once in three months and checked before use.

#### **4.15: Procedure for Earthing.**

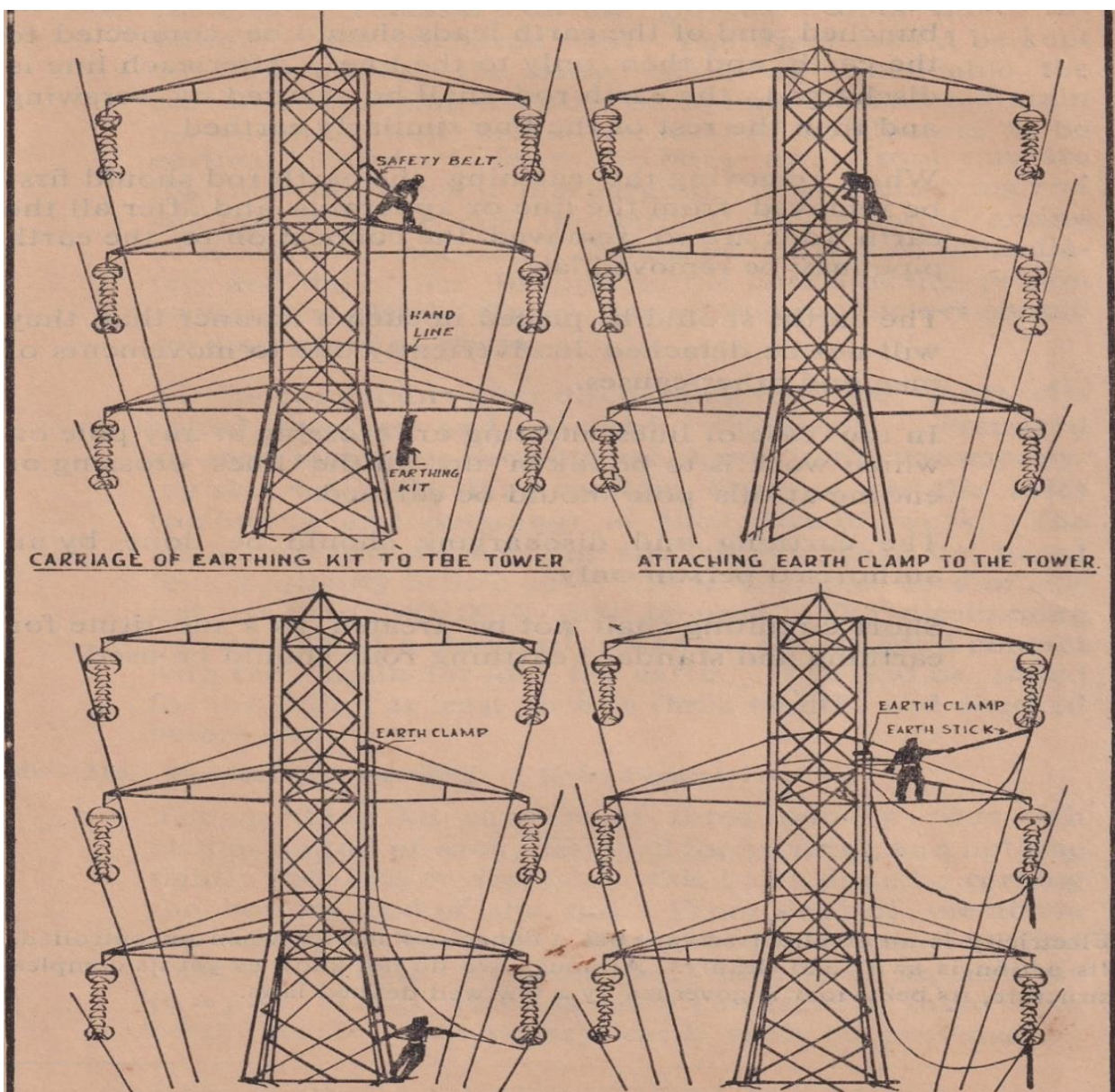
The earthing kit consists of three wooden rods with clamps on top of each, designed for securing and holding tightly the line or droppers, this being done by turning the bottom end of the rod. From each of the above top clamps, leads are brought down and bunched together. These are connected directly to an earth or to a pole clamp which is again earthed. If there is no earth nearby, a temporary earth shall be provided by driving a crowbar or pipe into the earth. At first the bunched end of the earth leads should be connected to the earth and then only to the line. After each line is discharged, the earth rod shall be secured by screwing and then the rest of the line similarly earthed.

While removing the earthing, the earth rod should first be removed from the line or apparatus and after all the earth rods are so removed, the connection to the earth pipe may be removed last.

The earths should be placed in such a manner that they will not be detached inadvertently due to movements of men and other causes.

In the case of lines' meeting or crossing at any pole on which work is to be taken up, all the lines crossing or ending at this pole should be earthed. The earthing and discharging should be done by an authorized person only. Short circuiting shall not be treated as a substitute for earthing and standard earthing rods should be used.

### TEMPORARY EARTHING OF EHT LINES ON TOWERS



ATTACHING EARTHING STICK TO LINE EARTHING OF ONE CIRCUIT,

FIGURE (Refer - 4.15)

## Chapter 5

### SUB - STATIONS AND LINES

#### 5.1: Sub-Station Yard

The substation yard should be fenced all round and admission into it should be only to the authorized operation staff on duty. It should not be used for storing any materials which pose danger to the men is involved whenever material is moved in or moved out.

#### 5.2: Numbering of Equipment

All the Feeders, Isolators, transformers, C.Bs. and kiosks etc., in a sub-station must be numbered. Schematic diagram of the Substation equipment should be made out on a board and the keys of the respective equipment should be hung at the places. The shift staff should be familiar with the key board. The key board itself must be under lock and 'key' of the same should be in the custody of the operator on Duty.

#### 5.3: Lighting in the Sub-Station

Every substation should be adequately illuminated so that the equipment, viz., switchyards and CBs, Isolators, HG fuses etc., operating gadgets, are all clearly visible to the substation staff so that they can be sure of the operations.

#### 5.4: Admission to Switch Yard

No person carrying an umbrella or stick should be allowed into the switch yard.

#### 5.5: Exclusion of Animals.

Employees shall take all precautions to prevent dogs, cats, other animals, or birds, from entering or remaining in the sub stations under their charge.

#### 5.6: Changing Shifts.

1. In preparation for a change of shift, the outgoing operator shall:
  - a) Prepare a statement in sufficient detail to acquaint the incoming operator with all conditions relating to line clears, shut-downs and operating conditions which should be drawn to his attention and which are known at the time of shift changeover. Specify the time at which the summary is complete and sign it. The summary conditions shall be made in the station log book.
  - b) Personally, draw the incoming operator's attention to and explain to him vital matters and show him, where possible, any conditions which require inspection for thorough understanding.
  - c) Sign operating records requiring signature.
2. In preparation for a change of shift, the incoming operator shall:
  - a) Read the summary of the operating conditions prepared and signed by the outgoing operator.
  - b) Inspect the station or any portion of it when either he or the outgoing operator deems this necessary.
3. The change of shift shall be effected when the incoming operator accepts the summary and information given to him by the outgoing operator as sufficient for his purpose in taking over the shift. This he does by signing the summary and recording the time, which automatically puts him in charge.

4. Until he has signed the summary, the incoming operator shall do no switching, give out no information of the station, except under instructions from the operator on duty.

### **5.7: Operating Records.**

1. All operating records shall be faithfully, accurately, promptly and completely entered on the forms provided for the purpose. Records shall be dated and entries accompanied by a statement of the time of the occurrence or if the time of occurrence is not known, the time it was observed. On completion of shifts, the operator responsible for the preparation of operating records shall sign them.
  - a) Time entries shall be made in accordance with standard 24 hour system in which 0.00 indicates the beginning of a day and 24.00 indicates the end of the same day. Time entries involving the first hour of the day shall be prefixed by 0, e.g. fifteen minutes past midnight is written 0.15
  - b) The standard week for summaries of operating records, reports, etc., which are issued on a weekly basis shall begin at 0.00 o'clock Monday and end at 24.00 o'clock Sunday.

### **5.8: Authority necessary for Operating Apparatus.**

1. Except in emergencies, no operator shall operate or order the operation of any apparatus, not under his operating control.
2. No operator shall accept instructions relating to operation unless they are issued by proper authorities.

### **5.9: Emergency Duties.**

1. In any emergency not provided for herein, operators shall act according to their judgment. Under such circumstances, when quick operating action is necessary to save life or property, all operators or other personnel engaged in operations are authorized to perform needed operations which they thoroughly understand but under no circumstances shall they attempt to perform operations about which they are in doubt.
2. In any emergency every reasonable effort shall be made to comply with requests from officials of Fire or Police departments or any public officials responsible for the public safety.
3. Any action taken in an emergency shall be promptly followed by a report, stating clearly the action taken and the reasons for it.

### **5.10: Reporting for Duty in Unfit Condition**

Should any member of an operating shift reports for duty in a condition which, in the opinion of person he is relieving renders him unfit to perform his regular duties safely and efficiently, the person on duty shall remain at his work and shall immediately report the condition of the incoming employee to his superior officer and ask for instructions.

### **5.11 Assistance from Operators Not on Duty.**

Should trouble develop while an operator not on duty is in the station, such an operator shall assist the operator on duty at the latter's request and under his instructions

### **5.12: Register of Movements of Staff**

In an attended sub-station, the movements of all the staff whether on duty or not, should be known to the operator on duty. A register of movements shall be kept at the S.S. and maintained by the operator on duty.

**5.13: Routine Inspections.**

The Operator in charge of the shift, shall make or delegate a qualified member of his shift to make complete routine inspection of the station and equipment in accordance with the Standing Instructions in force.

**5.14: Interchanging Shifts.**

Operators shall not interchange shifts unless permission to do so has been obtained from the proper authority.

**5.15: Reading on Duty**

Reading magazines, newspapers, books, watching videos, WhatsApp chatting, unrelated to the work on duty, is prohibited.

**5.16: Knowledge of the Equipment**

A thorough knowledge of the equipment will ensure safe operation and obviate damage to the particular equipment and also other connected apparatus and operating personnel.

**5.17: Kiosk**

Kiosks and cubicles have meters, switches etc., in a panel behind the front door. But these kiosks may not have similar panel in the rear immediately after the kiosk door and may be exposed to live parts. Care should therefore be taken when operating the rear door of such a kiosk even for inspections. It is preferable to provide an expanded metal screen behind the rear doors which will enable inspection but prevent access to live parts.

**5.18: Current Transformers.**

The secondaries of the CTs used in sub-station are highly inductive and are susceptible to development of dangerously high voltages in case of any open circuit. The changeover switches of ammeters are so designed that the C T. secondary is always kept in a closed circuit. In case any maintenance work is taken up it should be ensured that the C. T. secondary is never open circuited when the primary is ON.

When any instrument connected on to a secondary circuit has to be removed, replaced or freshly introduced, the secondary circuit should be shorted temporarily at an appropriate place before the point of work. After the work is over, all open circuits, if any done during the job should be closed and then the temporary shorting removed.

The primary side of the CTs should not be approached or touched unless these transformers are completely disconnected from circuit and effectively earthed.

**5.19: Potential Transformers.**

The primary side of the PTs should not be approached unless they are completely disconnected from the circuit and effectively grounded.

**5.20: Trip Circuit.**

The safety of the equipment depends on the soundness of the trip circuit and healthiness of the battery. Whenever an operator takes charge of the shift, he should check whether the trip circuit fuse is healthy and whether the battery has the raised voltage across it with the acid or liquid level up to the mark. He should also check the specific gravity of the pilot cell. The above readings shall be recorded in the log book or charge report book of the station.

**5.21: Temperature of the Hot Oil.**

Generally, the temperature of the hot oil for full continuous load should not exceed 40° C over the ambient temperature for oil filled natural cooled forced cool equipment. The temperature rise for full load will in practice be less than 40°C over the ambient. Hence it is necessary not to exceed the temperature limit. When the hot oil temperature reaches a figure of 65° C, it should be brought to the notice of the Officer-in-charge of the Sub-station and the transformers should be carefully watched if necessary.

**5.22: Isolators**

Always gloves should be used while operating the Isolator. The handle of the Isolator should be effectively earthed by means of a ground wire so that in case of insulation failure there is an alternate path to earth and the person operating is protected.

**5.53: Switching in and Switching off Loads.**

Isolators and A.B. switches are not designed for switching 'IN' and switching 'OFF' of loads.

As such, if a circuit breaker exists in a substation, the circuit breaker should be used for switching on and switching off feeder equipment. For switching on, isolator should be closed first and then the circuit breaker closed. For switching 'off', the circuit breaker should be tripped first and then the Isolator opened. Always speak of the switch as OPEN or CLOSED and of the line or apparatus as DEAD or ALIVE.

The employees operating A. B. switches should not be satisfied with having moved the handle from the 'CLOSED' to 'OPEN' position but should satisfy themselves by seeing that all the blades of the switch have opened to the required extent.

Double break A.B. switches should be opened so that the blades clear both sides of the switch by an equal amount. The switches must always be kept locked whether it is in the closed or open position.

**5.24: Back Feeding.**

When a Substation structure or a pole is fed from more than one source, the feeding in ends must be prominently indicated on a board fixed to the structure or pole so that every member of the staff is aware of the multiple feed or alternate feeds to the substation or structure or the pole. In case of any work on any part of the Substation structure or the pole, it must be ensured that the particular part is isolated from all possible feeds.

**5.25: Authorized Persons only to Operate.**

The switches, circuit breakers, etc. in a substation should be operated only by the authorized person 'ON DUTY'. Even authorized members of the substation should not operate when they are 'NOT ON DUTY'.

**5.26: Departmental telephones:**

Carrier communication phones, cellular phones, walkie talkies & Satellite phones are to be maintained in trim condition 24x7.

**5.27: Meggering of High Capacity Equipment.**

For meggering transformers, and high voltage switchgear, 5KV meggers are generally used. Where the capacity of the equipment and connected cables are high, considerable static electricity may be stored. This should be discharged before the equipment is

touched. Inductive equipment like transformers, take some time for discharging and therefore it should be effectively discharged. Failure to observe the above precaution may result in a shock

#### **5.28: Line Lightning Arresters.**

In a substation, the incoming and outgoing lines are connected to the lightning arresters before the incoming Isolator and after outgoing Isolator respectively to ensure protection at all times from surges.

In such cases, the work on such lightning arresters or work on earth connected to such lightning arresters should be carried out after isolating the lightning arresters from the lines.

##### **Care to be taken.**

These lightning arresters should never be touched or approached unless they are completely disconnected from all live lines or live equipments and all parts discharged to ground and effectively earthed. Lightning Arresters should be provided with the ground wires of LAs may develop dangerous potential.

#### **5.29: Working near live Supports or Equipment's.**

As a general rule, no person shall work on a live tower/structure, or equipment within six feet of any live conductor. In case work on one of the two circuits of a double circuit line is to be carried out, the following rules should be observed.

- (1) The circuit on which work is to be done should be made dead by disconnecting from source of supply and shall be discharged and earthed.
- (2) The minimum distance from the conductors of the live circuit within which, the men working on the dead circuit can go shall be at least 3'-6".
- (3) Only minor works of the nature of renewing insulators, bindings, etc., may be done when the other circuit is live. Works such as stringing of conductors etc., involving greater risk may be done only under special circumstances and that too under the personal supervision of a responsible person of a rank not lower than a AE/AEE
- (4) Use of tools with large handles should be avoided in the above cases.
- (5) In all other cases, all the circuits on the supports should invariably be made dead before working on any one of the circuits. An authorized person may work on any line wherein the pressure does not exceed 250 volts to earth provided the person uses a safety belt, wears rubber gloves or gauntlets and has not to push any part of the body except that portion of the arms protected by the gauntlets or gloves and is accompanied by an assistant with a torch light in case work is taken up during night.

#### **5.30: Switching off in Case of Fire.**

In case of fire close to a line, first make the line dead by switching off supply.

#### **5.31: Pits and Trenches.**

When pits and trenches are dug and left over for any period before resuming work, warning signs well ahead on either side and red lights during night time, shall be used.

#### **5.32: Caution Notices.**

The owner of every medium high, and extra high voltage installation shall affix permanently in a conspicuous position a caution notice in English, Hindi and the

Telugu and of a type approved by the Inspector on all supports of high and extra high voltage overhead lines.

**5.33: Safety and Protective Devices.**

The towers of every high and extra high voltage overhead line shall make adequate arrangements to the satisfaction of the inspector to prevent unauthorized persons from ascending any of the supports of such overhead lines without the aid of a ladder or special appliances.

**5.34: Public Hazards.**

1. When an operator receives a report on a hazardous condition of apparatus, he shall obtain from the informant his name and all available information relating to the hazardous condition. The Operator may isolate the apparatus in question or have the informant or anyone else stand guard over it until the hazard is removed or other suitable arrangements have been made.
2. In the event of an operator, requesting an informant to stand guard over the hazardous condition he shall positively warn him not to touch any conductor, guy, etc., under any circumstances.
3. When trouble is reported by non-employees, such report shall be recorded in the Charge Report Book or Log Book and the fact reported to the higher authorities immediately Rule - 291 Wave Traps, Capacitors and H. T. Coupling Capacitors.
4. Wave Traps, capacitors and H.T. coupling capacitors shall be disconnected from live lines and effectively discharged and grounded before any work is taken up on these equipments.
5. The secondary of the coupling capacitors shall be earthed effectively before any work is taken up on the equipment. After the work is completed, the earth shall be removed.

**5.35: Safety measures for operation and maintenance of transmission, distribution systems:**

1. Owner of every transmission system shall arrange for training of their personnel engaged or appointed to operate and undertake maintenance of transmission and distribution system, in his own institute or any other institute recognized by the Central Electricity Authority or State Government as per the guidelines framed in CEA Regulations and shall maintain records of the assessment of these personnel issued by the training institute in the format prescribed in guidelines and such records shall be made available to the Electrical Inspector, as and when required.
2. All electric supply lines and apparatus shall be of sufficient rating for power, insulation and estimated fault current and of sufficient mechanical strength, for the duty cycle which they may be required to perform under the environmental conditions of installation, and shall be constructed, installed, protected, worked and maintained in such a manner as to ensure safety of human beings, animals and property. The material and apparatus used shall conform to the relevant specifications of the Bureau of Indian Standards or International Electro-Technical Commission where such specifications have already been laid down.
3. All suppliers of electricity including generating companies, transmission companies and

distribution companies shall designate Electrical Safety Officer(s) for ensuring observance of safety measures specified under these regulations in their organization, for construction, operation and maintenance of electric system of all generating stations, transmission lines, substations, distribution systems and supply lines.

4. The Electrical Safety Officer shall carryout recommended periodic tests as per the relevant standards, and inspect such installation at intervals not exceeding one year, and keep a record thereof in the Forms specified in CEA Regulation; test reports and a register of recommendations in regard with safety duly acknowledged by owner; compliances made thereafter; and such records shall be
5. of safety as per the table given below: -

<b>Description</b>	<b>minimum factors of safety</b>
metal supports	1.5
mechanically processed concrete supports	2.0
hand-moulded concrete supports	2.5
wood supports	3.0

### **5.36: General clearances:**

1. No blasting for any purpose shall be done within 300 meters from the boundary of a sub-station or from the electric supply lines of voltage exceeding 1000 V or tower structure thereof without the written permission of the owner of such sub-station or electric supply lines or tower structures;
2. No cutting of soil within ten meters from the tower structure of 132 kV and above voltage level shall be permitted without the written permission of the owner of tower structure.
3. No person shall construct brick kiln or other polluting units near the installations or transmission lines of 220 kV and above within a distance of 500 meters without the written permission of the owner of the line.

### **5.37: Lines crossing or approaching each other and lines crossing street and road:**

- i. Where an overhead line crosses or is in proximity to any telecommunication line, either the owner of the overhead line or the telecommunication line, whoever lays his line later, shall arrange to provide for protective devices or guarding arrangement in a manner laid down in code of practice or guidelines issued by Power and Telecommunication Coordination Committee and shall observe the following provisions, namely: -
- ii. when it is intended to erect a telecommunication line or an overhead line which will cross or be in proximity to an overhead line or a telecommunication line, as the case may be, the person proposing to erect such line shall give one month's notice of his intention so to do along with the relevant details of protection and drawings to the owner of the existing line.
- iii. where an overhead line crosses another overhead line, clearances shall be as under:-

<b>(Minimum clearances in metres between lines crossing each other) Sl. No.</b>	<b>Nominal System Voltage (kV)</b>	<b>11-66 kV</b>	<b>110-132 kV</b>	<b>220 kV</b>	<b>400 kV</b>	<b>765 kV</b>	<b>1200 KV</b>

1.	Low and Medium	2.44	3.05	4.58	5.49	7.94	10.44
2.	11-66	2.44	3.05	4.58	5.49	7.94	10.44
3.	110-132	3.05	3.05	4.58	5.49	7.94	10.44
4.	220	4.58	4.58	4.58	5.49	7.94	10.44
5.	400	5.49	5.49	5.49	5.49	7.94	10.44
6.	765	7.94	7.94	7.94	7.94	7.94	10.44
7.	1200	10.44	10.44	10.44	10.44	10.44	10.44

iv. where an overhead direct current (DC) line crosses another overhead line, clearances shall be as under:-

(Minimum clearances in metres between AC and DC lines crossing each other) Sl.No.	System Voltage AC/DC	100 kV DC	200 kV DC	300 kV DC	400 kV DC	500 kV DC	600 kV DC	800KV DC
1.	Low and Medium AC	3.05	4.71	5.32	6.04	6.79	7.54	9.04
2.	11-66 kV AC	3.05	4.71	5.32	6.04	6.79	7.54	9.04
3.	110-132 kV AC	3.05	4.71	5.32	6.04	6.79	7.54	9.04
4.	220 kV AC	4.58	4.71	5.32	6.04	6.79	7.54	9.04
5.	200 kV DC	4.71	4.71	5.32	6.04	6.79	7.54	9.04
6.	300 kV AC	5.32	5.32	5.32	6.04	6.79	7.54	9.04
7.	400 kV AC	5.49	5.49	5.49	6.04	6.79	7.54	9.04
8.	400 kV DC	6.04	6.04	6.04	6.04	6.79	7.54	9.04
9.	500 kV DC	6.79	6.79	6.79	6.79	6.79	7.54	9.04
10.	600 kV DC	7.54	7.54	7.54	7.54	7.54	7.54	9.04
11.	765 KV AC	7.94	7.94	7.94	7.94	7.94	7.94	9.04
12.	800 kV DC	7.94	7.94	7.94	7.94	7.94	9.04	9.04
13.	1200 KV AC	10.44	10.44	10.44	10.44	10.44	10.44	10.44

v. Where two lines cross, the crossing shall be made as nearly at right angles as the nature of the case admits and as near the support of the line as practicable, and the support of the lower line shall not be erected below the upper line.

vi. where there are two trolley wires and the distance between them exceeds 40 cms but does not exceed 1.2 meters, three guard-wires shall be erected as in DIAGRAM-C;

### 5.38: Additional safety requirements for GIS:

- (1) A separate emergency source of illumination with automatic initiation shall be provided in every room or compartment of GIS station.
- (2) Cable cover protection unit shall be provided between flanges of GIS and cable termination unit.
- (3) GIS installation of 220 kV and above voltage shall be provided with partial discharge monitoring system.
- (4) SF6 gas leakage rate from any single compartment of GIS to atmosphere and between compartments shall not exceed as stipulated in IS/IEC 62271-203.

### **5.39: Earthing requirements of GIS:**

1. Enclosure of GIS bay shall be earthed for high frequency transient voltage, as per OEM (Original Equipment Manufacturer) recommendations, apart from the regular earthing.
2. Earthing of GIS installation shall be as per relevant IS/IEC 61936.
3. Travelling wave energy generated inside the GIS due to switching operations shall be diverted to the ground by providing effective earthing from bushing shroud to the earth.

### **5.40: Handling Gas Insulated Switchgear (GIS) apparatus for carrying out shutdown work or testing Precautions to be observed**

- 1) The Engineer or Supervisor in-charge of the work shall obtain proper Permit-To-Work (PTW) from the concerned Operation In-charge(s) and ensure that the electric supply line or apparatus or section is isolated from all sources of energy, de-energized and earthed.
- 2) Operation, maintenance and repair must be carried out by trained and certified personnel only.
- 3) Before commencement of any shut down work or testing of GIS apparatus, the Engineer or Supervisor in-charge of the work or testing shall identify the possible hazards, such as; electrocution, flash over, fall of person from height, fall of objects from height, failure of Tools & Plants, fire, etc., that may be encountered while carrying out the work or testing near charged area and take necessary precaution to protect the working personnel.
- 4) The Engineer or Supervisor in-charge of the work shall, before commencement of any work, brief the entire working group or gang of the hazards that may be encountered and the necessary precautions to be taken by them.
- 5) Wear hearing protection during operation.
- 6) Take care when touching the enclosure at any time as enclosures may heat up to the temperature of 70°C.
- 7) Observe the procedures for storage, transportation, and the use of filling equipment.
- 8) Wear the personal protective equipment: respirator mask (self-contained breathing equipment if necessary), protective overall, protective gloves, safety shoes, safety glasses.
- 9) Attach warning labels to all neighboring installation parts (to be removed after the works have been carried out).
- 10) Provide proper electrical clearance as required by interlocking rules. Mark e.g. main circuits and control circuits with appropriate tags.
- 11) Block off neighboring live parts with screens, insulating mats or spacer grids in order to prevent unintended contacts.
- 12) While working on any compartment in GIS, the immediate adjacent compartment(s) must be also depressurized for safety of the working person.
- 13) SF<sub>6</sub> gas following events such as arc faults becomes contaminated and contains poisonous substances. Hence, handling of SF<sub>6</sub> in such cases must be done using proper PPEs and by trained personnel preferably from the original equipment manufacturer (OEM).
- 14) The switchgear installation shall not be operated if the density of SF<sub>6</sub> gas indicated at the density monitors is not in the operating range.
- 15) Do not remove any protective covers if an assembly is energized.
- 16) The Engineer or Supervisor in-charge of the work shall ensure that adequate and appropriate local earths are fixed at the zone of working, and the earthing rods remain

connected to the isolated section of the electric supply line or apparatus or section till all men and materials have been moved away to safe zone and PTW is returned on completion of the work.

Minimum safety working clearances where electricity at voltage exceeding 1000 V

**[See sub-regulation (2)(iii) of regulation (46)]**

Highest System Voltage (kV)	Safety Working Clearance (Metres)
12	2.6
36	2.8
72.5	3.1
145	3.7
245	4.3
420	6.4
800	10.3

1. The above values are valid for altitude not exceeding 1000 m. A correction factor of 1.25% per 100 m is to be applied for increasing the clearance for altitude more than 1000m and upto 3000 m;
2. The above safety working clearances are based on an insulation height of 2.44 m which is the height of lowest point on the insulator, where it meets the earthed metal, from the ground;
3. “Safety Working Clearance” is the minimum clearance to be maintained in air between the live part of the equipment on one hand and earth or another piece of equipment or conductor on which it is necessary to carry out the work, on the other.
4. The “Highest System Voltage” is defined as the highest rms phase to phase voltage which occurs under normal operating conditions at any time and at any point of the system. It excludes voltage transients (such as those due to system switching) and temporary voltage variations due to abnormal system conditions (such as those due to fault conditions or the sudden disconnection of large loads).
5. Minimum safety clearances to be maintained for bare conductors or live parts of any apparatus in out-door HVDC sub-stations, excluding overhead lines of HVDC installations.

**[See sub-regulation (5) of regulation (46)]**

S.No.	DC Voltage (kV)	Pole to Earth Clearance (Meters)	Ground Clearance (Meters)
1.	100 kV	1.17	4.55
2.	200 kV	1.80	5.65
3.	300 kV	2.45	6.75
4.	400 kV	3.04	8.00
5.	500 kV	3.65	9.00
6.	600 kV	3.98	10.1
7.	800 kV	5.3	11.2

1. The above ground clearances are not applicable to equipment that are housed within fence or a building and where access is prevented under energized condition through a suitable safety interlocking scheme.

2. The above pole to earth clearances are for conductor-structure electrode configuration using gap factor k equal to 1.35.
3. It is recognized that within a substation many different types of electrode configurations shall be there with different values of k, therefore, the above clearance shall be modified based upon the values of gap factor for a particular electrode configuration subjected to the minimum ground clearance.
4. Clearance shall be provided for electrical apparatus so that sufficient space is available for easy operation and maintenance without any hazard to the operating and maintenance personnel working near the equipment and for ensuring adequate ventilation.

### Schedule VIII-A

A Minimum clearance in air above ground and across road surface of Highways or roads or railway corridors or navigational or non-navigational rivers for lowest conductor of an alternating current overhead lines, including **service lines of nominal voltage system**

[See sub-regulation (6) of regulation (60)].

Nominal voltage of system	Clearance above ground			Clearance between conductor and road surface across Highway (m)	Clearance between conductor and rail level across Railway Corridor (m)	Clearance above HFL for River crossing	
	Across Street(m)	Along Street(m)	Elsewhere (m)			Navigational river (m)	Non-navigational river(m)
Upto 1000V	5.80	5.50	4.60	U/G Cable	U/G Cable	16.50	5.80
11 kV	6.50	5.80	4.60	U/G Cable	U/G Cable	19.00	6.50
22 kV	6.50	5.80	5.20	U/G Cable	14.66	19.00	6.50
33 kV	6.50	5.80	5.20	11.60 or U/G Cable	14.66	19.00	6.50
66 kV	6.50	6.10	5.50	11.60 or U/G Cable	14.66	19.00	6.50
110 kV	6.50	6.10	6.10	11.60	15.56	19.00	6.50
132 kV	6.50	6.10	6.10	11.60	15.56	19.22	6.50
220 kV	7.02	7.02	7.02	12.52	16.46	20.10	7.02
400 kV	8.84	8.84	8.84	14.00	18.26	21.90	8.84
765 kV	18.00*	18.00*	18.00*	18.80	23.40	25.55	18.00
1200 kV	24.00*	24.00*	24.00*	30.00	23.00 (from highest traction conductor)	29.90	24.00

For navigable rivers, clearances shall be fixed in relation to the tallest mast in consultation with the concerned navigational/port authorities.

\* Higher clearance due to predominantly induction effects and time varying electric field (ICNIRP limit: 10 kV/m for occupational exposure) at voltage exceeding 400 kV.

Railway crossing clearances as per ACS 20 of IRSOD Dated 17-07-2017

### Schedule- VIII-B

The Minimum Clearance in air above ground and across road surface of Highways, or Minimum clearance between conductor and Rail Level or navigational or non-navigational rivers for lowest conductor of High Voltage Direct Current (HVDC) overhead line of nominal voltage system.

**[See sub-regulation (6) of regulation (60)].**

Sl. No.	DC Voltage	Ground Clearance(m)	Clearance between conductor and road surface across Highway (m)	Minimum clearance between conductor and Rail Level (m)	Clearance above HFL for River crossing	
					Navigational River (m)	Non-navigational River(m)
1.	100 kV	6.50	-	-	-	-
2.	200 kV	7.30	-	-	-	-
3.	300 kV	8.50	-	-	-	-
4.	400 kV	9.40	-	-	-	-
5.	500 kV	12.50	17.25	21.23	22.90	12.50
7.	800 kV	18.00	22.75	25.74	25.90	18.00

\* Higher clearance due to predominantly time varying electric field (ICNIRP limit: 10 kV/m for occupational exposure) at voltage exceeding 400kV.

1. Highway clearances required 4.75 m higher than ground clearances (considering the vehicle height is 4.75, as mentioned in the Indian Road Congress documents, 1983).
2. Railway clearances required 10% higher value than HVAC values (HVAC values are mentioned in Indian Railway document: IRSOD,2004).
3. Navigational River clearances as mentioned in the Regulation of Inland Waterways Authority.

## Chapter – 6

### LIVE LINE WORKS

#### 6.1: General safety rules for work on live lines

1. Live line work shall only be performed whenever practicable and necessary to avoid interruptions to consumers.
2. Only approved tools or equipment's shall be used for live line work.
3. The Assistant Engineer/ Assistant Executive Engineer shall plan the work carefully in advance and they shall advise their men of the details before the work is started.
4. The Assistant Engineer /Assistant Executive Engineer shall be responsible for ensuring that live line tools and equipment are tested in accordance with standard practice.
5. The Assistant Engineer /Assistant Executive Engineer shall be responsible at the beginning of each work day for the inspection of all live line tools and associated equipment which are to be used that day.
6. Close co-operation must be obtained from every man on the job. Each man shall observe closely the progress of work performed by fellow workmen and shall look to the safety of his fellow work men as well as to his own.
7. Haste, inconsistent with safety shall not be permitted.
8. Live line work shall not be carried out during adverse weather conditions. Tools may be left on the line until weather improves, or overnight if work conditions preclude removal of tools; however, it is the responsibility of the Assistant Engineer /Assistant Executive Engineer to ensure that the tools are dry and safe to handle when work is again undertaken.
9. Live line work may be avoided in the night. If it has to be necessarily taken up, adequate illumination must be provided
10. The electrical and mechanical safety limits of live line tools shall be observed. Clearance from live conductor, consistent with safety and efficiency shall be maintained by workmen handling live line tools.

#### 6.2: Safety rules for hotline maintenance

##### a) General rules and precautions: -

1. Nothing in these rules for hot-line maintenance shall be construed as prohibiting any authorized linemen from performing routine opening and closing of manually operated hook disconnects and switches, or replacing of fuses on high voltage lines, provided proper methods are followed and approved tools are used. These operations do not strictly fall within the scope of 'Hot-line' works.
2. Hotline maintenance cannot always be governed by firm and steadfast rules, and the supervisor must exercise certain amount of ingenuity in following safe methods for accomplishing various jobs. However, this provision shall not permit any supervisor to violate any rules contained herein, but shall cover only situations not dealt within these rules. The idea of safety is paramount from the beginning of the job up to its satisfactory and safe completion.

3. Hot line maintenance should only be done during favourable weather conditions. Rain, snow, sleet, dampness, mist, high winds etc., produce conditions under which hot line maintenance shall not be permitted.
4. Only crews selected and especially trained for such work in approved centres shall be employed in hot line maintenance. The selection of the crew shall be based on the following factors:
  - a) Experience;
  - b) Training;
  - c) Temperament and general fitness;
  - d) Habits and Judgement;
  - e) Mental and physical fitness;
  - f) Reputation for carefulness; and
  - g) Alertness.
5. A minimum hotline maintenance crew shall consist of four experienced hotline trained persons. Supervisory cadre trained Executive officer must be present in the crew.
6. Only approved hot line maintenance tools and ropes shall be used and it shall be the duty of the sub divisional officer in charge of the crew to ensure that these tools are in good condition. This doesn't relieve the supervisor from his responsibility for inspecting the tools before the work is started.
7. Only one conductor or wire on the same structure shall be worked upon at one time.
8. Wood structures and steel structures shall be considered alike and the insulating value of wood poles or structures shall not be depended upon for protection

**b) Safety Rules for Supervisor:**

1. The supervisor shall designate the tools used and the method to be used for each individual job, adhering to the safety rules herein. He shall be held directly responsible for the enforcement of all these safety rules.
2. It shall be the duty of the supervisor to see that he has sufficient experienced men, material and proper tools to do the job safely.
3. While hot men (the person who trained in hot line techniques with certified from NPTI Bangalore or any other equivalent institutions in the world) are actually engaged in hotline maintenance work, the supervisor shall give their operations his undivided attention and shall direct their work from a location where he can be in a position to caution or warn them, if necessary. If it is necessary for any reason for the supervisor to leave the job or devote his attention to another matter, he shall not do so until he has appointed another trained person as supervisor and notified the linemen working who shall then follow the newly identified supervisor or cease all work until notified by the supervisor that he is back on the job.
4. The supervisor shall not attempt any hot line maintenance work which, in his opinion, is beyond the ability of the men or the equipment, but shall notify his immediate superior officer that in his opinion, the work would be unsafe.
5. A complete survey of the job shall be made by the supervisor and a definite plan to be followed must be decided on or before the work is started.
6. It shall be the duty of the supervisor to see that the men doing the work understand thoroughly the procedure to be followed before any work is started.

7. No other work of any nature shall be performed on a pole or structure while hot line maintenance work is in progress.
8. Before any crew is permitted to work on hot line maintenance work, they must be trained on de-energized equipment. This preliminary training in the use of hot line maintenance tools must be very thorough and include every detail of hot line maintenance work which the crew will be required to perform.
9. Employees shall be cautioned against the danger of coming in contact with any guy wire attached to a structure upon which hot line maintenance is being performed.
10. Ensure the feasibility of carrying out the work using hotline techniques, since every work cannot be dealt in Hotline method.
11. The live line maintenance work should never be hurried. The work output is more effective in the absence of time limit.
12. Ensure that the working personnel should use proper tool is being used in proper position with proper angle

**c) Safety Rules for Hot man:**

**Safety precautions to be taken by the hotlines staff while working on live lines and equipment.**

1. Persons having certificate in Live Line Maintenance Techniques (LLMT) from the Component Authority are only eligible to attempt and to supervise the live line maintenance works.
2. Live line maintenance work should be carried out in the presence of at least one person in the Executive cadre holding such LLMT certificate.
3. The line maintenance work should be attempt only in fair weather condition i.e. make sure that the weather is clear and there is no chance of rain.
4. Live line maintenance work should not be attempt during rain/sleet (winter storms)/dampness /cloud /mist (fog) and heavy wind flows etc.
5. If weather changes unexpectedly and creates unfavourable conditions while carrying out live line maintenance work. The working personnel should abandon work, keeping all the erected tools at where they are and have to continue the work after ensuring the weather conditions and also the healthiness of the hotline tools.
6. The tools being used for live line maintenance must be tested periodically for dielectric strength (Epoxy glass tools) and mechanical strength (Hardware like yokes) by the certified Agency. i.e. M/s CPRI/Bangalore
7. Hotlines tools maintenance should be carried out whenever the situation warrants le based on the quantum of works being attended, but at least once in 15 days.
8. As most of the hotlines tools are lengthy (Max. length of epoxy glass ladder is 20), they should be transported in separate specially designed vehicle.
9. Hotline tools to be kept on hooks, arranged in a ventilated store room
10. Hotline tools must be inspected before and after each operation for their damage/scratches if any.
11. Damaged or failed hotline tools having unreliable dielectric and mechanical properties should not be used in live line operations.
12. All hotlines team members must understand the method of live line work thoroughly before the commencement of work.

13. Ensure that the tower/pole/Structure being attended to be strong enough to take load of the crew (trained hotlines Staff) and hotline tools.
14. No other work of any nature should be performed on the tower while live line work is in progress, which causes to disturb the concentration of working personnel and lead to accidents.
15. Hotlines tools and ropes should always keep dry.
16. Ensure the feasibility of carrying out the work using hotline techniques since every works cannot be carried out in hotline method.
17. Before climbing tower/pole, remove wrist watch, mobile phone and all other ornaments.
18. Before commencing work and while leaving work place, the work in-charge must be informed.
19. Live line maintenance work should never be hurried. Work output is more effective in absence of time limit.
20. Live ne maintenance work in-charge should take "Permit to Work (PTW)" from both ends (Supply & Receiving Stations) of live line work to be attended. Auto Re closures shall be kept in OFF condition at both ends of the Sub stations. Also inform to wait for 15 minutes to charge line in case trips.
21. Working personnel should equip themselves with safety helmets, UV protected goggles, high grip safety shoes and safety belts while carrying live line works.
22. Working personnel should not climb towards jumpers while attending live line tower works. If clearance is less, push the jumper with wire tong/cover with insulator guard.
23. Working personnel should take proper position before commissioning work and ensure that they are safe and comfortable to work freely with both hands.
24. Working personnel should not dependent on his colleagues for his safety.
25. Working personnel should ensure safe clearances and maintain adequate clearances during work from phase to ground/phase to phase.
26. Working personnel should ensure that proper tool being used in proper position with proper angle depends on work nature.
27. Working personnel should avoid unnecessary discussions / arguments during live line works carried out. They should not loose tamper, instead should work with calm and cool. Maintain high degree of co-ordination among the team
28. If situation warrants, moving the working personnel from one position to another position, they should inform to the colleagues and work in-charge.
29. Working personnel standing on ground should not come under work spot to avoid accidents (falling of tools, materials etc.)
30. In-charge of work should not do any work with his hands, he should take such a position on the ground from where he can see all working personnel and should instruct and guide them.
31. If the situation warrants leaving the in-charge from work spot, other workmen should stop working till he comes back,
32. In view of inadequate clearances, no hotline work should be carried up to 33 KV potential levels.
33. While performing live line operations using Bare Hand Techniques (BHT), there should not be more than one make and one break operation between the hot man and live equipment.

34. If situation warrants changing hot man position, he should do so duly maintain continuity with the potential at which he has been charged.
35. Proper care is to be taken by both hot man and hand line operation person on the ground while connection/disconnection of bus droppers / additional hardware to avoid existing of differential potential.
36. The person trained in Live Line Maintenance Techniques (LLMT) using Bare Hand Technique (BHT) are only eligible to perform bare hand operations up to and including 400 KV potential.
37. While performing bare hand operations, working personnel should ensure that the leakage current should not exceed the [potential level (400,220,132) in KV]/3 micro amperes ( $\mu\text{A}$ ).
38. While performing the hotline works the following safety clearances are to be maintained:

Voltage level Phase to Phase (KV)	Minimum distance of safe clearance to be maintained			
	Phase to Earth		Phase to Phase	
	Meters	Feet-Inches	Meters	Feet-Inches
30-35	0.7	2'-4"	0.7	2'-4"
35-46	0.8	2'-4"	0.8	2'-4"
46-72.5	0.9	3'-0"	0.9	3'-0"
72.5-121	1.0	3'-4"	1.4	4'-6"
138-145	1.1	3'-6"	1.5	5'-0"
161-169	1.2	3'-8"	1.7	5'-6"
230-242	1.5	5'-0"	2.5	8'-4"
345-362	2.1	7'-0"	4.1	13'-4"
400-450	2.73	9'-0"	5.87	16'-4"
500-552	3.4	11'-0"	6.1	20'-0"
700-765	4.6	15'-0"	9.4	31'-0"

39. Minimum distance of safe clearance to be maintained

Current Range in MA	Effect on Human body
0-1 mA	Cannot feel any thing
1-8 mA	Can feel, but no pain
8-12 mA	Painful, but can let it go
12-20 mA	Freeze, cannot, let it go
20-50 mA	Breathing Stops
50- 200mA	Heart Stops
200mA and Above	Severe burns

### 6.3: Care and storage of live line tools:

- I. Since the safety features of live line tools depend upon the electrical insulation and mechanical condition of the tools, great care shall be taken to ensure that they are properly cared for and maintained. The following instructions shall be noted:-
  - a) Live line tools shall not be altered or repaired except by the authorized to do so.
  - b) The tools shall be inspected regularly for checks, cracks, etc., by the Assistant Engineer, or a section officer delegated to such duty. Auxiliary equipments, such as blocks, shall be included in this inspection and shall be maintained in good condition.

- c) Insulating quality of sticks must be maintained. Maintenance of insulation shall not be attempted in the field except for touch-up of minor scratches.
- d) Special attention shall be given to the channel for the operating rod of the tie cutter and the clamp stick. It must always be kept thoroughly clean and dry.
- e) Live Line tools shall not be left lying on the ground where they might absorb moisture or otherwise be subjected to misuse.
- f) Live line tools shall not be dropped from a height but shall be raised and lowered by means of hand line.
- g) Live line tools shall be carried and stored only in an approved container and kept in a dry location. The rubber supports and seals of this container shall be maintained in good condition at all times.
- h) Live line tools shall be forwarded to the Electrical Research Department of the Research division for test and inspection at least once in every two years, or more often if deemed necessary.
- i) Live line tools shall be securely stowed. Material and tools which are not part of the set shall not be carried in live line tool trailers or boxes unless special provision is made so that the live line tools will not be damaged.

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## **Chapter - 7**

### **VEHICLES**

#### **7.1: License Required to Drive Board Vehicles.**

Any employee/contract employee (Driver) who drives APTRANSCO Motor vehicle/hired vehicle must possess a driving license issued by the competent authority. It is the responsibility of the officer-in-charge of the vehicle, to see that an employee/contract employee (Driver) is in possession of such a license before allowing him to drive. A person with a learner's license should not be permitted to drive a vehicle.

#### **7.2: Driving Regulations.**

Drivers/Contract drivers to the APTRANSCO vehicles/hired vehicles shall be guided by the rules prescribed by the Transport Authority.

#### **7.3 Motor Vehicle Accidents.**

1. If investigation indicates that the employee/contract employee (Driver) is at fault, he will be held responsible for accidents involving APTRANSCO motor vehicle/hired vehicle under his care and suitable action will be taken against employee/Agency of hired vehicle.
2. All accidents involving board APTRANSCO motor vehicle/hired vehicle shall be reported promptly to all the concerned officers.

#### **7.4: First Aid Kits.**

A first aid kit and the booklet of First Aid shall be carried on every vehicle and men shall be trained in First Aid

#### **7.5: Condition of Vehicle.**

The driver of every motor vehicle shall assure himself that the vehicle is in safe working condition at all times. Defects shall be reported promptly to the officer-in-charge/Agency of hired vehicle who will see that the defect is rectified promptly and quickly

#### **7.6: Transportation of Personnel.**

1. Employees shall not enter or leave a motor vehicle while it is in motion.
2. No person shall open the door of a motor vehicle on the road side without first ensuring that this act will not interfere with the movement of or endanger other motorists or vehicles.
3. Workmen shall not ride on trucks along with material if the nature of the load creates a hazard to personnel.
4. Sudden stops and starts shall be avoided.
5. A driver of a vehicle shall take all reasonable precaution to see that accidents are avoided.

#### **7.7: Passengers.**

Persons not employed by the APTRANSCO shall not be permitted to ride in board APTRANSCO vehicles/hired vehicles except when on authorized department business or in emergencies.

## **7.8: Courtesy.**

1. Since drivers are constantly under the notice of general public, it is important that they maintain a high standard of courtesy at all times. This can be accomplished by
  - (a) Practicing a general attitude of courtesy and consideration.
  - (b) Trying to be helpful even to the extent of inconvenience to themselves.
  - (c) Avoiding disputes and particularly arguments that cause irritation

## **7.9: Rail Road Crossings**

Drivers shall approach all railway crossings with extreme caution. If a stop is required to permit a train to cross, care must be taken before proceeding. Care must also be exercised to ensure clear roadway for crossing the entire track way. Speed should be reduced considerably to avoid accidents.

## **7.10: Rules for the care and operation of the Vehicles**

1. Before leaving the garage/Starting point i.e., office or sub-station, test the brakes, horns, lights, both front and rear. Do not leave the garage/Starting point i.e., office or sub-station with a defective vehicle. Also carry an extra set of light bulbs.
2. Safety in driving depends partly on your tyres. Watch your tyres. Over-inflation is bad for tyres. Also, it increases the skidding hazard. Under-inflation makes steering more difficult.
3. Observe local speed limits and do not speed on highways.
4. Where it is necessary to park on a grade, be sure that the vehicle is left in a safe position.
5. Avoid distracting the driver's attention from his job.
6. Employees should not attempt to get on or off a moving vehicle.
7. Employees should perform ride securely inside truck and vans.
8. Riding on trailers is prohibited.
9. In coupling trailers, be sure to place coupling pin securely and place cotter key in pin.
10. When vehicle is being backed, the driver should be guided by an assistant.
11. When a vehicle is parked in the street or highway, it should be stationed as far to the left as possible.
12. The driver shall satisfy himself that all employees are safely in the vehicle before the vehicle is started.
13. When emerging from or entering alleys or entrances, drivers should use proper precautions to avoid accidents.
14. On approaching corners or curves, the drivers shall reduce the speed of the vehicle, Corners or curves shall not be turned at a speed at which the vehicle cannot be brought to a stop within the range of vision.
15. The driver shall be alert for the sudden appearance of children in the through fare in this connection the following general rules shall be carefully observed. The vehicle shall be driven particularly cautiously when it is (a) passing schools, play grounds and children playing on the side of the road, (b) approaching children who are riding bicycles.
16. When following another vehicle, drivers shall maintain a sufficient space to avoid accidents. The space necessary for safety varies with the speed, load and other conditions. The drivers shall be alert to the signals from the preceding vehicle and for its sudden stopping.

17. In passing a standing vehicle, crowds or an object, beyond which he cannot see, the driver shall proceed very cautiously and be on the alert for pedestrians or vehicles that may quickly move into the traffic lanes.
18. Drivers shall not attempt to overtake and pass another vehicle while it is ascending a hill unless a good stretch of clear road ahead of the vehicle to be passed can be seen. He shall reduce speed just before reaching the top of a hill to avoid a possible collision with a vehicle that may be coming from the opposite direction on the wrong side of the thoroughfare.
19. Drivers shall operate the vehicle at a speed consistent with conditions surrounding street obstructions, particularly at night when approaching Signal lights or other warning signals.
20. In wet weather or when thoroughfares are covered with rain water, sharp turns and sudden application of brakes shall be avoided.
21. Park vehicles away from the main road or at extreme left thereof while making repairs. If at night, do not stand in front of tail lamps.
22. When trailers, poles etc., are hauled in the rear of the vehicle, or when it is necessary to carry loads which will project beyond the rear end of the body, red flags, or at night, red lights shall be placed at the extreme end of the object trailed or load carried.
23. Vehicles shall not be overloaded.
24. Bring all vehicles to a full stop before passing through garage/End point i.e., office or sub-station doors.
25. When approaching rail roads, the drivers shall approach cautiously. Never follow another vehicle which is crossing the track so closely that its stopping might enforce your remaining on the tracks. Flag heavily loaded vehicles and vehicles towing trailers across unprotected crossings.

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## Chapter - 8

### TREE CUTTING

#### 8.1 Tree Cutting.

1. The following precautions shall be observed while tree cutting:
  - a) In locations, where ordinary tree cutting operations might cause damage to property, trees shall be suitably dismembered and felled using recognized practices.
  - b) Whenever practicable, trees shall be felled directly away from a power or telephone line after having removed all limbs that might contact the line or cause damage to other trees or property. If the tree must be felled towards a line, it shall be topped low enough to clear all conductors, poles, guys, etc.
  - c) Pulling down trees or lowering limbs by means of attachment ropes connected to a moving motor vehicle is prohibited.
  - d) Guy ropes shall be used on all trees that are sufficiently large to cause damage should they fall in any direction other than that intended. The guy ropes shall be installed before any cutting is done at the base.
  - e) Anchors for guy ropes shall be installed in such a position that persons handling the guy ropes shall be able to stand well outside the striking distance of the tree.
  - f) Before a tree is felled, men other than those actually engaged in cutting the tree shall keep clear of any area within the possible striking distance of the tree. Men shall not be allowed to remain in nearby trees if there is any doubt as to their safety.
  - g) Ample warning shall always be given before a tree is expected to fall and the workmen must stand clear in case the tree springs from the stump while falling.
  - h) Under no circumstances shall a partially cut tree be left standing during a lunch hour or overnight.

#### 8.2: Lowering Severed Branches from Trees

1. When it is necessary to remove branches from above a live line and the branches cannot be controlled safely by hand, they shall be lowered by means of at least two ropes, one for lowering and one attached to the butt for guiding. For personnel safety, LINE CLEAR must avail on that particular line, for removing branches from above a live line.
2. Ample warning must always be given before a limb or stub is dropped from a loft.
3. Allowing branches to fall on overhead lines, fences, flower beds or where they will damage private property must be avoided.
4. No partially cut branches shall be allowed to remain on tree overnight.

#### 8.3: Working above the level of Live Conductors

1. Branches which are likely to be broken and fall on the conductors and any branches which are likely to whip into the circuit during the clearing operations, shall be carefully removed.
2. Large branches which are to be cut directly above a line shall be controlled and lowered by means of ropes. Branches which are to be pruned or removed from above a line and which are too short to require roping, shall be cut off in short lengths, each length to be shorter than the distance between line phases. The workmen must not touch by hand any branch which is in a position to contact a live conductor.

#### **8.4: Public Relations**

Tree trimming or tree removal involves the public and private interest to a large degree. Permission is required from the authorities or owners concerned. In those cases where criticism of tree trimming or removal is anticipated, the matter should be referred to the competent authorities for decisions before permission is requested.

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## Chapter - 9

### SAFETY PRECAUTIONS IN CONSTRUCTION WORKS

#### 9.1: Transport of Materials.

- i. When tower parts are being loaded, workmen must not stand between the tower parts and the conveyance. Nobody shall stand or pass under a suspended load.
- ii. If tower parts are to be transported on a flat type of trailer, they shall be stacked neatly and fastened together tightly.
- iii. Workmen shall not travel on trailers loaded with tower parts.
- iv. Danger flags (red color) shall be fixed as necessary
- v. During the course of transport of any equipment like transformers, etc., they shall rigidly be secured to the transport vehicle and packing material put on either side of the base of the equipment to prevent skidding. The loading shall be supervised by the competent authority.
- vi. No employee shall stand between the equipment and the sides of the transport vehicles.
- vii. While making turnings or going up or down inclines with loaded vehicles, very great care should be exercised in driving and over speeding should never be resorted to. The brakes of vehicles should be specially checked.
- viii. While transporting tall equipment, care should be bestowed for keeping the balance of the vehicle particularly at turnings.
- ix. When transporting particularly tall equipment, it should be ensured that there is sufficient clearance between overhanging branches of trees on roads and any telegraph or other line and the top of the equipment (highest part of the equipment).
- x. Loading and unloading of tower parts:
  1. The loading and unloading of tower parts should be done very carefully and systematically. When it is performed manually the respective persons should wear suitable safety gloves.
  2. In most cases the tower parts are supplied from bottom to top of the tower. So there should be some special and clear signaling or communication between the persons who supply tower parts.
  3. If any lifting equipment is used to lift such tower parts the lifting equipment must be tested according to the standard loads.

#### 9.2: Erection work.

1. Tower foundation pits in sandy and collapsible soils should be shuttered and should not be dug much in advance of casting tower foundation.
2. Warning danger boards should be exhibited on either side of the pits in inhabited areas.
3. Pits excavated on road sides in advance of casting tower foundation erection should be covered or suitably fenced before closing the work for the day.
4. The derrick used for erection of transmission tower needs to be checked especially for its respective strength and size.

5. Correct size of nuts and bolts are to be used between the sections of tower to connect the tower members.
6. Erection works during adverse weather conditions:
  - i. It is better to avoid all activities of tower erection in rainy/heavy cloudy and lightning days to avoid potential hazards due to storms & lightening strokes.
  - ii. Under unexpected heavy wind or storm, it is really essential to take the migratory measures. Every person who work near such tower line should immediately walk away from the tower line to eliminate the potential hazards.
7. The excavation for pad or pile type foundations in excess of 1.5 mtr. depth located on unstable earth, shall be either sloped to the angle of repose or shored if entry is required. Ladders shall be provided for access to paid or pile type-footing excavations in excess of 1.2 mtr.
8. Wherever the foundation is being constructed on unstable earth, the workmen shall not be permitted to enter the excavated pit unless shoring is done.
9. Only responsible and skilled employees shall be deployed for directing mobile equipment adjacent to footing excavations.
10. No workmen shall be permitted to remain in the excavated pit where concreting is done using machinery.
11. The mobile equipment shall be located only on levelled earth to assure stability.
12. Sufficient care shall be taken during tower erection to see that more than the minimum numbers of workmen are not deployed. This will minimize injury due to exposure of falling objects on workmen, when working at two or more levels. Proper protection such as use of helmets, safety belts etc., shall be insisted upon.
13. SAFETY GUIDELINES FOR WORKING ON LT / HT POLES & STRUCTURES DURING TOWER ERECTION / STRINGING OF EHT TRANSMISSION LINES:
  - a) Shut Down (S/D) of the LT / HT Lines where jumpers are to be opened or conductors are to be brought down to facilitate Tower Erection or Stringing shall be obtained from the respective Utility as per the prevailing prescribed procedure.
  - b) If the conductors of the existing power lines are to be brought down for carrying out stringing work or for any repair / restoration work, it shall be checked whether there is a possibility of the same touching the nearby charged Lines or infringing the electrical safety clearance. If such situation exists, then shut down shall be obtained in those nearby lines also for safe ROW / corridor clearance.
  - c) While taking shut downs of Utility Lines, especially LT / 11 KV Lines, possibility of back feeding shall be checked, and if such possibility exists, isolation / opening of jumpers / locking arrangement to avert inadvertent operation shall be done at all such possible junctions, in addition to deploying local earthing.
  - d) Screening of the workers before deploying them for work on poles & structures shall be done to ensure that only experienced workers / fitters are deployed for working at height / shut down works.
  - e) Sufficient supervisory personnel shall be deployed for close monitoring while various type of works are under progress at the same or different locations. Supervising work

- should not be delegated to the sub-contractors 'personnel.
- f) The deployed Supervisor(s) should not leave the working spot when work at height or S/D work is in the process, as the workers may not be aware of the consequences of unsafe practices. Dedicated Supervisors shall be available for such works.
  - g) Fitters should not be permitted to climb the tower / structure without the presence of the identified Supervising personnel at the particular location(s).
  - h) APTRANSCO Site Supervising Personnel shall be vigilant and strictly monitor the daily activities and keep regular communication with the executing Agency's Supervisors / Site in- charge and ensure that the safety requirements are implemented by them at all point of time.
  - i) Fitters should be permitted to climb the utility poles / structures for opening the jumpers only in the presence of the concerned Lineman / JE of the Utility and after fixing the discharge cables, as required. The earthing cables shall remain connected in the isolated section of the line till the LC is returned on completion of work
  - j) Again, the fitters should be permitted to climb the utility poles / structures for re-connecting the jumpers only in the presence of the concerned Lineman / JE of the Utility and after doubly ensuring that any intersection line portion, if any, at the jumper connecting point is not charged, and after fixing the discharge cables, as required.
  - k) Before giving clearance for the workers to climb the Poles or Structures, the Site Supervising Personnel of APTRANSCO as well as the Agency shall doubly ensure that the said Line has been effectively switched off, and verified by use of suitable Testing devices such as "AC High Voltage Non-Contact Proximity Detectors with Hot Sticks".
  - l) It should be ensured that none of the workers climb the towers / structures or approach the conductors, without confirming the shutdown and without providing local earthing of the lines / circuits for which shut down is being availed.
  - m) Where two or more crews are working independently on the same line or equipment, each crew shall properly be protected themselves by placing their own temporary grounds / local earthing.
  - n) 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.
  - o) All the fitters / workers required to work at height shall be provided with double lanyards safety belts, and it shall be ensured by the associated Agency's Supervising personnel that the fitters / Workers anchor both the lanyards to the structure / cross arm, immediately on reaching the work point.
  - p) On arriving at the working position, the fitter shall put his safety belt around the pole or cross arm or some other suitable support and make sure that the belt is properly secured / anchored. Safety Belts shall not be attached to insulator pins, span wires, guy wires, etc.,
  - q) If the tower or structures are apparently unsafe because of decay or unbalanced tensions of wires on them, they shall be properly braced or guyed at appropriate levels before they are climbed.
  - r) Before releasing any load on the tower/structure exerted by the existing conductors on the end points / cut points, additional support stays shall be given on all the directions

- after due consideration of load balancing carefully.
- s) The guy ropes shall be installed before any changes are made on the line conductors and care must be taken not to place excessive pulls on the tower /structure and conductors already in position.
  - t) Due care shall be taken while removing the conductors in between sections or near the end points to ensure not to exceed the load bearing capacity of the tower /structure due additional weight of the persons, self-weight of the conductors, etc.
  - u) Ordinarily no fitter should work vertically below another fitter on the same pole except under extreme necessity. When this condition cannot be avoided, extreme care shall be taken to prevent tools or other objects being dropped upon the man below.
  - v) Before a fitter cuts or disconnect an overhead conductor, he should make sure that it will fall clear. Where there is a possibility of the falling conductors coming in contact with another wire or doing other damage, it should be lowered with a rope.
  - w) Men working on the ground shall stand clear of overhead work to prevent being struck by falling objects.
  - x) Tools and materials shall not be thrown from the ground to a fitter working a loft, nor shall fitter throw tools and materials from working place to the ground.

### **9.3: Energization of Lines and Equipment.**

1. Before any new equipment or line is energized, it shall be the responsibility of the Officer-in-charge of the work to notify to the workmen that the line or equipment is being energized and that it will no longer be safe to work on line or equipment without proper line clear. Acknowledgement of all the workmen in writing should be taken in token of having intimated them.
2. Wide tom - tom should be arranged in all the localities through which the line that is to be energized passes, intimating the energization of the line and warning the public against the dangers in meddling with the line.
3. The person energizing the line or equipment shall personally satisfy himself that the same is in a fit state to be energized.

### **9.4 Safety Points in the Transmission Line Construction:**

1. While Back Filling the Foundation Pits never allow Tractor or JCB to move near Foundation Stubs for dumping Earth in Foundation Pits, as it will disturb Foundation Stubs.
2. Before Commencing Tower Erection Check Diagonal Distances between Foundation Legs. These Distances should match. Vertical level of all Four Stubs to be checked with water tube or Theodolite. All Four Stubs should be at same level. On any deviation in the above parameters, Tower Erection should not be commenced until rectification.
3. Extreme care should be taken about surrounding HT and EHT Live Lines while doing Tower Erection. Necessary Line Clear may be availed wherever required.
4. After Completion of Tower Erection Tower Verticality should be checked, any deviation should be within allowable margin.
5. Tower Earthing should be completed prior to Tower Erection for the safety of people working on the Tower.

6. Trees should be cleared in the corridor to facilitate commencement of Stringing.
7. Necessary Line Clears may be availed on various Power Lines which are crossing underneath for facilitation of Stringing of the Line. Necessary Clearances to be maintained from various Power Lines which cross underneath and overhead after completion of Stringing Work.
8. For Stringing of the Conductor on the Line, Tensioning with tractor should not be encouraged. Instead, use of Leg Winch or Motorised Winch should be used. Wherever possible Tensioning machine may be used.
9. Sag Boards should be used during Stringing of the Line.
10. Clipping of Conductors on Suspension Towers should be taken up after 24 Hours of Final Tensioning,
11. While Compressing the Steel Cones and Aluminium Cones care should be taken such that proper size Die Sets are used, and no holes should be formed after Compression.

#### **9.5: Safety Points for Line Maintenance**

1. Before attempting any Shut down the Line should be Isolated and Earthed at Both ends of the Line. Local Earthing should be done at the Work Spot. Without Earthing No Work should be attempted on the Line.
2. All the Staff should wear Helmets, Safety Belts for working in the Tower. The person should use the Safety Belt compulsorily while working on the Tower.
3. Necessary Stays should be provided before unloading the Conductor from the Line.
4. All the underneath Crossing Lines (415V, 11KV, 33KV, 132KV, 220KV, 400KV) should be de energized and cleared if required from the Line before Commencement of any Shut Down Work.
5. Leg Winch or Motorized Winch Should be used for tensioning and releasing the Conductor on the Line.
6. While Compressing the Steel Cones and Aluminium Cones care should be taken such that proper size Die Sets are used, and no holes should be formed after Compression.
7. To the Possible Extent Night time work to be avoided, if inevitable Flashlight to be arranged with portable Generator Set such that visibility is clear for comfortable working.
8. After Completion of the Work, in charge of the Shutdown work should ensure that the Line is clear from all men and materials. All local Earths to be removed before returning Shutdown.
9. After Return of Line Shut down the Line should be Idle Charged from the Shut Down availing end.
10. Line Earths to be checked periodically such that All Towers are earthed.
11. While Tree cutting during patrolling the Line extreme care should be taken to not enter Induction Zone of Line Conductors, if required Shut Down should be availed on the Line prior to Tree Cutting.

## **Chapter - 10**

### **FIRST AID AND SHOCK TREATMENT**

#### **10.1: First Aid Kit, its location and maintenance**

- (i) In every sub-Station and vehicle, there shall be a first aid box of the prescribed variety. As and when the medicines and other contents are used up/ expired, these should be replaced immediately. Every First Aid box shall contain simple and easily understandable instructions for their use in the local language.
- (ii) The first aid equipment should visibly be located so that the contents are easily

accessible.

(iii) The first aid shall be administered only by trained employees. The names of authorized persons to render first aid and the location and telephone numbers of the hospitals in the areas should be displayed prominently.

(iv) The first aid kits should periodically be inspected by the in charge of Sub-Station and it should be ensured that the kits are always equipped completely.

## 10.2: Contents of the First Aid Kits.

The following shall be the scale of equipment in the first aid kits.

### FIRST AID KIT

S.No.	Items	Quantity
1	Small size sterilized dressings	12 Nos.
2	Medium size sterilized dressings	6 Nos.
3	Large size sterilized dressings	6 Nos.
4	Large size sterilized burn dressings	6 Nos.
5	Packets of Sterilized cotton wool (15gm)	6 Nos.
6	Snake – bite lancet	1 No.
	a) Artery forceps Surgical Scissors 4” -Straight	1 No.
	b) Artery forceps Surgical Scissors 4” -Curved	1 No.
7	Potassium permanganate crystals (30ml)	1 No.
8	bottle of mercurochrome solution (2 per cent) in water (60ml.)	1 No.
10	Bottle containing Sal-volatile having the dose and mode of administration indicated on the label	1 No.
11	Roller Bandages 6” wide	3Nos.
12	Roller Bandages 4” Wide	6 Nos.
13	Roller Bandages 2” Wide	6 Nos.
14	Roller of Surgical Adhesive Plaster	1 Roll.
15	Triangular Bandages	3 Nos.
16	Safety Pins	1 Packet
17	A supply of suitable splints	1 Set.
18	Tourniquet	1 No.
19	Pieces of sterilized eye pads in separate sealed packets	6 Nos.
20	Polythene wash bottle (500 c.c) for washing eyes	1 No.
21	Forceps toothed 4” inch	1 No.
22	Splint Crammer wire	3 Pieces
23	Kidney tray	1 No.
24	Ambu Bag	1 No.
25	Surgical spirit bottle (100 ml.)	1 No.
26	Silverx ointment	1 tube
27	Aspirin or any other analgesic tablets	2 Sheets.
28	Adhesive tape (1/2” & 1 1/2” size	Each 1
29	Betadine solution (for wound clean)	1 No.
30	Normal Saline (for cleaning wound)	1 No.
31	Electoral Sachets	1 No.
32	Tab. Dolo 650mg. (fever, pain)	1 Strip

33	Tab. Atarax-5mg (Skin Allergy)	1 Strip
34	Band aid	1 Strip
35	Tab.Sarbitrate-5mg **	1 No.
36	Tab.Ecosprin (Aspirin 325mg)-**	2 Nos.
37	Tab. Atorvastatin 80mg (2 Nos) **	10 Nos.
38	Elastic Wraps	1 No.
39	First Aid leaflet issued by the Chief Advisor of Factories, Government of India. (Annexure)	1 No.

### **10.3: Electrical Burns and First Aid Treatment.**

Electrical burns may occur due to:

Passage of electric-current through the body and garments due to inadvertent contact with electric supply.

Electric arcing and if the patient is not breathing, artificial respiration should be resorted to immediately as separately described in this chapter. When satisfactory breathing is restored, treatment of burns may be undertaken.

If the burns are small, a small amount of any burn ointment may be applied and the burns covered with sterile gauze dressing with bandage finishing.

If the burns are extensive, the victim may be covered with a clean sheet and moved to a doctor.

### **10.4: Chemical Burns.**

Burns caused due to acids and alkalis should thoroughly be washed immediately with water to dilute away the acid or alkali and to wash it away. Then treat the patient for burns and call for a doctor.

### **10.5: Clothing on Fire**

The victim should not be allowed to run but covered with a thick blanket or rug to smother the flames and subsequently the victim should be treated for burns.

### **10.6: Shock Treatment.**

Shock treatment cards are to be fixed at all places of work like generating stations, substations, distribution offices etc., Every employee in the organization should make himself conversant with the methods for treatment of persons in the event of an electric shock and practice them beforehand so that they may be applied quickly when necessary.

When any person receives electric shock or is suspected to have received a shock, the following procedure is to be adopted even if he appears to be dead.

Note: First Aid drills and safety meetings (demonstrations and practice by all authorized persons etc.) shall be conducted once in a calendar month in each section.

### **10.7: Removal from Contact.**

The apparatus or conductor which has given shock to the casualty should be disconnected from supply as quickly as possible. If that should take time, the rescuer should remove the

victim from the electric contact by standing on a dry wooden chair or rubber or coir matting. Otherwise the casualty may be pulled free from the contact by using a dry stick, dry rope, dry cloth or any other such non-conductor. Bare hands should not be used. The rescuer should ensure that he is well insulated before touching the casualty.

If the patient's clothes are burning, the fire is to be extinguished by using a rug or rolling the patient on the ground. Then the nearest doctor should be sent for. Then examine the casualty. If the casualty is breathing and has only received burns, he is to be treated for the burns as indicated earlier.

If the casualty is not breathing, artificial respiration is to be rendered without any delay as indicated below. The victim's dress should be loosened. The mouth and throat should be examined for any foreign material like tobacco, false teeth etc. It should be removed from the mouth of the casualty quickly. If the mouth is tight-shut, pay no more attention to it until later.

Begin artificial respiration immediately without wasting even one second. Remember that there is no medicine for treatment of persons suffering from electric shock.

As chances of recovery will be more and more remote with a delay of minutes, everyone should familiarize himself thoroughly with the methods of Artificial Respiration to earn the credit and satisfaction of saving lives.

Also send for a Doctor-DELAY MAY RESULT IN DEATH.

And Call the Ambulance immediately

### **10.8 Artificial Respiration.**

When electric current passes through the breathing center in the brain, it paralyses the same for some time and consequently breathing stops. By artificial respiration it is possible to resuscitate the breathing action. There are many methods for artificial respiration. They are to be utilized depending on the condition of the casualty i.e., if he has received burns on face and chest, he should not be laid face downwards and if he has burns on the back and cannot be laid on his back, the other suitable method is to be chosen. For rendering artificial respiration, the casualty should be laid flat with head and chest about 6" to 8" lower than the feet. He should not be removed from the place of artificial respiration till he breathes normally. He may then be removed but only in a lying position. Never give an unconscious man anything to drink since it may choke him.

### **10.9: Various Methods of artificial respiration.**

The following are the various methods of artificial respiration.

- i) Neilsen's Armlift back-pressure Method.
- ii) Schafer's Method.
- iii) Silverster's Method.

The procedure of each of the methods is described below: -

### **10.10: Neilsen's armlift back pressure method.**

Position 1. (Refer Figure No. 6)

Place the victim face downwards with his arms folded one over the other and the head resting on them.

Kneel at the victim's head on one or both knees. Place your hands on the back of the victim away from the armpits with your fingers spread out downwards and thumbs touching each other.

Position 2.

As you count one, two, three, rock forward, keeping arms straight until they are nearly vertical thus steadily pressing the victims back. This completes expiration.

Position 3.

As you proceed to count four, rock backwards releasing pressure and slide your hands downwards along the victim's arms and grasp his upper arm just above the elbows. Continue to rock backwards:

Position 4.

As you rock back counting five, six, seven, raise and pull the victim's arm towards you until you feel tension in his shoulders. This expands his chest and result in inspiration.

As you count eight, lower the victim's arms and move your hands for the initial position. Repeat this cycle twelve times a minute. When the victim starts breathing, synchronize your steps with his breathing until he breathes strongly. Then stop.

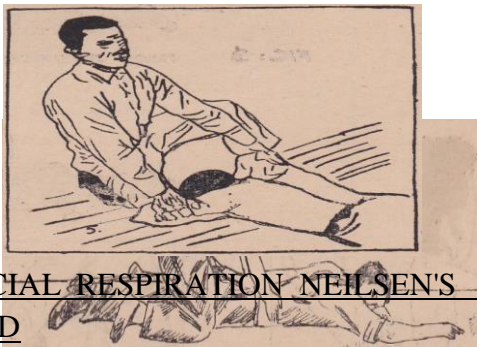
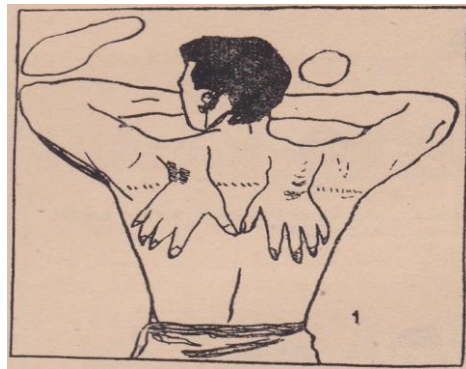
#### **10.11: Schafer's method (Refer figure No. 7)**

1. Lay the patient on his stomach one arm extended directly overhead the other arm bent at elbow and with the face turned outward and resting on hand and forearm so that the nose and mouth are free for breathing. Kneel over the patient, rest the hands flat on the small of his back with fingers resting on the ribs, the little finger just touching the lowest rib with the thumb and other fingers in a natural position and the tips of the fingers just out of sight.
2. With arms straight swing forward slowly and gently over the patient so that the weight of your body is gradually brought to bear on the patient exerting a steady pressure downward. The shoulder should be directly over the heel of the hand at the end of the forward swing. Do not bend your elbows.
3. Swing yourself gently backwards so as to completely remove the pressure.
4. After two seconds, swing forward again. Continue these two movements twelve to fifteen times a minutes. The object is to keep expanding and contracting the casualty's lungs so as to initiate slow breathing.

#### **10.12: Silvester's Method. (Refer Figure No. 8)**

(Armlift Chest Pressure Method.)

1. The patient is laid on his back. His arms are grasped above the wrists and drawn first upward and then above the head until they touch the floor.



ARTIFICIAL RESPIRATION NEILSEN'S METHOD

ARM LIFT BACK PRESSURE

FIGURE—6 (Refer Rule No. 10.10)

### Artificial Respiration –SCHAFER’S Method

Fig: 1 POSITION IN WHICH PATIENT SHOULD BE PLACED AND KEPT UNTIL CONSCIOUS. FIRST POSITION FOR OPERATOR. CONSCIOUS. FIRST POSITION FOR OPERATOR.



Fig 2: SECOND POSITION OF OPERATOR



Fig 3: THIRD POSITION OF OPERATOR



FIG: 4

Fig: 4 RELIEF OPERATOR. TAKING OVER COMES IN WITH FEET AND KNEE POSITIONS AS SHOWN

Fig 7:  
Refer Rule No: 10.11

## ARTIFICIAL RESPIRATION

### SILVESTER'S METHOD



### INSPIRATION CHEST EXPANDED



## **EXPIRATION CHEST COMPRESSED**

**FIGURE—8**  
(Refer Rule No. 10.12)  
**CHEST EXPANDED**

2. Bring back the arms to the chest and exert pressure in a downward direction.

N.B. : The tongue is to be put out and held in that position so that it does not obstruct the throat. Otherwise a large thick pad may be placed behind the shoulders, so that the head lies dangling downwards and the tongue does not obstruct.

### **10.13 Arrange for stand –by operator**

In carrying out artificial respiration, it may be necessary to change the operator. This must be done without losing the rhythm of respiration. Continue artificial respiration for at least four hours or until RIGOR MORTIS sets in. Breathing has returned even after eight hours in a case of electric shock, but in such instances the victim will show some signs of recovery which will call for continued effort even on the part of the rescuers.

After obtaining the Doctor's advice on arrival, the victim can be moved, and artificial respiration can also be carried on simultaneously, if necessary. A brief return of natural respiration is not a certain indication for stopping the resuscitation. Not infrequently, the victim, after a temporary recovery of respiration, may stop breathing again. The victim must therefore be watched and if natural breathing stops, artificial respiration should be resumed at once.

### **10.14: Treatment after Recovery.**

**Upon Recovery:** Burns, if serious should be treated with a proper dressing. Avoid exposing patient to cold. Administer no restoratives until the doctor comes. Cold water may be drunk and smelling salts applied in moderation.

### **10.15: Images**



# ELECTRIC SHOCK AND TREATMENT

# विद्युताघात तथा उपचार



Stand on insulating material to touch victim.  
विद्युत रोधक वस्तु पर खड़े होकर घायल का स्पर्श करें।

## Effects of Shock

1. Paralysis of respiratory muscles.
2. Extensive and deep burns.
3. Muscle contraction.
4. Dehydration.
5. Clotting of blood.
6. Necrosis.
7. Heart failure.
8. Kidney failure.

## Treatment

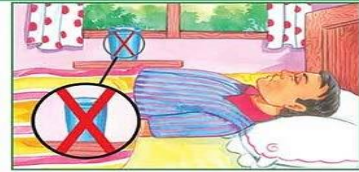
1. Do not move the victim.
2. Call for help.
3. Switch off or move the current source using insulating object.
4. Loosen tight clothing. Give artificial respiration and treat any burns.

## विद्युताघात के परिणाम

1. श्वसन पेशीयों का पक्षाघात।
2. व्यापक व गहरे दाह।
3. मांसपेशी संकुचन।
4. निर्जलीकरण।
5. रक्त के थक्के।
6. परिगलन।
7. हृदयघात।
8. गुर्दों की लक्ष्मी।

## उपचार

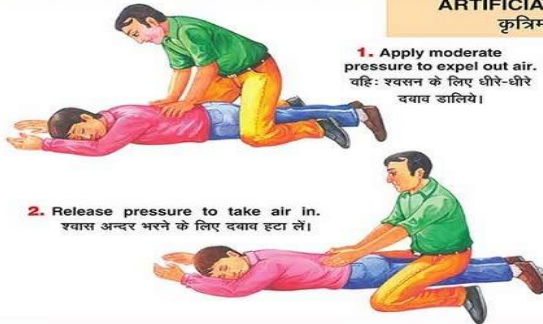
1. मरीज को हिलाने नहीं।
2. मदद के लिए पुकारें।
3. विद्युत्स्रोत वस्तु की मदद से करंट बंद करें।
4. ढंग कापड़ों को ढीला करें। कृत्रिम श्वसन दीजिए और जलाने हुआ हो तो उसका उपचार कीजिए।



Never give any thing to drink to an unconscious person.  
अचेत व्यक्ति को कोई भी वस्तु पीने के लिए न दें।

## ARTIFICIAL RESPIRATION

### कृत्रिम श्वास क्रिया



## CONTACT IN EMERGENCY :

### आपातकालीन स्थिति में सम्पर्क करें :

Doctor  
डॉक्टर



Electricity Department  
बिजली घर

Ambulance  
रोगी वाहन



The speed with which casualty be brought under treatment is of utmost importance.  
घायल का अतिरीघ्र उपचार परम आवश्यक है।

Fire Brigade अग्नि शमन सेवा



Police पुलिस

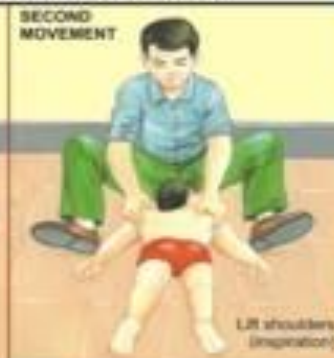


# Artificial Respiration

## HOLGER - NIELSEN METHOD (For Adults)



### For Children Under Five Years



## SCHAFFER'S METHOD



## SILVESTER'S METHOD



# RESUSCITATION

## 1 Danger

Check For Danger To You  
To Casualty  
And To Others.

## 2 Response

Talk & Touch

RESPONDS

Reassure,  
Make Comfortable.  
Treat Bleeding And Other Injuries.



## 3 Send For Help

EMERGENCY PHONE: 000  
REMOTE AREAS PHONE: 112  
from mobiles

## 4 Airway

Open Airway

NO RESPONSE

If Required, Roll Casualty  
On Side To Clear Airway.



## 5 Breathing

Check For Breathing

BREATHING

Observe Breathing  
Look, Listen & Feel



## 6 CPR

For Mutual Protection The Use Of A Shield  
Devices Is Recommended

NOT  
BREATHING  
NORMALLY



Begin CPR  
30 Compressions Followed By 2 Rescue Breaths  
If Unwilling/ Unable To Perform Rescue Breaths Continue  
Chest Compressions  
Continue CPR until responsiveness Or Normal Breathing Return

## 7 Defibrillation

Attach AED  
(Automated External Defibrillator)  
If Available & follow its prompts.



**Child Resuscitation Guide**

**Child Not Breathing Normally** → Give 2 small breaths. Moderate head tilt. Using 1 or 2 hands compress 1/3 chest depth on the middle of chest. Give 30 compressions & 2 breaths.

**Infant Resuscitation Guide**

**Infant Not Breathing Normally** → Give 2 puffs of air. Nil head tilt. Using 2 fingers, compress 1/3 chest depth on the middle of chest. Give 30 compressions & 2 breaths.

**FIRST AIDER'S CHOICE** 

Date: 2015  
© Study Australia Pty Ltd 2015  
This chart is a quick reference  
summary and does not intend  
to replace formal first aid training.





Cardio Pulmonary Resuscitation Rate Chart			
	Adult & Older Child	Young Child 1-8	Infant Less Than 1
Head Tilt	Maximum	Moderate	Nil
CPR Pressure	2 Hands	1 or 2 Hands	2 Fingers
CPR Chest Depth	1/3	1/3	1/3
CPR Rate	100/min	100/min	100/min
Ratio of Compressions to Inflation	30:2	30:2	30:2

If unwilling/unable to perform rescue breathe continue with chest compressions.

# BURNS & SCALDS

A person on fire.



1. Drop the casualty to the ground.
2. Wrap him tightly in a non – inflammable blanket.
3. Roll him until the flames are smothered.

## First Aid Essentials – FIRES



4. Then pour cold water on him.
5. Cover the injured part.
6. Rush him to a hospital.

When trapped in a building on fire



Shut the door and place a thick cloth against the bottom of the door to keep the smoke out. Open the windows, keep low, if possible escape through the window, feet first.

1. Help the casualty to lie down. If possible, prevent the burnt area from coming into contact with the ground. Pour a lot of cold water over the burnt area until the pain is relieved.



## SEVERE BURNS & SCALDS



2. Carefully remove burnt clothing unless it is sticking to the burn. Also remove rings, belts, watches, shoes to prevent swelling.



3. Cover the injured area with a sterilize dressing or any clean piece of cloth to protect it from infection.
4. Take the casualty to a hospital immediately.

## MINOR BURNS AND SCALDS

1. Pour a lot of cold water over the burnt area until the pain is relieved.

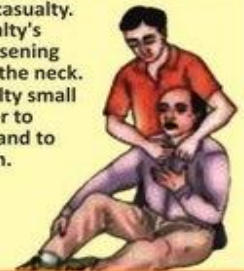


2. Cover the injured area with a sterilize dressing or any clean piece of cloth and bandage it to protect it from infection.



## BURNS TO THE AIRWAY

1. Reassure the casualty.
2. Improve casualty's air supply by loosening clothing around the neck.
3. Give the casualty small sips of cold water to reduce swelling and to avoid suffocation.

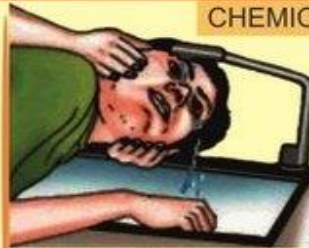


## CHEMICAL BURN

1. Move the casualty to a safer place. Ventilate the area or seal the chemical container.
2. Pour a lot of cold water over the injured area to remove chemical and to stop the burning. Make sure the water doesn't collect underneath the patient.
3. Remove any contaminated clothing.
4. Take the casualty to a doctor.



## CHEMICAL BURN TO THE EYE



1. Hold the casualty's affected eye under gently running cold water to irrigate the eyelids thoroughly.



2. Apply a loose sterile eye dressing or a clean piece of cloth over the injured eye.

## ELECTRICAL BURN

1. Make sure that the electrical contact is broken before giving any first aid.
2. Pour a lot of cold water over the injured area to cool down the burns.
3. Apply a sterile dressing to protect it from airborne infection.



## SUNBURN

1. Cover the casualty's skin with light clothing or a towel and move her into the shade or preferably indoors.
2. Cool her skin by sponging with cold water or by soaking the affected area in a cold bath.
3. Let the casualty take frequent sips of cold water.
4. If it is minor sunburn apply after sun preparation. If it is a major burn, take the casualty to a doctor.



# ELECTRIC SHOCK

**IF THE CASUALTY HAS STOPPED BREATHING, THIS IS WHAT YOU SHOULD DO**



★ Keep calm but act with great urgency ★ Switch off supply, if not possible immediately, don't waste time searching for switches. ★ Remove from cause. Safe guard yourself. Remove the casualty from electric contact. Use rubber mat and rubber hand gloves, dry wood, dry rope, dry clothing or a thick pack of news papers ★ Make sure that someone calls for medical help. ★ If burns are present ask some one to cover them with a dry sterile dressing. ★ Prevent crowding of people around blocking fresh air. ★ Star giving artificial respiration preferably by

### MOUTH-TO-MOUTH METHOD.

- ★ Lay the casualty down in a face-up position.
- ★ Loosen the tight clothing. (Fig.1)
- ★ Clear his mouth of obstructions. (Fig.1)
- ★ Open his air way by tilting his head back and pushing the chin upwards.
- ★ Keep a folded blanket or the like under his shoulders.
- ★ Hold his chin upwards with one hand, pinch his nostrils with the other. (Fig.2)
- ★ Open your mouth, take a deep breath. (Fig.2)
- ★ Seal your lips over his mouth.
- ★ Watch his chest and breath gently into his lungs untill his chest raises. (Fig.3)
- ★ You can feel the air getting into the casualty's lungs when you breather air into his/her mouth.
- ★ Remove your mouth and watch his chest fall. (Fig.4)
- ★ Repeat this four times in quick successions.
- ★ If you are unable to inflate his lungs with the first few attempts:
  - ★ Roll him on his side.
  - ★ Slap him sharply between the shoulders several times, to loosen any obstructions. (Fig.5)
- ★ Bring him to face up position again.
- ★ Repeat and Continue inflations at your natural rate of breathing. 12 times a minute until he breathes on his own.
- ★ Check the pulse.

### SEQUENCE

- ★ Swith off Current.
- ★ Remove from cause
- ★ Unless the casualty is breathing normally give artificial respiration till casualty starts breathing.
- ★ Treat for shock
- ★ Treat for burns
- ★ Transfer to hospital.

# ఎలక్ట్రిక్ షాక్

**ప్రమాదానికి గురైన వ్యక్తికి శ్వాస ఆగితే వెంటనే ఇలా చేయండి**

★ చురుకుగా, నిదానంగా, నిశ్శబ్దంగా అవ్యక్తిని రక్షించే ప్రయత్నం ప్రారంభించండి. ★ మొదట పనిగా స్విచ్ నొక్కే విద్యుత్ ప్రసారాన్ని ఆపండి. ఆ పాదాపిడిలో స్విచ్ ఎక్కడ ఉందో మీకు కనబడకపోవచ్చు. స్విచ్ కౌసం వెతుకుతూ కాలుయాపన చేయకండి ★ ప్రమాదంలో ఇరుక్కప్పు వ్యక్తిని రక్షించే ప్రయత్నంలో మీరు చిక్కాలో పడకూడదు. రబ్బరు పట్టాపై గాసి, పాడిగా పుస్తా చెక్కపట్టాపై గాసి చాడితాడుతో గాసి, పాడి బట్టలతో గాసి, ఆఖరికి పాడికాగిశాల దొంతరతో గాసి, ఎలక్ట్రిక్ షాక్ కు గురైన వ్యక్తిని విద్యుత్ పరికరాల నుండి కరింతు తీగల నుండి బయటకు లాగండి. మీకు ఆపకాళం ఉంటే రబ్బరు గ్రఫ్ఫసులు, రబ్బరు బూట్లు ధరించండి. ★ చైర్మన్ కౌసం కలుపు పంపండి. ★ శ్వాస కోల్పోయిన వ్యక్తి కరింపై చొబ్బాలు, గాయాల ఉంటే వాటిపై గాజుగుడ్డ / పుట్టపైన బట్టను కప్పండి. ★ రోగి చుట్టూ జనం మూగితే తాళా గారి అదే ఆపకాళం పొందు. రోగి పరిస్థితి మరింత విపరీతమైతే, చుట్టూ జనం మూగకుండా నిరోధించండి. ★ త్వరిత శ్వాస కల్పన ప్రారంభించండి. ఆలస్యం చేయవద్దు. **"నోటితో నోటికి"** అనే పద్ధతి మంచిది.

- ★ రోగిని వెళ్లకూడదు పడుకోబట్టండి
- ★ రోగి చుట్టూ జనం చేయండి. మీ వైళ్లతో అతని నోటిని, గొంతుకను శుభ్రం చేయండి. ( చొబ్బు 1 )
- ★ రోగి శ్వాసమాధుల వెరుచుతారేయకు బీబూ అతని కలలు వెరిక్కి పంచ గడ్డాన్ని పైకి ఎత్తండి.
- ★ భుజాల క్రింద మడతల దుప్పటి లేదా కలదల ఉంచండి.
- ★ ఒక చేత్తో రోగి గడ్డాన్ని పైకి ఎత్తవల్సి మరొక చేత్తో ముక్కును మూయండి. ( చొబ్బు 2 )
- ★ బూరు బూ నోటితో గడ్డాని గాని పీల్చి బూ పెరుపులతో రోగి నోటిని ఖైల్లా మూయండి.
- ★ బూరు పీల్చి గాని రోగి నోటిలోని వెళ్లాలి తురిండి. ( చొబ్బు 3 )
- ★ బూరు తురిత గాని రోగి తురితలకుట్టా లోనికి బియ్యంపుడు, రోగి ఛాతి పైకి లేపుండి. ఆ విషయం గమనించండి.
- ★ బూ నోటిని రోగి నోటి నుండి తీసి అతని తురితలకుట్టాలో నుండి గాని బయటకు పప్పుట్టికి లేపి గమనించండి. ( చొబ్బు 4 )
- ★ బూ శ్చరత్కరంగా నాలుగుపాళ్లు బూ నోటితో గాని ఉపండి. బూరు తురిత గాని రోగి తురితలకుట్టా లోనికి వెళ్లాలితే రోగిని వెంటనే వైళ్లు, తన్ని భుజాల నుద్దు వీపుపై బూ అంచెల్లో లాక్కండి.
- ★ ఆ విధంగా చేయడం పిల్ల రోగి శ్వాస మాధులో ఏపైబా పదార్థాలు బద్దపడితే తొలగి పోతాయి. వెంటనే మళ్లీ రోగిని వెళ్లకూడదు పడుకోబట్టి మరొకరిని బూ వైళ్లతో అతని నోటిని, గొంతుకను శుభ్రం చేయండి. మళ్లీ **"నోటితో నోటికి"** పద్ధతి బిబూ అతని వ్యక్తిని శ్వాసకల్పన ప్రారంభించండి. ( చొబ్బు 5 )
- ★ బూ రోగి తరలు తారుగా తురిత పీల్చి తొలగిపోకంకడరదల గమనించండి 12 నిచ్చు చేయాలి.
- ★ రోగి నాతి చూడండి.

### సంక్షిప్తంగా







- ★ విద్యుత్ ప్రసారాన్ని ఆపివేయాలి. ప్రమాద బాంబాన్ని తొలగించాలి. ఎవరినైనా ప్రమాద బాంబంగా తురిత అగితే ఆ రోగి తరల తారు తురిత తీసుకోగలగంక పదలూ క్షుత్రము శ్వాస కల్పన చేయాలి.
- ★ తురిత తీసుకోగలగం ప్రారంభించాలి వైళ్లు చెప్పాలి. అతి నిస్త్రాబలు చరిక్కి చేయాలి. గాయాలను, బొడ్డులను చరిక్కి చేయాలి. వైళ్లు సహాయం తోరలు అనుపక్తికి తరలించండి.

**DON'T ASSUME THAT ALL IS SAFE**


Emergency Resuscitation 10

# EMERGENCY RESUSCITATION

## UNCONSCIOUS ADULT

1.  Gently shake shoulders to confirm whether the casualty is conscious or not.
2.  Kneel by the casualty's head. Place one hand on his forehead and gently tilt it backwards. The mouth will fall open.
3.  Place the fingertips of your other hand under the casualty's chin and lift it.
4.  Pinch the soft part of the nose with the finger and the thumb. Open the casualty's mouth.
5.  Look along chest for movement indicating breathing.
6.  Continue to pinch the nose and blow into the casualty's mouth.

**SPECIAL CASE**

7.  In case of rescue from water, close the casualty's mouth and blow into his nose.

**IF YOU CANNOT ACHIEVE EFFECTIVE BREATHS**





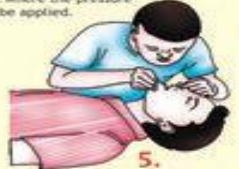

Recheck the head tilt and chin lift.

Recheck the casualty's mouth. Remove any obvious obstructions.

Do not do a finger sweep of the mouth.

Make no more than five attempts to achieve two effective breaths.

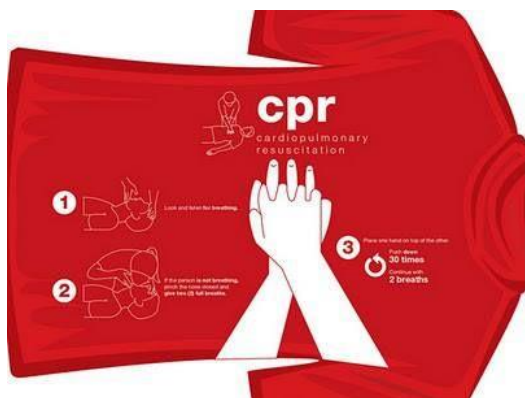
## CARDIAC PULMONARY RESUSCITATION (CPR)

1.  Kneel beside the casualty. Place your middle finger at a point where lowermost ribs meet the breastbone.
2.  Place the heel of your other hand along the end of the index finger to find the point where the pressure is to be applied.
3.  Place the heel of your first hand on top of the other hand, and interlock your fingers.
4.  Lean over the casualty. Keep the arms straight, and press the chest by about 4-5 cms. Release pressure without removing your hands from his chest. Compress it 15 times at the rate of 100 compressions per minute.
5.  Tilt the head, lift the chin and give two rescue breaths.
6.  Continue the cycle of alternating 15 chest compressions and 2 rescue breaths until emergency help arrives.

## UNCONSCIOUS INFANT

**EMERGENCY RESUSCITATION OF A CHILD**

- 1 Place the heel of your one hand along the end of the index finger of the other hand at the breastbone and apply pressure.
- 2 Keep your fingers raised to avoid pressing the child's ribs. Tilt the head, raise the chin and give one rescue breath.
- 3 Continue the cycle of alternating 5 chest compressions and 1 rescue breath until emergency help arrives.



**Rule-10.16: Pressure Points**

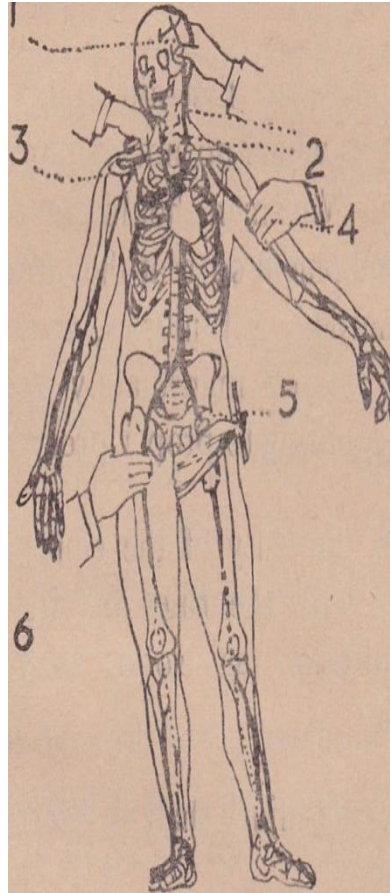
## Where to Apply Pressure to Stop Bleeding:

FOR SCALP AND  
UPPER PORTION OF  
HEAD

FOR SHOULDER OR  
ARM

FOR BACK  
SURFACE OF LOWER  
LEG

You should feel the pulse in every case, otherwise you are not pressing the artery. Pressure should be sufficient to stop this pulsation.



FOR FACE, FOR NECK  
OR HEAD  
FOR LOWER ARM.

FOR THIGH OR LEG

Tourniquets are useful in two locations: At point No. 4 about the middle of the upper arm and at point No. 5 in the groin. These two points should take care of bleeding at any place below them. Pressure should be applied tight enough to stop the blood from spurting and should be released every 15 minutes; if bleeding starts again, the bandage should be tightened.

## 10.17: Annexure (Leaf Let)

1. FIRST AID
2. ARTIFICIAL RESPIRATION
3. CONTROL OF BLEEDING
4. CAUTIONARY NOTE
5. FRACTURES
6. BURNS
7. SHOCK
8. WOUNDS
9. EYE INJURIES
10. ABDOMINAL WOUNDS
11. BACKBONE FRACTURE
12. HEAT STROKE
13. BLEEDING NOSE
14. FOREIGN BODY IN THE NOSE
15. BLEEDING EAR
16. FOREIGN BODY IN THE EAR
17. SNAKE BITE
18. DOG BITE
19. INSECT BITE
20. CHEMICAL BURNS OF THE EYES
21. SUFFOCATION
22. ELECTRIC SHOCK/INJURIES
23. UNCONSCIOUSNESS
24. POISONING

### 1. FIRST – AID

First-aid is the immediate care given to the victim of an accident or sudden illness before the arrival of a qualified expert. The purpose of First-aid is to preserve life, assist recovery, prevent aggravation and minimize complications at a later date with the help of such material as may be available

### 2. ARTIFICIAL RESPIRATION

- a) Mouth to Mouth: This is appropriate and effective technique for emergency artificial respiration.
- b) Keep the head slightly backward and open the jaw.
- c) Seal the casualty's nose to prevent escape of air by pinching with thumb and index finger.
- d) Take a deep breath, open your mouth widely, place it over the victim's mouth and make a tight seal.
- e) Quickly blow the full breath into the mouth of victim.
- f) Remove your mouth from the victim and allow him to exhale passively.
- g) Repeat the procedure 12 to 15 times per minute, till medical aid is arranged.
- h) Arrange immediate medical aid.

### **3. CAUTIONARY NOTE**

- a) Do not give mouth to mouth resuscitation during CPR in the presence of toxins such as cyanide, hydrogen sulphide, corrosives and organophosphates. Ventilate the casualty by using a face mask or bag/valve/mask assembly.
- b) Avoid mouth to mouth resuscitation if there is possibility of transmission of infection between the victim and the rescuer, such as HIV, Hepatitis-B, Tuberculosis, Shigellosis, Meningococcal meningitis, Herpes simplex virus and Salmonella. Use an inter-positional airway device which must function effectively in both its resuscitation and protective roles, and be immediately available at all times.

### **4. CONTROL OF BLEEDING**

- a) Apply direct pressure by thumb or finger.
- b) Apply dressing – gauze pad and bandage.
- c) Apply indirect pressure on pressure points.
- d) Apply tourniquet.
- e) Remove the injured to the hospital.

### **5. FRACTURES**

- a) Signs of Fracture: Pain, Tenderness, Swelling, Loss of Power, Deformity
- b) Do not move the injured unless the life is endangered from other causes.
- c) Deal with the hemorrhage and breathing difficulties. Immobilize the fracture by using suitable splints.
- d) Immobilization should include one joint above and one joint below the fracture.
- e) Move the injured to the hospital.

### **6. BURNS**

- a) Pour running cold water on the affected part.
- b) Do not apply ointments or oils or any other substance.
- c) Cover the wound with sterilized cloth.
- d) Give artificial respiration, if needed.
- e) Prevent shock.
- f) Arrange immediate medical aid.

### **7. SHOCK**

- a) Lay the patient on his back.
- b) Stop bleeding, if any.
- c) Relieve pain by supporting the injured part.
- d) Keep the patient comfortable.
- e) Do not cause sweating.
- f) Fluids may be given by mouth in small amounts, if the patient is conscious.
- g) Reassure the patient.
- h) Arrange immediate medical aid.

## **8. WOUNDS**

- a) Stop the bleeding, if any.
- b) Avoid touching the wounds.
- c) Cover the wound with sterilized cloth.
- d) Arrange immediate medical aid.

## **9. EYE INJURIES**

- a) Removal of foreign body should not be attempted.
- b) Do not apply oil or ointment.
- c) Apply sterile pad and loose bandage.
- d) Send the patient to the hospital

## **10. ABDOMINAL WOUNDS**

- a) No time should be lost in sending the patient to the hospital.
- b) Keep the patient flat on his back.
- c) Give nothing by mouth.
- d) Maintain warmth.
- e) If intestines protrude from the wound, do not attempt to touch or replace them.
- f) Apply sterile dressing and binder on the wound.
- g) Provide immediate transportation to the hospital

## **11. BACK FRACTURE**

- a) Fracture of backbone may lead to paralysis of limbs. Hence, victim should be handled with great care.
- b) Transport on a rigid frame, which may be improvised by using available board.
- c) The rigid frame is to be placed on a stretcher for transportation.
- d) Immediate hospitalization is needed

## **12. HEAT STROKE**

- a) Make the patient lie down.
- b) Remove all clothing's except the undergarments.
- c) Keep the patient under the fan.
- d) Pour cold water on the body repeatedly.
- e) Wash the head thoroughly with cold water and dry it with towel.
- f) Record body temperature falls up to 38°C stop pouring water.
- g) Give plenty of cold water with a pinch of common salt in each glass of water to drink.
- h) Send the patient to the hospital.

## **13. BLEEDING NOSE**

- a) Make the patient sit on a Chair with head downward.
- b) Pinch the nose with fingers and thumb.
- c) Apply ice or cold compression.
- d) Do not plug the nostrils.
- e) Do not put water or any medicine through the nostrils.
- f) Send for medical aid immediately.

#### **14. FOREIGN BODY IN THE NOSE**

- a) Do not try to remove the solid object.
- b) Ask the patient to breathe through mouth.
- c) Send the patient to the hospital.

#### **15. BLEADING EAR**

- a) Lay the patient with the head slightly raised.
- b) Incline the head to the affected side and apply a dry dressing over the ear with loose bandage.
- c) Do not plug the ear.
- d) Apply pressure in front of the ear.
- e) Send for medical aid immediately.

#### **16. FOREIGN BODY IN THE EAR**

- a) Solid – Do not try to remove, scratch or probe it.
- b) Insects – Put a few drops of water in the ear and turn the head so that affected ear points upwards.
- c) Keep the head in that position for 5 minutes, then turn the head downwards so that the water flows out.
- a. Arrange immediate medical aid.

#### **17. SNAKE BITE**

- a) Reassure the patient
- b) Do not allow the person to run or walk
- c) Apply a ligature above the wound (in between the heart and the wound) if the bite is in the leg or hand.
- d) Wash the wound with potassium permanganate solution or with soap and water.
- e) Allow free bleeding.
- f) Never suck the blood from the wound.
- g) Treat for shock.
- h) Arrange immediate hospitalization, by transporting the patient in a lying down position.

#### **18. DOG BITE**

- a) Clean the wound immediately with water.
- b) Then wash with antiseptic soap and water.
- c) Do not try to stop bleeding.
- d) Do not cover the wound.
- e) Send the patient to hospital for treatment.

#### **19. INSECT BITE**

- a) The sting bite should be pulled out.
- b) Apply cold compression.
- c) Apply vinegar diluted with water.
- d) Soda-bicarbonate paste should be applied at the site.
- e) Prevent shock.
- f) Send for medical aid immediately.

## **20. CHEMICAL BURNS OF THE EYES**

- a) Immediate washing of the eye with cleanwater at least for fifteen minute or longer.
- b) Apply sterile dressing over the eye.
- c) Neutralizing agents or ointments should not be used.
- d) Send the patient to the hospital.

## **21. SUFFCATION**

- a) Remove the patient from the source
- b) Clean the airways.
- c) Restore breathing by artificial respiration.
- d) Send the patient to the hospital.

## **22. ELECTRIC SHOCK / INJURIES**

- a) Do not touch the casualty while he is still incontact with electricity.
- b) Switch off the current at once.
- c) Do not attempt first aid until the contact hasbeen broken.
- d) Make the air passage clear and clean.
- e) Restore breathing Artificial respiration and external cardiac massage, if needed.
- f) Call for immediate medical aid.
- g) Send the patient to the hospital.

## **23. UNCONCIOUSNESS**

- a) Make the patient lie down on his belly with head turned to one side.
- b) Check breathing and pulse.
- c) Loosen tight clothing's.
- d) Clean the air-way.
- e) Give artificial respiration and external Cardiac Massage, if needed.
- f) Transport the patient to the hospital.

## **24. POISONING**

- a) Find the nature of the poison
- b) Give universal antidote mixture as given below to drink:
  - Charcoal powder - 2 table spoons
  - Coffee powder - 2 table spoons
  - Chalk powder - 1 table spoon

Add it to a glass of warm water and mix well.

- c) Send the patient immediately to the hospital.

## Chapter 11

### ACCIDENTS

#### 11.1: Electricity – Indian Electricity act 2003 – Report of Accidents

(Refer G.O.Ms.No.7 (ENERGY (SERVICES) DEPARTMENT) Dt. 13.02.2012)

In exercise of powers conferred by sub-section (1) of section 161 read with clause (m) of sub-section (2) of Section 180 of the Electricity Act,2003 (36 of 2003), the Government of Andhra Pradesh hereby make the following rules for the Intimation of Accidents.

a. **Intimation of accidents:**

If any accident occurs in connection with the generation, transmission , supply or use of electricity in or in connection with, any part of the electric lines or other works of any person and the accident results in or is likely to have resulted in loss of human or animal life or in any injury to a human being or an animal, such person or any authorized person of the generating company or licensee, not below the rank of a Junior Engineer or equivalent shall send to the Inspector a telegraphic report within 24 hours of the knowledge of the occurrence of the fatal accident and a written report in the Form set out in Annexure within 48 hours of the knowledge of occurrence of fatal and all other accidents. Where possible a telephonic message should also be given to the Inspector immediately, if the accident comes to the knowledge of the authorized officer of the generating company/licensee or other person concerned.

- b. For the intimation of the accident, telephone numbers, fax numbers and addresses of Chief Electrical Inspector or Electrical Inspectors, District Magistrate, Police station, Fire Brigade and nearest hospital shall be displayed at the conspicuous place in the generating station, sub-station, enclosed sub-station/switching station and maintained in the Office of the in-charge/owner of the Medium Voltage (MV)/High Voltage (HV)/Extra High Voltage (EHV) installations.
- c. Notice of every Accident shall be given in the form annexed to the G.O.Ms.No.7 (ENERGY (SERVICES) DEPARTMENT) Dt. 13.02.2012)
- d. That the reports mentioned under (a) and (c) shall be followed by a detailed report shall be sent to the authorities mentioned in clause (a) and (b).
- e. **Penalty for breach of Rules:** If any person fails to report as required under sub-rule (1) of rule 3, such person shall be punishable with fine of three thousand rupees and in case of the continuing breach with further fine which may extend to fifty rupees for every day after the first during which the breach has continued.
- f. If any in-charge / owner of the Medium Voltage (MV)/High Voltage (HV)/ Extra High Voltage (EHV) installations failed to display the Boards as required under sub-rule (2) of rule 3, he shall be punishable with fine of three thousand rupees.

#### 11.2: G.O.Ms.No. 43 (ENERGY (SERVICES) DEPARTMENT) Dated:19<sup>th</sup> November, 2011

In exercise of powers conferred by sub-section (1) of Section 162 of the Electricity Act, 2003 (Act 36 of 2003), and in supersession of the orders issued by the Government in G.O.Ms.No.2, EFS&T Department, dt.06.01.1984, the Government of Andhra Pradesh

notified the Powers and functions of the Chief Electrical Inspector and Electrical Inspector as below.

- (a) The Government of Andhra Pradesh hereby appoint the Chief Electrical Inspector to Government, Electrical Inspectorate Department as the Chief Electrical Inspector, to “Investigation of all electrical accidents”. The Chief Electrical Inspector may delegate this function of “Investigation of all electrical accidents” to any such officer as he considers necessary.
- (b) The Government of Andhra Pradesh hereby appoint the Deputy Chief Electrical Inspector to Government and Electrical Inspectors, Electrical Inspectorate Department as the Electrical Inspector to Investigation of electrical accidents involving multiple fatalities involving 3 persons or more.

### **11.3: Preliminary Report of Accident.**

The preliminary reports should be sent to the following Officers by the Assistant Engineer /in-charge of the works.

1. The District Magistrate.
2. Commissioner of Workmen's Compensation (in case of departmental accidents only)
3. Police.
4. Chief Engineer respective Zone.
5. Superintending Engineer.
6. Divisional Engineer / Executive Engineer Electrical.

### **11.4: Detailed Investigation.**

A further detailed report should be sent by the Assistant Engineer within 72 hours to the concerned Chief Engineer, Superintending Engineer and Executive Engineer.

In addition to the investigation by the electrical inspectorate, all fatal accidents to departmental employees shall be investigated personally by the Executive Engineer within 5 days of the accident and report sent.

In all other cases the Assistant Engineer should investigate personally. The investigation should cover the following aspects:-

1. The-causes and the circumstances under which the accident occurred.
2. Whether all the safety rules and precautionary measures have been observed and if not who were all responsible for the same.
3. Liability to pay-compensation to the casualty.
4. Any observations or inferences which could be drawn for future guidance.

**11.5:**

Time Limits to be Adopted by Various Officers While Sending Accident Reports.  
 Assistant Engineer/ Asst. Executive Engineer      Executive Engineer      Superintending Engineer

DEPARTMENTAL - NON - DEPARTMENTAL/FATAL      DEPARTMENTAL-FATAL ACCIDENTS      ALL ACCIDENTS.

Should report all the fatal accidents departmental, non-departmental and any death due to suspected electrocution, by means of telegram/ Phone immediately after occurrence of accidents to concerned Chief Engineer, Superintending Engineer and Divisional Engineer

DEPARTMENTAL FATAL, NON-FATAL; NON- DEPARTMENTAL FATAL, NON-FATAL.

Should conduct investigation within 5 days and send the investigation report within 15 days from the date of accident to concerned Chief Engineer with a copy to the Superintending Engineer.

Should furnish his specific remarks on the investigation reports submitted by the EE, DEE & AE/AEE. Discussing the remedial measures to be taken administratively and technically in order to prevent recurrence of such accidents along with the compensation proposals if any within 30 days from the date of accidents.

a) Should send preliminary report in the proforma given in the annexure to all the officers mentioned above and also to the Police authorities, District Magistrate and in case of Departmental accidents to the Commissioner, Workmen's Compensation, Vijayawada within 24 hours.

b) Should send an investigation report within 15 days to the concerned Chief Engineer Zones with copies to Superintending Engineer and Executive Engineer.

## 11.6: ANNEXURE

**(To the G.O.Ms.No.7 Energy (Ser.) Department Dt. 13.02.2012)**  
**FORM FOR REPORTING ELECTRICAL ACCIDENTS.**  
(Rule-3(1))

1. Date and time of accident
2. Place of accident (Village/ Town, Tehsil /Thana, District and State).
3. System and voltage of supply (whether Extra High Voltage (EHV)/High (a) Voltage (HV)/ Low Voltage (LV)) Line, substation/Generating (b) Station/Consumer's Installations)/ Service Lines/other installations.
4. Designation of the Officer-in-Charge of the generating company/licensee 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 address	Postal	Approximate age	Fatal/ Non-fatal
1	2	3	4	5	6	7	

(b) Animal

S.No	Description of animal(s)	Numbers(s)	Name(s) of Owner(s)	Address(es) of Owner(s)	Fatal/Non-fatal
1	2	3	4	5	6

7. In case the victim (s) is/are employee(s) of supplier:
  - (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 workmen's permit(s) supervisor's Certificate of competency?  
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 system of the generating company/licensee, was the permit to work (PTW) taken?
10. (a) 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.  
(b) 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 and Police Station concerned have been informed of the accident (if so, give details).
14. Steps taken to preserve the evidence in connection with the accident to extent possible.
15. Name and designation(s) of the person (s) assisting supervising the person(s) killed or injured.
16. What safety equipment's were given to or 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 sectionalizing devices were employed to deaden the sections for working on the same? Whether working section was earthed at the site of work?
18. Whether the work on the live lines was undertaken by authorized person(s)? If so, the name and designation of such person(s) may be given.
19. Whether artificial resuscitation treatment was given to the person(s) who met with the electric accident? If yes, how long was it continued before its abandonment?
20. Names and designations of persons present at and witnessed the accident.
21. Any other information/remarks.

Signature

Name

Place

Time

Date

Address of the person reporting.

## CHAPTER 12

### MISCELLANEOUS

#### 12.1: Grounding Practices:

1. In all cases, the in charge of work shall be responsible for placing and removing of grounds.
2. All phases of lines or equipment shall be properly grounded.
3. Do not ground out any supposedly dead circuits without first ascertaining whether or not they are actually dead.
4. Whenever there are other live circuits on the same tower/structure or on nearby tower/structure it is essential to caution the staff specifically about the same.
5. The line or circuit on which work has to be carried out, shall be grounded or earthed on either side of the workspot at least one span away usually and never beyond one mile, to provide positive protection against accidents.
6. All conductors shall be treated as alive until they have been grounded properly.
7. Workman shall stand well below the parts to be grounded so that the body may be kept sufficiently away from any arc that may occur when ground leads are applied.
8. Grounds shall be placed on the same tower/structure on which work has to be taken up such that during the course of the work, the grounds might not be detached.
9. Grounds shall never be fixed or removed by bare hands.
10. When attaching grounds, attach ground connection first.
11. When removing grounds do not break ground connection until after they have been detached from line or apparatus.
12. Be careful of capacity discharge from transformers and other apparatus when grounding.
13. The maintenance/lines Engineer shall make frequent inspections of grounding apparatus.
14. All ground connections existing on tower/structure shall be inspected before grounding to determine whether they have been cut or are fastened to the ground properly. This is extremely IMPORTANT.
15. Approved copper grounding wires and leads with proper clamps, bolts and nuts shall be used to ground high voltage lines, which have been discharged, before commencing any kind of work on these lines.
16. Grounding on circuits or equipment shall be done as per the standard practice.
17. If any normally live line or equipment which is supposed to be dead, has to be tested before grounding, bring the discharge rod slowly towards the circuit. During this process, if it is confirmed that the line or equipment is really dead, then it may be grounded effectively- If, however, during this process, a flash over or arcing is observed, the discharge rod shall be removed at once and the fact reported to the competent authority issuing line clear.
18. The grounds shall be attached firmly so that the same will not be detached inadvertently due to any cause at the time of working.

## 12.2: Review of Accidents

- (a) Electrical Accidents to Departmental Employees a review of the accidents listed below shows that the accidents are mainly due to.
- i) Unauthorized persons attending to works.
  - ii) Persons working without making use of safety appliances.
  - iii) Working without taking proper line clear.
  - iv) Persons working without taking proper instructions from their superiors.
  - v) Due to wrong instructions issued to the workmen by the supervisory staff.
  - vi) Due to improper planning of works and noncompliance of Safety Rules and precautions.
  - vii) Due to negligence, carelessness and hasty actions of Supervisory staff.
  - viii) Due to ignorance of the staff regarding the correct feeding arrangements and supply conditions.
  - ix) Due to failure of equipment and deteriorated wires/cables causing leakage and due to several other causes. The Supervisory staff and other employees should take all safety precautions to avoid electrical accidents.

## 12.3: Case Studies:

1. A skilled person at a 132/33 kV substation got electrocuted and sustained severe burns as he entered into the induction zone of 33 kV bus while attending the hotline remarks on the line isolator of one of the 33 kV feeders. The victim died later while undergoing treatment.

The incident could have been averted, if

- i) The victim has waited till he receives clearance from the authorized person.
  - ii) The victim has reached the line isolator by climbing the structure from line side instead of bus side after earthing the work spot on both sides, to avoid induction from the 33kV bus, which is right above him. (The 33kV bus in the substation is strung on RS joist structures and the circuit breakers are erected under the 33kV bus leaving very little working clearance for carrying out the maintenance works).
2. A skilled person at a 132/33 kV substation got electrocuted while tying rope to the structure for dismantling 33 kV vacuum circuit breaker, as he slipped and his hand went into induction zone. The victim died later while undergoing treatment.

The incident could have been averted, if

- i) The victim has used safety belt duly fastening it to the structure on which he is standing.
  - ii) The victim had been careful during the execution of work.
3. A skilled person at 220/132/33 kV substation got electrocuted and sustained burns when he tried to climb over a 33 kV VCB of one feeder accidentally while talking over phone, when the line clear was availed on another 33kV feeder. The casualty has died later while undergoing treatment.

The incident could have been avoided, if

- i) The victim is pays attention to the work with presence of mind without talking over phone.
- ii) The victim should have checked the feeder before climbing to the breaker.
- iii) The victim should have checked the general safety measures during line clear such as

opening of isolators, earthing etc.

4. A skilled person at a 132/33 kV substation got electrocuted and sustained burns when he tries to take a spanner that is left on 33 kV VCB when the bus isolator is in close condition, as he entered into the induction zone. The casualty has later died while undergoing treatment.

The following lapses were noticed.

- i) Before returning the line clear, it is to be ensured that all men and material are cleared from the work site and no tools are left on the equipment.
- ii) If, at all, any tools are left on the equipment, they should be taken when the feeder is in dead condition.
- iii) In this incident, the victim tried to take a spanner that is left on the circuit breaker in haste without proper instruction of the authorized person and without observing safety procedures such as opening of bus and line isolators, earthing etc.

5. An unskilled person engaged by the contractor for tree cutting along a 132kV line got electrocuted and died when he accidentally got in contact with the tree he cut while it fell down touching the live 132 kV line.

The following causes are found for occurrence of the accident:

- i) The contractor has not taken line clear on the 132kV line to ensure safety to the working personnel.
- ii) The contractor has engaged an unskilled worker who is not acquainted with the electrical works or possible accidents caused in electrical lines. Thus, he failed in assessing the possible induction that can occur when the tree comes close to the live electrical line during its fall. He accidentally came into contact with the tree, while the tree was falling down almost touching the live line and got electrocuted due to induction and died.

#### **12.4: In Rainy Season**

- 1) Many insulators become conductors.
- 2) Insulation of the wires gets easily broken down.
- 3) The metallic wires and steel articles get energized at times.
- 4) Wet walls become conductors at times.
- 5) Danger tries to spring upon us from unknown quarters

Therefore, move very cautiously even in your house-Take all possible precautions

#### **12.5: Shock**

Electricity is one of the most commonly encountered hazards in any facility. Under normal conditions, safety features (engineering controls) built into electrical equipment protect workers from shock. Shock is the flow of electrical current through any portion of the worker's body from an external source. Accidents can occur in which contact with electricity results in serious injury or death.

Most electrical systems establish a voltage reference point by connecting a portion of the system to an earth ground. Because these systems use conductors that have electrical potential (voltage) with respect to ground, a shock hazard exists for workers who are in contact with the earth and exposed to the conductors. If a person comes in contact with an

energized (ungrounded) conductor, while also in contact with a grounded object, an alternate path to ground is formed in which current passes through his or her body.

The effects of electric current on the human body depend on many variables, including the:

- a. Amount of current
- b. Waveform of the current (e.g., DC, 60 Hz AC, RF, impulse)
- c. Current's pathway through the body (determined by contact location and internal body chemistry)
- d. Duration of shock
- e. Energy deposited into the body

The amount of current passing through the body depends on:

- a. Voltage driving the current through the body
- b. Circuit characteristics (impedance, stored electrical energy)
- c. Frequency of the current
- d. Contact resistance and internal resistance of the body
- e. Environmental conditions affecting the body's contact resistance.

The heart and brain are the parts of the body most vulnerable to electric shock. Some research shows that fatal ventricular fibrillation (disruption of the heart's rhythmic pumping action) can be initiated by a current flow of as little as 70 milli amperes (mA). Without immediate emergency resuscitation, electrical shock may cause a fatality from direct paralysis of the respiratory system, disruption of rhythmic pumping action, or immediate heart stoppage. Severe injuries, such as deep internal burns, can occur, even if the current does not pass through vital organs or the central nervous system. Specific values for hazardous voltages and for hazardous current flow through the body are not completely reliable because of physiological differences between people.

#### **12.6: Body Resistance:**

- a. The resistance of the body is much less if the skin is punctured by a shock above the skin breakdown threshold (400 to 500 V). This allows higher current flow through the body, resulting in more damage. The amount and duration of current flow determines the severity of the reflex action, the amount of damage to the heart, and neurological and other tissue.
- b. The internal body resistance is often modelled as 1000 Ohms but can be as low as 200 Ohms.

#### **12.7: Reflex action:**

Reflex action occurs when electric current causes a violent contraction of the muscles. Such contraction can result in violent recoil, resulting in falling from heights, recoiling into a nearby hazard, or violent muscle contractions resulting in broken bones, torn ligaments, or dislocated joints. Reflex action is enhanced by high-voltage shock as the energy can be delivered more quickly from higher instantaneous currents.

#### **12.8: Let-Go Threshold:**

The so called no-let-go response occurs when continuous shock current keeps the muscles violently contracting such that the victim is clutching the conductor without any ability to release. This only happens with AC waveforms.

### 12.9: Shock Thresholds:

Because of the effects of the waveform on the body's response, the thresholds for acceptable shock vary, depending on the form of the electricity. Acceptable means that below these thresholds there is no injury, and above these thresholds there could be injury. The threshold values are based on available research and theoretical data. The values should not be considered absolute.

Source	Includes	Thresholds
AC	50-60 Hz nominal	$\geq 50$ V and $\geq 5$ mA
DC	All	$\geq 100$ V and $\geq 40$ mA
Capacitors	All	$\geq 100$ V and $\geq 10$ J
Batteries	Lead-Acid and Lithium Ion	$\geq 100$ V
Sub-RF	1 Hz to 3 kHz (excluding 50-60 Hz nominal)	$\geq 50$ V and $\geq 5$ mA
RF	3 kHz to 100 MHz	A function of frequency

### 12.10: Human resistance values for various skin-contact conditions:

Condition		Resistance (Ohms)
Dry		Wet
Finger touch	40,000 to 1,000,000	4,000 to 15,000
Hand holding wire	15,000 to 50,000	3,000 to 6,000
Finger-thumb grasp	10,000 to 30,000	2,000 to 5,000
Hand holding pliers	5,000 to 10,000	1,000 to 3,000
Palm touch	3,000 to 8,000	1,000 to 2,000
Hand around 1.5 in pipe or drill handle	1,000 to 3,000	500 to 1,500
Two hands around 1.5 in pipe	500 to 1,500	250 to 750
Hand immersed	-	200 to 500
Foot immersed	-	100 to 300
Human body, internal, excluding skin ohms		200 to 1,000

### 12.11: Current range and effect on a 70 kg person:

	Physiological phenomena	Feeling or lethality
<1.0 mA	None	Imperceptible
1.0 mA	Perception threshold	-
0.5 mA – 2.0 mA	-	Mild sensation
1.0 mA – 4.0 mA	-	Painful sensation
6.0 mA – 22 mA	Paralysis threshold of arms	Cannot release hand grip. If no grip, victim may be thrown clear. (May progress to higher current and be fatal.)
18 mA – 30 mA	Respiratory paralysis	Stoppage of breathing (frequently fatal).
90 mA	Fibrillation threshold, 0.5% (greater than or equal to 3 sec exposure)	Heart action disco-ordinated (probably fatal).
250 mA	Fibrillation threshold, 99.5% (greater than or equal to 3 sec)	Heart action disco-ordinated (probably fatal).

	exposure)	
4 A	Heart paralysis threshold (no fibrillation)	Heart stops for duration of current passage. For short shocks, heart may restart on interruption of current (usually not fatal from heart dysfunction).
> 5 A	Tissue burning	Not fatal unless vital organs are burned.

## 12.12: Batteries:

### a) Application of batteries:

- a. Energy storage;
- b. Voltage multipliers;
- c. Filters; and
- d. Isolators.

Batteries are used in multiple applications. Specialized types exist that are suitable for different applications.

Lead-acid storage battery types are the lead-antimony and the lead-calcium. The lead-antimony battery is low cost, high efficiency, small size and long life. Typically, the lead-calcium is chosen for use in UPS systems due to the similar characteristics of lead-antimony coupled with lower maintenance requirements. Both types use dilute sulfuric acid as the electrolyte.

Alkali storage battery types are the nickel cadmium and the nickel metal hydride. These batteries use compounds of nickel peroxide and iron oxide for the plate materials, and potassium hydroxide as the electrolyte. Storage batteries of this type perform well in extremes of temperature.

Other Batteries. Specialized batteries for applications include lithium ion, silver zinc, silver cadmium and mercury. Manufacturers' data sheets provide guidelines for safety for these and other battery types.

### b) Hazards

Electrical Hazards. Electrical safety during battery operations is primarily concerned with prevention of a direct short circuit across one or more cells. Due to the large amount of stored energy in the battery cells, along with the low internal resistance of the cells, a short circuit could have catastrophic results including an explosion of the cells involved.

## 12.13: Chemical Hazards

- a. For each battery type considered for use, obtain Material Safety Data Sheet (MSDS) information and understand the specific hazards involved before use.
- b. Chemicals associated with battery systems may include:
  - Cadmium (Cd);
  - Lead (Pb);
  - Lead peroxide (PbO<sub>2</sub>);
  - Lithium hydroxide (LiOH);

- Lithium Hexafluorophosphate (LiPF<sub>6</sub>) in propylene/ethylene carbonate (Flammable)
  - Potassium hydroxide (KOH);
  - Sodium bicarbonate (NaHCO<sub>3</sub>);
  - Sodium hydroxide (NaOH); and
  - Sulfuric acid (H<sub>2</sub>SO<sub>4</sub>).
- c. Many of these chemicals (and other battery components not listed here) are corrosive, poisonous and/or flammable. Possible consequences of a ruptured container or spilled electrolyte include:
- Fire;
  - Explosion;
  - Chemical burns; and
  - Reactions to toxic fumes, solids or liquids.

#### **12.14: Operation and Maintenance**

Personnel conducting electrical work on battery systems are to follow the following guidelines:

- a. Use insulated tools that are stored in a manner that will not expose them to degradation from battery chemicals.
- b. Only instruments having a non-conductive case (e.g., the yellow rubber holster provided with some multi-meters) are permitted in the vicinity of battery systems.
- c. Storage battery systems may present terminal voltages of 48, 220 V DC. If the physical construction of the battery system permits, inter-cell or inter-tier cables should be disconnected when performing work on the battery system. The idea behind splitting the intercell ties in this manner is to reduce the exposed voltage in the fewest number of steps, thereby minimizing the exposure to energized parts.
- d. If one terminal of the battery system is bonded to ground, an additional hazard exists. Single-point contact between an exposed battery terminal and surrounding structures could result in very large short-circuit currents and possibly lead to fires or personal injury.

#### **12.15: Hazards**

##### **Shock hazard:**

- a. The shock hazard to a person is an impulse shock hazard limited by the discharge time constant. For voltages less than 100 V, there is no shock hazard. For voltages between 100-400 V, the discharge is significantly limited by a long time constant, related to skin surface resistance. Above 400 V, the skin ruptures and the time constant is limited by internal body resistance alone.
- b. For voltages above 100 V, safety margins assume only an internal body resistance of 1000 Ohms. The time constant,  $\tau$ , is equal to resistance times capacitance ( $\tau=RC$ ). The discharge time through the body is assumed to be three times the time constant.
- c. At 10 Joules or greater, there is a significant shock and fibrillation hazard.
- d. Below 10 Joules, a significant reflex action may occur and cause injury:
- e. Capacitor cases are not always grounded and should be considered charged unless otherwise determined.
- f. Hazardous capacitors may store and accumulate a dangerous residual charge after the equipment has been de-energized. Grounding capacitors in series may transfer rather than discharge the stored energy.

- g. Because of the phenomenon of "dielectric absorption," not all the charge in a capacitor is dissipated when it is short-circuited for a short time. High voltage capacitors may build a charge in the presence of high electric fields.
- h. A hazardous voltage can exist at the moment of contact across the impedance of a few feet of grounding cable at the moment of contact with a charged capacitor.

#### **Short-circuit hazard**

Capacitors have the unique ability to discharge very rapidly in a shorted condition. AC power system faults typically occur on the order of milliseconds and are limited by transformer impedances. Battery faults take seconds or minutes to discharge. Capacitors can fully discharge in microseconds, with very high current.

#### **Explosion hazard**

- a. An additional hazard exists when a capacitor is subjected to high currents that may cause heating and explosion.
- b. When capacitors are used to store large amounts of energy, internal failure of one capacitor in a bank frequently results in explosion when all other capacitors in the bank discharge into the fault.
- c. Fuses are generally used to preclude the discharge of energy from a capacitor bank into a faulted individual capacitor. Improperly sized fuses for this application may explode.

#### **Other hazards**

- a. The liquid dielectric and combustion products of liquid dielectric in capacitors may be toxic.
- b. Discharging a capacitor by means of a grounding hook can cause a loud electric arc at the point of contact.

Internal faults may rupture capacitor containers. Rupture of a capacitor can create a fire hazard. Dielectric fluids may release toxic gases when decomposed by fire or the heat of an electric arc.

### **12.16: WHAT TO DO IN CASE OF TRAUMATIC (PHYSICAL) SHOCK.**

By the term Traumatic (Physical) Shock is meant a condition in which all the activities of the body are greatly depressed due to lack of proper circulation.

Physical shock varies in degree from a mild condition resembling fainting to a severe from which may result in death. Immediate shock treatment may save a life.

Any one or all of the following symptoms may either come on quite rapidly or not appear until some minutes or even hours later.

The face is pale with an anxious expression. The lips' fingernails and ears have a bluish tinge. The weary, lusterless eyes half covered by drooping eyelids, have a glassy and vacant expression.

Cold perspiration appears, particularly on the forehead and the palms of the hands. The pulse is rapid and weak.

A severe chill often results. The body feels cold, shakes violently and the teeth chatter.

Usually the injured lies quietly and takes little interest in what goes on around him. Nausea and vomiting are frequent.

Breathing is irregular. Long, deep, sighing breaths alternate with very shallow ones.

#### Treatment of Physical Shock

There are only two measures of value in the First Aid treatment of shock:

- 1) Heat: - Maintain body heat.
- 2) Position: - Lay flat with head low

Heat may be applied by wrapping the injured, under-neath as well as on top, with blankets, coats, robes or other similar material to maintain body temperature. Don't use V. I. R. wires for portable fittings. Use only work-shop Flex for safety.

External heat must be used with caution. If covering is inadequate, you may apply external heat. This is best done by the use of hot water bottles, bricks, chemical bags, etc., care being used in hot burning or over-heating the body. (Do not place next to the skin.)

Position-should be lying down flat with nothing under the head.

Remember: In Artificial Respiration, Time is of utmost Importance

### **12.17: Fractures**

For practical purposes, fractures can be divided into two kinds- simple and compound.

In a simple fracture, the bone is broken, but there is no connecting wound from the break in the bone to the skin.

In a compound fracture, the bone is broken and in addition there is a wound from the break to the surface of the skin.

In the case of any suspected fracture, the immediate services of a physician should be secured. Sudden pain, swelling and /or deformity are symptoms of such a condition.

To prevent further damage, avoid handling the injured part. **DO NOT ATTEMPT TO SET THE FRACTURED BONE.**

If fracture is suspected, the injured area should be immobilized prior to transportation and additional care should be used in the movement of the victim. Persons having a suspected fracture should always be transported in a prone position.

You may save a little money by not taking safety precautions. You will save a precious life by taking safety precautions.

If a possibility of fracture exists or if there seems to be damage to either the head, neck or spinal column, the victim of the accident should remain at rest until sufficient help and equipment are available. Only thoroughly trained people should attempt the transportation of such an accident victim.

### General Treatment of Simple Fractures:

Secure a physician or ambulance at once if this can be done.

Do not move the victim.

Make the victim as comfortable as possible. Treat for shock.

### General Treatment of Compound Fractures.

If arterial bleeding is present, check it by hand pressure between the wound and the heart; then apply pressure to stop bleeding

Treat the wound as any wound with mild antiseptic, sterile dressing and bandage. If the bone is protruding through the wound, apply the antiseptic over the end of bone and well around the wound.

Secure a physician or ambulance at once if this can be done.

Make the victim as comfortable as possible. Treat any shock that may be present.

Do not move the victim or the broken part before the arrival of the doctor.

Do not take any current carrying wires near the clothes line. If they are taken, the wires carrying clothes will get energized at some moment and kill the Occupants Beware.

### **12.18: Injuries to Spine.**

This injury is extremely serious. Wrong handling may result in damage to the spinal cord, thus causing permanent paralysis.

Pain in the neck or back may be the only symptoms. If the victim cannot move his fingers, his neck is probably broken. If he can move his fingers but not his feet and toes, his back is probably broken. Nevertheless, the victim may be able to move both his hands and feet and yet have a spinal fracture.

**WHAT TO DO:** Send for a doctor at once. Do not move the victim. Keep him warm with blankets or coats and external heat. Do not let him try to sit up and do not lift his head even to give him a sip of water.

### **12.19: Common Poisonous Plants:**

Skin poisoning occurs in most people after direct contact with any part of the poison-ivy, poison-oak, or poison-sumac plant. From within a few hours to several days, the skin becomes red and swollen and an eruption of blisters occurs, accompanied by painful itching and burning. In severe cases, fever may be present.

### **12.20: Prevention:**

The only sure way to escape poisoning by these plants is to stay away from them. After exposure, poisoning can often be prevented by immediately washing the exposed skin areas thoroughly with soap (preferably yellow naphtha soap) and water, followed by an application of rubbing alcohol.

Clothes that have been in contact with these poisonous plants should be dry cleaned

or washed as soon as possible, since infection may occur from such clothing several months after actual contact with the plants.

In some instances, poison ivy extract administered by a physician may give temporary immunity against ivy poisoning.

The eradication of poison ivy and poison oak is now made possible by the development of chemical weed killers. Directions for applying these chemicals are given on the containers.

Care should be taken to keep away from smoke as much as possible when burning poisonous plants, as it is a very good source of infection.

### **12.21: Treatment**

Any one of following applications may give relief if skin poisoning develops.

Calamine lotion or an ointment (available in any drug store).

Compresses soaked in cold baking soda or Epsom salts solution.

A 5% solution of ferric chloride (poison ivy wash) applied with a cotton sponge, and allowed to dry on the skin. Lemon juice will remove the ferric chloride stain.

In severe cases of such skin poisoning, see a doctor.

### **12.22 Injuries Due To Extremes of Heat and Cold**

#### **Burns and Scalds:**

The purpose of the First Aid treatment of burns is (1) to relieve pain (2) to prevent infection in all burns in which the skin is broken and (3) to prevent loss of tissue fluid in extensive burns. Shock nearly always develops when large areas of skin are burned.

For small minor burns, characterized by reddened, unbroken skin or surface blisters, apply burn ointment.

For severe burns (deep burns and all extensive burns) get medical aid as quickly as possible". Remove loose clothing from burned area, but not if it sticks to the burned area. Cut around it and leave the adhering clothing for the doctor to remove. In giving emergency treatment, apply a smooth, thick layer of lint free sterile gauze and bandage the entire dressing in place. Keep the victim quiet and comfortably warm until the doctor arrives.

#### **Chemical Burns:**

Chemical burns are caused by chemicals such as strong acids and alkalis. Immediately strip off all clothing which has come in contact with the chemical and flood the skin with large quantities of clean water. Then give First Aid according to the depth and extent of the burn. If there has been any delay in giving First Aid, do not use water. Get medical aid at once.

If acid, lime, or any other chemical enters the eye, immediately wash out the chemical

then and there with great quantities of clean water. Do not use water if there has been any delay in giving First Aid. Get medical aid at once.

### **Minor Burns and Scalds:**

Apply burn ointment to burned area and bandage lightly with sterile gauze. If burn is extensive or deep, always consult a physician.

### **Sunstroke:**

The victim feels dizzy, sometimes becomes nauseated, and has acute pain in the head. In true heatstroke or sunstroke these symptoms are rapidly followed by unconsciousness. The victim's skin is dry and hot, and his face red or purple. He breathes with difficulty, his pulse is rapid and he has a high fever.

### **What To Do:**

Call a doctor. Remove the victim to a cool, shady place, lay him on his back and remove as much clothing as possible. Apply an ice bag or cold clothes(iced if possible) to his head. To reduce his temperature, wrap him in a sheet and spray or sprinkle it repeatedly with cold water or sponge his body with cold water. Give no stimulants.

### **Heat Exhaustion:**

The victim is very pale, his skin cold and moist, his breathing rapid and shallow, and his pulse weak and rapid. The body temperature may be subnormal or slightly elevated. The victim is usually conscious.

### **What to Do:**

Call a doctor. Lay the victim in a cool, quiet place in a reclining position. Loosen his clothing. Keep him comfortably warm with blankets or coats placed under and over him. If conscious, give him a stimulant-tea, coffee or aromatic spirits of ammonia (1 teaspoonful in half glass of water). It may also be helpful to give him sips of salt water (1 teaspoonful of salt to 1 pint of water).

## **12.23: Bruises, Strains and Sprains**

A bruise is an injury usually caused by a fall or a blow. The skin is not broken, but the tissues under the skin are injured, resulting in the breaking of small blood vessels. Pain, swelling and black and blue marks occur. Bruises are not usually serious; however, other internal injuries should be suspected. Apply cold applications. If the skin is broken, treat same as for minor cut.

### **Sprains (Joint Injuries):**

Elevate injured part and apply ice bags or cold clothes for 25 minutes immediately after injury. If swelling is pronounced, do not attempt to use injured part until seen by a physician.

### **Strains (Muscle Injuries):**

Apply heat to injured area. Be careful not to burn tissues. If pain continues, see a physician.

### **Dislocations**

The injured part should be made as comfortable as possible. Cold compresses should be applied at the joint to prevent swelling, relieve pain, contract blood vessels; treat for shock if it is present .

## **12.24: Bites:**

### **Dog or Cat Bites**

Wash the wound thoroughly with soap and water. Then treat as any open wound. (see wounds)

Always consult a physician. (If possible, identify owner of animal).

### **Insect Bites**

The bite or sting of such insects as bees, mosquitoes, flies or spiders often causes swelling and inflammation.

Treat as any open wound.

If swelling or evidence of infection develops, obtain medical care.

### **Snake Bites**

Prompt action is important in every case of poisonous snake bite. The bite of a poisonous snake is followed rapidly by severe pain and swelling. Always get a physician as soon as possible, but in the meantime give First Aid. Immediate treatment is absolutely necessary.

1. Make the patient lie down and keep him as quiet as possible, as muscular movement causes the poison to spread.
2. If the bite is on one of the limbs, apply a constricting band (necktie, belt, hand kerchief, etc.) around the member about two to four inches above the fang marks, between the puncture wounds and the heart. The constricting band should be tight enough to stop the surface flow of blood, but should not restrict the flow of blood in the deeper arteries and veins.
3. Apply an antiseptic to the fang marks and the surrounding tissue.
4. Using a sterilized razor blade, lancet or sharp knife, make a cross incision ¼" long and not over ¼" deep over each fang mark. Particular care should be exercised not to cut large blood vessels, tendons or nerves in making incisions.
5. Use suction directly over incisions to draw all the fluid possible out of wounds. If swelling spreads upward beyond the constricting band, move the band upward and make a series of 1" deep crosses in the swollen area and alternate suction on the incisions in the swollen area. **LOOSEN CONSTRICTING BAND EVERY FIFTEEN MINUTES FOR A FEW SECONDS AND THEN RETIGHTEN.** Victim should not be allowed to walk but should be moved in a lying down position. Suction should be continued until patient is in the hands of a doctor. Medical attention should be procured as quickly as possible.

### **12.25: Injuries to the Head:**

Every head injury should have the attention of a physician. Fractured skull or concussion should be suspected and First Aid rendered

Lay patient down. Give no stimulants.

Keep head slightly raised and apply cold compresses to forehead and back of neck and heat to rest of body.

Treat any wounds if present. Transport victim very carefully.

### **12.26: Infection:**

Every break in the skin carries with it the danger of infection. Germs may be present on the skin, fingers, clothing, on unclean dressings, and in droplets sprayed from the mouth or nose in sneezing, coughing, laughing or talking. Do not touch a wound with cloth which is not sterile (free from germs) or with the fingers unless bleeding can be stopped in no other way, and do not cough, sneeze or breathe into a wound.

The cleansing and disinfection of all serious wounds should be left to the doctor. First Aid stops with the checking of the bleeding, the application of a sterile dressing, and measures taken to prevent or lessen the severity of shock.

For small wounds like cuts and scratches, which probably will not be seen by a doctor, first paint the wound with an antiseptic and when the antiseptic is dry, cover it with a sterile (germ free) pad or compress

If iodine is the antiseptic selected, remember that the iodine solution becomes stronger with age owing to the evaporation of alcohol. Therefore, old solutions should not be used. Because of this, only iodine ampules are recommended.

A supply of individual sterile gauze compresses in sealed packages should be kept in the First Aid kit.

A sterile compress becomes non-sterile (contaminated) when it is touched with the fingers or any object not sterilized. Hence, in unfolding or unrolling the compress, take care to touch only the outer surface and place the inner, untouched surface over the wound. Make sure that the compress is large enough to cover the wound completely. Hold it in place by a bandage or adhesive tape. (See Wounds)

### **12.27: Transportation:**

Improper transportation increases the possibility of further damage to a severely injured or ill person. Where possible, a physician should be called to the accident scene. With his advice, a safe method of transportation can be used.

With most injured or ill persons, CARE rather than HASTE is important. Few cases require break neck speed.

A stretcher is the easiest and safest way to transport a severely injured person. If such a piece of equipment is not available AND ONLY IF IT IS ABSOLUTELY IMPERATIVE TO MOVE THE VICTIM, a suitable stretcher can be fashioned out of a blanket and two stout pieces of wood, such as pikes, scoops, tree limbs, etc. Heavy coats may be used as a substitute for the blankets and should be completely buttoned, if used.

## **12.28: Injuries to the Eyes**

All cases except the most trivial ones **MUST** be sent to a physician.

Never probe or dig the eye for removal of embedded particles. If object is floating on the surface, it may be brushed off with a clean cotton applicator or the corner of a sterile gauze compress.

Do not allow patient to rub eyes. This will cause great irritation and do little good.

If particle cannot be readily removed or if irritation continues, the eye should be flooded with a 10% solution of boric acid or boric acid ointment. A couple of drops of clean olive oil or castor oil should then be applied.

Do not remove splinters from eye.

### **Burns to Eye:**

In all cases of burns to the eye, patient must be sent to a physician.

### **Chemical Burns:**

Never neutralize chemical burns of the eye. It is too risky for the novice to attempt. Thoroughly flush eye with clean water, then drop olive oil, castor oil or boric acid ointment into eye.

### **Electric Arc or Flash Burns:**

Electric arc or flash burns of the eye should be treated with clean olive oil, castor oil or boric acid ointment. Do not use water.

For a person suffering from severe Electric shock. The lungs get paralyzed and will be unable to attend to the respiratory functions without external aid. Therefore, the lungs should be pressed and released alternately by another person, till the lungs pick up and function. Then the victim is out of danger.

### **Other Burns to Eye:**

Other burns to the eye should be treated same as electric flash burns to the eye. Cover eye with a soft gauze compress.

## **12.29: House Keeping**

### a) Storage Yard

1. Keep general appearances orderly and clean.
2. Pile materials in a safe manner.
3. Maintain proper clearance for walk and work areas.
4. Use adequate areas for storage of equipment, tool carts, trailers, etc.
5. Keep depressions filled.
6. Barricade all danger areas. Openings overhanging hazards, etc.
7. Remove possible tripping hazards.
8. Clean and rake-periodically.
9. Mow grass and weeds

## b) Tool Rooms

1. Keep clean and in good repair.
2. Keep floors free of oil and grease spots.
3. Repair floors when they become worn or damaged.
4. Keep tools in good repair. Store in racks provided for them.
5. Store paints, oil, gasoline, kerosene and oily rags or waste in approved containers, properly marked, and only in those rooms and buildings so designated
6. Use approved barrel racks for large drums of oil or like material
7. Clean and store properly all rubber goods-boots, raincoats, gas masks, main bags and stoppers. Do not store rubber goods near exhaust pipes or radiators.
8. When storing materials or tools overhead, make sure they are made secure.

### **12.30: Electric and Acetylene Welding**

1. Only experienced operators should perform welding operations.
2. Welding helmets shall be worn on electric welding operations; welding goggles on acetylene welding.
3. Welder's helpers shall wear goggles that are available for such work, either electric or acetylene.
4. Arc welding operations shall be shielded to protect the public and other employees.
5. Oxygen and gas cylinders should be stored separately in cool places and not subjected to direct sun rays.
6. Cylinder valves should be closed when torches are not in use.
7. No repairs should be attempted on a closed vessel which has previously contained any volatile liquid until it has been steamed out, washed with water and checked with a combustible indicator for gas concentration.
8. Oil and grease should be kept out of torches, hose, regulators and valves. When it is present, parts should be washed with non-inflammable cleaner and allowed to dry thoroughly.
9. Oxygen and acetylene cylinders should never be dropped, but always lifted and set down carefully. Do not store cylinders near heat.

### **12.31: Use of Pneumatic Tools**

1. Only properly instructed persons should be permitted to use pneumatic tools.
2. All pneumatic tool holders and tools are to be inspected at regular intervals, to be assured they are in a safe and usable condition at all times.
3. Pneumatic tools should be used only for the nature of work as specified by the manufacturer.
4. Be sure that compressor is in proper working order before connecting any air-powered equipment.
5. Before attaching air-powered equipment, make sure all connections are tight and safe, and that the equipment is in proper working order.
6. Safety chains or the equivalent should be applied across all those connections.
7. Deflectors or diffusers should be used at the exhaust of all pneumatic equipment.

8. Trace out hose lines before turning on valve to be sure right valve is being used.
9. Check pavement breakers and spades before using, to be sure they are sharp.
10. Check moil points and drills for sharpness and clear air passage.
11. Do not use tools that are worn and unsafe.
12. Operators of pneumatic tools should always wear goggles.
13. Toe guards or steel-capped safety shoes should be worn when using paving breakers or tamping machines.
14. Be sure air-powered equipment is properly supplied with lubrication at all times.
15. Always have a firm grip, with both hands, for safe control during actual operation of equipment.
16. Horseplay shall not be permitted.
17. Turn valve off at source of air supply when tools are not in use.
18. Place hose, tools or equipment where they will be a minimum tripping hazard.
19. Pneumatic tools shall be properly grounded when used in the vicinity of other underground structures or cables.

### **12.32: Mouth - to - mouth (or mouth- to - nose) Technique of Artificial Respiration.**

#### **Introduction:**

The mouth-to-mouth (or mouth-to-nose) technique of artificial respiration is the most practical method for emergency ventilation of an individual of any age who has stopped breathing, in the absence of equipment or of help from a second person, regardless of the cause of cessation of breathing.

First aid-trained people do not usually have the experience, training, and essential equipment to distinguish whether or not lack of breathing is a result of disease or accident. Therefore, some form of artificial respiration should be started at the earliest possible moment.

Any procedure that will obtain and maintain an open-air passageway from the lungs to the mouth and provide for an alternate increase and decrease in the size of the chest, internally or externally, will move air in and out of a non-breathing person.

The mouth-to-mouth (or mouth-to-nose) technique has the advantage of providing pressure to inflate the victim's lungs immediately. It also enables the rescuer to obtain more accurate information on the volume, pressure, and timing of efforts needed to inflate the victim's lungs that are afforded by other methods.

When a person is unconscious and not breathing, the base of the tongue tends to press against and block the upper air passageway. The procedures described below should provide for an open-air passageway when a lone rescuer must perform artificial respiration.

Related Information for all Methods

Time your efforts to coincide with victim's first attempt to breathe for himself

If vomiting occurs, quickly turn the victim on his side, wipe out the mouth, and then reposition him.

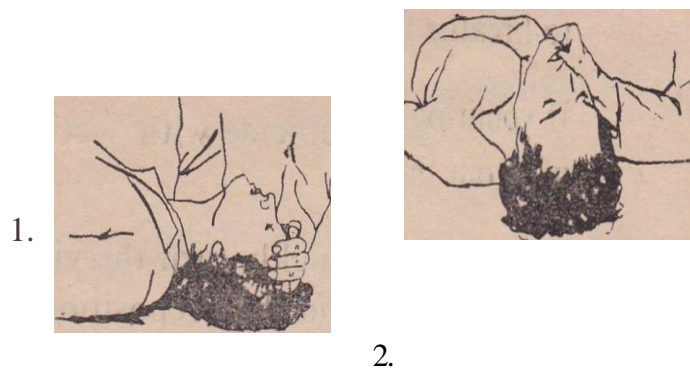
Normally, recovery should be rapid, except in electric shock, drug poisoning, or carbon monoxide poisoning cases. In these instances, nerves and muscles controlling the breathing system are paralyzed or deeply depressed, or the carbon monoxide has displaced oxygen in the blood stream over a period of time. When these cases are encountered, artificial respiration must often be carried on for long periods.

When a victim is revived, he should be kept as quiet as possible until he is breathing regularly. He should be kept covered and otherwise treated for shock until suitable transportation is available, if he must be moved. Artificial respiration should be continued until the victim begins to breathe for himself, or until a physician pronounces the victim dead, or until the person appears to be dead beyond any doubt.

A doctor's care is necessary during the recovery period, as respiratory and other disturbances may develop as '1. an after mouth. Mouth - to - Mouth (Mouth - to - Nose) Method of **Artificial Respiration**.

If there is foreign matter visible in the mouth, wipe it out quickly with your fingers or a cloth wrapped around your fingers

1. Tilt the head back so the chin is pointing upward (Fig.1). Pull or push the jaw into a jutting-out position (Fig. 2 and Fig.3.)



These maneuvers should relieve obstruction of the airway by moving the base of the tongue away from the back of the throat.

2. Open your mouth wide and place it tightly over the victim's mouth. At the same time pinch the victim's nostrils shut (Fig 4) or close the nostrils with your cheek (Fig.5.) Or close the victim's mouth and place your mouth over the nose. Blow into the victim's mouth or nose. Air may be blown through the victim's teeth, even though they may be clenched. The first blowing efforts should determine whether obstruction exists or not.



3. Remove your mouth, turn your head to the side, and listen for the return rush of air that indicates air exchange. Repeat the blowing effort for an adult, blow vigorously at the rate of about 12 breathes per minute. For a child, take relatively shallow breathes appropriate for the child's size, at the rate of about 20 per minute.
4. If you are not getting air exchange, recheck the head and jaw position (Fig. 1 or Fig. 2 and Fig. 3). If you still do not get air exchange, quickly turn the victim on his side and administer several sharp blows between the shoulder blades in the hope of dislodging foreign matter (Fig. 6).

Again, sweep your fingers through the victim's mouth to remove foreign matter.



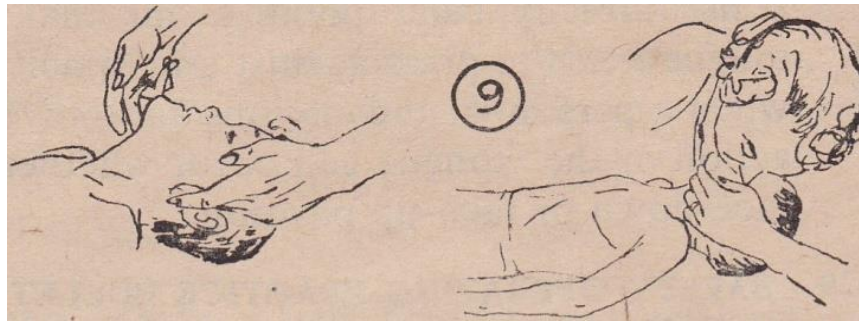
Those who do not wish to come in contact with the person may hold a cloth over the victim's mouth or nose and breathe through it.

The cloth does not greatly affect the exchange of air

Mouth-to-Mouth Technique for Infants and Small Children

If foreign matter is visible in the mouth, clean it out quickly as described previously.

2. Place the child on his back and use the fingers of both hands to lift the lower jaw from beneath and behind, so that it juts out.
3. Place your mouth over the child's mouth and nose, making a relatively leak-proof seal, and breathe into the child, using shallow puffs of air (Fig.9). The breathing rate should be about 20 per minute.



If you meet resistance in your blowing efforts, recheck the position of the jaw. If the air passages are still blocked, the child should be suspended momentarily by the ankles (Fig. 10) or inverted over one arm (Fig.11) and given two or three sharp pats between the shoulder blades, in the hope of dislodging obstructing matter.



( 11)

#### Manual Methods of Artificial Respiration

Rescuers who cannot, or will not, use mouth-to-mouth or mouth-to-nose techniques, should use a manual method. The rescuer should not be limited to the use of a single manual method for all cases, since the nature of the injury in any given case may prevent the use of one method, while favouring another.

It has already been pointed out that the base of the tongue tends to press against and block the air passage when a person is unconscious and not breathing. This action of the tongue can occur whether the victim is in face-down or face-up position.

## **12.33 - Annexure-I**

### **Slogans can be displayed**

1. No job is so urgent or no service is so important that it prevents us from taking the time to do safely.
2. Don't take chances - safety first.
3. Accidents are certainly avoidable.
4. No job is done well unless it is done safely.
5. The time to prevent an accident is before it happens.
6. Accidents don't just happen, they are caused.
7. Think of safety before you go too far. Work safely. You need more than luck to be safe.
8. Accurate knowledge precedes correct opinion. Obey safety rules.
9. Don't stick your neck out- Danger, keep away high voltage.
10. Never feel too sure that you are safe.
11. Accidents seldom happen at convenient times or places.
12. The greatest thing next to creating a life is saving a life.
13. Work safe to day-Be back tomorrow.
14. The avoidance of accidents are an essential requirement of every operation-Don't take chances.
15. Gauntlets, gloves are out around-Use them and be safe.
16. Monkey business - Has no business in any business.
17. If a job is too big for you- Get Help-Don't get hurt.
18. Accidents are not any fun.
19. Safety does pay.
20. Men - It is our job - Accidents must stop.
21. The end of a perfect day - No accidents - Every one home safe and sound.
22. If you are not safe - You are out - You must work safely.
23. All for safety for all - Do your part.
24. Accidents don't always happen to the other man.
25. Report any dangerous conditions to your foreman.
26. Every accident no matter how small, must be reported to your foreman at once.
27. We don't want anyone injured while working here. If you don't know the safe way to do a job assigned to you, ask your foreman.
28. Beginner's luck does not work here. If you are new on the job, learn our safety rules at once.
29. Our safety Rules impose no hardship. But their violations may.
30. Be orderly-sloppy habits result in poor work and accidents.
31. More team work -Fewer accidents.
32. Targets for safety - clean work area, use safeguards, follows safe practices.
33. Get first aid - no matter how slight the wound.
34. A broken wire gave a wound -First Aid would have prevented infection.
35. Have you thought of this - Knowing first Aid might someday enable you to show someone how to save your life?
36. If you only wear those safety shoes - You can avoid a foot injury. It can cost you your

full pay for weeks.

37. If you get chemicals in your eyes - Flush them out with water - Use lots of it and be quick about it.
38. Goggles (Proper type) will save your eyes.
39. Loose clothes and revolving drill caused many an accident.
40. Machinists and others - Beware - Wiping rag - Waste and floppy clothing can catch on a smooth revolving shaft or spindle and pull you in.
41. In artificial respiration, time is of utmost importance.
42. Fire - Friend or Foe, it is up to you.
43. Keep stairs clear.
44. Put oil rags in closed containers.
45. Slips count, clean up the things that cause them.
46. (Fire Protection appliances and equipment). Know where they are and how to use them. Be alert, Accidents happen in a flash.
47. Don't throw any tool, use the bag and hand line.
48. Look them over - Use only safe tools.
49. Stay clear of all ropes or cables under tension and you will be safe if they break.
50. Heads - up - Keep out from under loads.
51. They subtract from your pleasure - They add to your discomfort - They divide your income - They multiply your worries.
52. Safety first - use goggles or use shield.
53. You cannot afford accidents - Work safety.
54. The skillful worker is a safe worker.
55. Being careful is a part of your job.
56. If you want to be efficient, you must know how to instruct others in safety.
57. When you touch a nervous person, he jumps. One nervous person jumped off a scaffold and broke both legs when a fellow worker touched him. Another almost jumped into a pot of molten slag. Hence do not intentionally startle a nervous person while at work. It is more than a mean trick. It is criminal.
58. Your life may carefully depend on these - Help to keep them in good condition (Rope, Cable, Chain).
59. Be. Work safely. The angle of a sling alters its safe carrying capacity. 90°-1000 lb.; 45°-707 lb.; 30° - 500 lb.; 15° - 258 lb.
60. Always analyze why accidents have occurred to others. Take lessons and try to avoid such accidents.
61. Jokes - Begin in fun - can end in tragedy - Do not be guilty - Avoid them.

## Annexure-II

### **Extracts from Safety Posters. Can be displayed**

1. Men who know Electricity best- Respect it.
2. You can't overdo Safety.
3. No job we have to do is so important that we cannot take time to do it safely.
4. A safe Holiday is a happier one.
5. Big reasons for little caution- Shock, flash, burns, falls.
6. Don't Monkey with anything you don't understand Leave Electrical repairs to the experts.
7. Defective Electrical Equipment is Dangerous.
8. Report about defective Equipment.
9. Always use a fuse, Puller.
10. Keep room clear-Electrical contacts kill.
11. For Expert s only-Even when de-energized Practice Safety.
12. Makeshifts don't pay, use the right tools.
13. Follow Safety Rules, Prevent Accidents.
14. Dry up wet or greasy Spots.
15. Safety Pays.
16. Use Hand Rails.
17. Safety is a year-round job.
18. Never feel too sure you are safe.
19. One Step at a time (Near Steps).
20. Avoid falls-use a ladder or Platform.
21. Make Everyday a Holiday from accidents.
22. Avoid strains. Never twist your body. Shift your feet.
23. Beware of all hazards.
24. Be alert- Remove all hazards.
25. Prevent fires by removing causes.
26. National Security is our job. We can do it better without accidents.
27. Look for Hazards. Think of Solutions-Suggest a better way.
28. Nothing fully compensates for an accident. Don't have one.
29. Stop fires-save lives.
30. Safety is everybody's job.
31. From Safe lift. Bend Knees-lift steadily-No jerking. Feet and body in good position. Keep load close. Don't over reach. Get Help when necessary.
32. Look into the future for Safety. Protect your eyes.
33. How safe are we this year?
34. Walk- Do not run-Use Hand Rails.
35. Knowing safe way to do a job is not enough. Follow safe practices.
36. Safe living is a steady job at work - At Home-At play.
37. Get the safety Habit. It pays.
38. Stop Accidents with Safe work practices.
39. Safety costs you nothing. But without it, it can be cost to you.
40. A clean Shop is a safe Shop.
41. Cleanliness breeds safety.

42. Use safety guards required for your job.
43. The greatest thing next to creating a life is saving a life.
44. Over loaded circuits cause a Jot of fires. Think ahead of safety.
45. Several workers are injured every day. Don't you be one.
46. The life you save may be yours. Do not fall a victim to accidents.