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**Zambian Standard**

**ELECTRICAL SAFETY CODE – Code of Practice**

**Part 2: Operations and maintenance**

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**DRAFT STANDARD FOR PUBLIC COMMENTS**



## DATE OF PUBLICATION

This Zambian Standard has been prepared and published under the authority of the Standards Council on .....

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The revision of this Zambian Standard was undertaken to address the challenges faced and deficiencies observed during its implementation. Further, there was need to ensure that the Standard continued to meet the aspirations of the stakeholders in the Zambia Electricity Supply Industry (ESI). These reasons together with the need to be abreast with the advancements in technology necessitated the revision of the second edition of the standard (ZS 418-1:2013) which has been replaced by this third edition of ZS 418-1:2024.

ZS 418 has been divided in two parts as follows:

Part 1: Construction, installation and commissioning rules.

Part 2: Operations and maintenance.

## ACKNOWLEDGEMENT

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DRAFT STANDARD FOR PUBLIC COMMENTS

# ZAMBIA BUREAU OF STANDARDS

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## ZAMBIAN STANDARD

### ELECTRICAL SAFETY CODE: Code of Practice

#### Part 2: Operations and maintenance

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## 1 SCOPE

This part of ZS 418 provides rules on safety in the operations and maintenance of electrical systems. It covers the basic provisions for safeguarding of persons, animals, infrastructure and the environment from hazards arising from the installation, operations or maintenance of electrical equipment.

**NOTE:** Appendices A and B have been included for information only.

## 2 NORMATIVE REFERENCES

The following standard contains provisions which, through reference in this text, constitute provisions of this standard. All standards are subject to revision and, since any reference to a standard is deemed to be a reference to the latest edition of that standard, parties to agreements based on this standard are encouraged to take steps to ensure the use of the most recent editions of the standard indicated below. Information on currently valid national and international standards can be obtained from the Zambia Bureau of Standards.

ZS 418 Part 1	Electrical Safety Code - Code of Practice - Construction, installation and commissioning rules
ZS 387 Part 1	Electricity Supply - Power Quality and Reliability - Overview of Implementation and Minimum Standards
ZS 691	Safety in AC Substation Earthing
ZS 692	Substation Fire Protection
IEC 60038	IEC Standard Voltages

## 3 DEFINITIONS

For the purpose of this Standard the following definitions and those given in ZS 387–1 shall apply.

- 3.1 Apparatus:** any device installed or that forms part of a system for generation, transmission or distribution of electricity.
- 3.2 Authorised person:** means a Competent person possessing technical knowledge and appointed in writing by an enterprise or consumer of electricity to carry out specific duties or work on the enterprises' or consumers' own electrical system or apparatus.
- 3.3 Barricade:** means the physical limits in areas with energised or moving parts where it is safe to work as detailed in the relevant safety documents issued by an Authorised person.
- 3.4 Competent person:** means any person who in relation to any duty or function has had adequate training and experience so as to enable him to perform such duty or function without avoidable danger to himself, other persons, animals, equipment, infrastructure and the environment.



- 3.5 **Danger:** a risk of loss of life, bodily injury, or damage to health from shock, burn or other cause arising from generation, transmission, distribution or use of electric energy.
- 3.6 **Dead:** means at or about earth potential or zero voltage and not connected to a live conductor or live part of an electrical system.
- 3.7 **Earthed:** means connected to the general mass of earth in such a manner as to ensure at all times an immediate and efficient discharge of electrical energy without danger.
- 3.8 **Effective earth/ effectively earthed:** means bonded to an effectively earthed neutral conductor or to an earthing system designed to limit the likelihood of hazards to persons and having resistances to earth low enough to permit prompt operation of circuit protective devices.
- 3.9 **Effectively earthed neutral conductor:** means a neutral conductor of a multi-earthed system that is intentionally connected to the source transformer neutral directly or through an impedance to limit phase-to-earth fault current. The neutral conductor shall be of sufficient size to carry the available fault current and permit prompt operation of circuit protective devices.
- 3.10 **Electrical work:** means work in or on an electrical installation such as testing, measurement, repairing, replacing, modifying, extending, erection and inspection.
- 3.11 **Electrical installation:** means an assembly of associated electrical equipment supplied from a common origin to fulfil a specific purpose and having certain coordinated characteristics.
- 3.12 **Electrical supply station:** Any building, room, or separate space within which electrical supply equipment is located and the interior of which is accessible, as a rule, only to authorised personnel. This includes generating stations and substations, including their associated generator, storage battery, transformer, and switchgear rooms or enclosures, but does not include facilities such as pad-mounted equipment and installations in manholes and vaults.
- 3.13 **Electrical systems:** means a system in which all the conductors and apparatus are electrically connected to a common source of electromotive force.
- 3.14 **Energised:** means live and encompasses any motive force used to drive equipment.
- 3.15 **Enterprise (licensee):** A body, licensed by the ERB for generation, transmission, distribution and supply of electricity.
- 3.16 **Equipment:** A general term including fittings, devices, appliances, fixtures, apparatus, and similar terms used as part of or in connection with an electrical supply system.
- 3.17 **Extra high voltage (EHV):** The set of nominal voltage levels used in power systems in the range  $U_n > 220\text{kV}$ .

**NOTE:** The definitions of voltage levels of LV, MV, HV and EHV have been defined without any relationship to distribution and transmission voltage.

- 3.18 **Generating station:** A plant wherein electric energy is produced by conversion from some other form of energy (for example, hydro, chemical, nuclear, solar, mechanical, or hydraulic) by means of suitable apparatus. This includes all generating station auxiliaries and other associated equipment required for the operation of the plant. Not included are stations producing power exclusively for use with communications systems.

- 3.19 High voltage (HV):** The set of nominal voltage levels used in power systems in the range  $33 \text{ kV} < U_n \leq 220 \text{ kV}$ .
- 3.20 Live:** means electrically connected to a source of potential difference, or electrically charged so as to have a potential significantly different from that of earth in the vicinity.
- 3.21 Live area:** means any well-defined and enclosed area within generating station, switching stations or substation containing exposed live conductors.
- 3.22 Live working:** means all work in which a person makes contact with live parts or reaches into live working zone with either parts of his or her body, or with tools, equipment or devices being handled.
- 3.23 Live working zone:** means a space round live parts within which the insulation level to prevent electrical danger is not assured when encroaching it without protective measures.
- 3.24 Lock-out box:** means a box at a generating station, switching station or substation which is used for depositing keys for locks on an equipment which has been taken out of service and is under Permit-To-Work or Sanction-For-Test. The keys deposited in this box are those related only to isolation points on the equipment that has been taken out of service.
- 3.25 Low voltage (LV):** The set of nominal voltage levels that are used for the distribution of electricity and whose upper limit is generally accepted to be an a.c. voltage of 1 000 V (or a d.c. voltage of 1500 V).
- 3.26 Medium voltage (MV):** The set of nominal voltage levels that lie above low voltage and below high voltage in the range  $1 \text{ kV} \leq U_n \leq 33 \text{ kV}$ .
- 3.27 Non-electrical work:** means work on or to an electrical installation such as mechanical maintenance work, construction, excavation, cleaning, painting, etc. which is not electrical work.
- 3.28 Permit holder:** means a Competent person who has been issued with a permit to work or sanction for test or any other relevant safety document.
- 3.29 Permit-to-work:** means a written declaration on an approved form and signed by an Authorised person issued to a person in charge of work stating the apparatus upon which it is safe to work and the work to be carried out.
- 3.30 Safety document:** means a written form that outlines the necessary precautions, guidelines and rules to ensure safe work practices when working on electrical systems, apparatus or installations.
- 3.31 Safety notice:** means a notice suitably inscribed and securely displayed and conveying a warning against interference.
- 3.32 Sanction-for-test:** means a written declaration on an approved form and signed by an Authorised person issued to a person in charge of testing apparatus for the purpose of making known exactly what apparatus is to be tested and the condition in which the test is to be carried out.
- 3.33 Shielding:** means any permanent or temporary safety device that ensures that a person does not enter the live working zone. Shielding may consist of a screen barrier, enclosed or insulated cover.
- 3.34 Substation:** means an enclosed assemblage of equipment, e.g. switches, circuit breakers, buses and transformers, under the control of authorised persons, through which electric energy is passed for the purpose of switching or modifying its characteristics.

## 4 GENERAL SAFETY RULES

### 4.1 General safety requirements

#### 4.1.1 Responsibility of the employer

- (a) The employer shall develop and implement safety rules in accordance with this Code.
- (b) The employer shall inform each employee working on or in the vicinity of electrical supply equipment and the associated lines, of the safety rules governing the employee's conduct while so engaged.
- (c) The employer shall provide a copy of such safety rules to each employee working on or in the vicinity of electrical supply equipment and the associated lines .
- (d) The employer shall provide appropriate training to all employees who work on or in the vicinity of energised lines and parts. The training shall include applicable work rules required by this Code and other mandatory referenced standards or rules. The employer shall ensure that each employee has demonstrated proficiency in required tasks. The employer shall provide retraining for any employee who, as a result of routine observance of work practices, is not following work rules.
- (e) The employer shall appoint an Authorised person who shall be in charge of the operation of equipment and shall be responsible for their safe operation.
- (f) In cases where the strict enforcement of some particular safety rule could seriously impede the safe progress of the work at hand; in such cases the Authorised person in charge of the work should take necessary safety precautions to mitigate the hazard.
- (g) If more than one Authorised person is engaged in work on or about the same apparatus, one Authorised person shall be assigned to be in charge of the work to be performed. Where there are separate work locations, one Authorised person may be assigned at each location.
- (h) The employer shall ensure that an assessment is performed to determine potential exposure to an electric arc for employees who work on or near energised lines, parts, or equipment.

If the assessment determines potential employee exposure, employees shall not wear any clothing made from acetate, nylon, polyester, or polypropylene unless arc rated, and shall not wear an outer layer of clothing that could ignite and continue to burn when exposed to flames or the electric arc identified in the assessment.

- (i) The employer shall ensure that employees are informed of the procedures to be followed in case of emergencies and first aid including approved methods of resuscitation. Copies of such procedures should be accessible where the number of employees and the nature of the work warrants.
- (j) System authorisation
  - 1. The employer shall ensure that all unauthorised technical personnel involved in review of switching operations and procedures or carrying out switching operations are appropriately authorised as provided for in the employer's safety rules.
  - 2. The employer shall ensure that all authorised personnel are re-trained on a regular basis on issuance of instructions.
  - 3. The employer shall implement a clear and effective mode of communication among all personnel involved in issuing instructions and operations

#### 4.1.2 Responsibility of the employee

- (a) Employees shall carefully read and study the safety rules, and may be called upon at any time to show their knowledge of the rules.
- (b) Employees shall familiarise themselves with approved methods of first aid, rescue techniques and fire extinguishments.
- (c) Employees whose duties require working on or in the vicinity of energised equipment, apparatus or lines shall perform only those tasks for which they are trained, equipped, authorised and so directed. Inexperienced employees shall:
  - i) Work under the direction of a competent person at site; and
  - ii) Perform only directed tasks
- (d) No work shall be performed prior to conducting a risk assessment.
- (e) If an employee is in doubt as to the safe performance of any assigned work, the employee shall seek clarification from the employee's supervisor or the person in charge.
- (f) Any employee who, on grounds of safety, has an objection to carrying out any instruction shall convey such objection to the person who issued the instruction who shall have the matter investigated, and, if necessary, shall refer it to a more senior authority.
- (g) Employees who do not normally work on or in the vicinity of electrical supply equipment but whose work brings them into these areas for certain tasks shall only proceed with this work when authorised by the Authorised person.
- (h) Employees shall heed warning signs and signals and warn others who are in danger or in the vicinity of energised equipment, apparatus or lines.
- (i) Employees shall report promptly to the proper authority any of the following:
  - i) Equipment defects such as abnormally sagging lines, broken insulators, broken poles, or lamp supports;
  - ii) Accidentally energised objects such as conduits, light fixtures, or stay wires; and
  - iii) Other defects that may cause a dangerous condition.
- (j) Employees whose duties do not require them to approach or handle electrical equipment and lines shall keep away from such equipment or lines and should avoid working in areas where objects and materials may be dropped by persons working overhead.
- (k) Employees who work on or in the vicinity of energised equipment or apparatus shall consider all of the effects of their actions, taking into account their own safety as well as the safety of other employees on the job site, or some other part of the affected electric system, the property of others, and the public in general.
- (l) No employee shall approach or take any conductive object, without a suitable insulating handle, closer to any energised part.
- (m) Employees should exercise care when extending metal ropes, tapes or wires parallel to and in the proximity of live lines because of induced voltages. When it is necessary to measure clearances from live objects, only devices approved for the purpose shall be used.

### **4.1.3 Personal protective equipment and tools**

#### **4.1.3.1 Equipment and tools**

- (a) The employer shall provide adequate personal protective equipment and tools, sufficient to enable employees to meet the requirements of the work to be undertaken.
- (b) First aid equipment and materials shall be available in readily accessible and where practicable, conspicuous places.
- (c) Protective equipment and tools shall conform to the applicable standards and industry best practice.

**NOTE:** The following is a list of some common protective equipment and tools, the number and kinds of which will depend upon the requirements of each case:

- 1. Insulating wearing apparel such as rubber gloves, rubber sleeves, and headgear
- 2. Insulating shields, covers, mats, and platforms
- 3. Insulating tools for handling or testing energised equipment or lines
- 4. Face and eye protection
- 5. Person at work tags, portable danger signs, traffic cones, and flashers
- 6. Line worker's body belts, lanyards, and positioning straps
- 7. Fire-extinguishing equipment designed for safe use on energised parts or plainly marked that they must not be so used
- 8. Protective earthing materials and devices
- 9. Portable lighting equipment
- 10. First aid equipment and materials
- 11. Voltage detection devices/meters

#### **4.1.3.2 Inspection and testing of protective equipment and tools**

- (a) Protective equipment and tools shall be inspected and/or tested to ensure that they are in safe working condition.
- (b) Frequently used equipment such as insulating gloves, sleeves, climbing and fall protection equipment shall be inspected and/or tested before use.

#### **4.1.3.3 Identification and location**

- (a) Means shall be provided so that identification of supply lines can be determined before work is undertaken.
- (b) Persons responsible for buried facilities shall be able to indicate the location of their facilities.

#### **4.1.3.4 Fall protection**

- (a) Employers shall develop, implement, and maintain an effective fall protection program applicable to climbing or otherwise accessing and working from elevated work locations, which shall include all of the following:
  - i) Training, retraining, and documentation
  - ii) Guidance on equipment selection, inspection, care, and maintenance
  - iii) Considerations concerning structural design and integrity, with particular reference to anchorages and their availability
  - iv) Rescue plans and related training
  - v) Hazard identification
- (b) The employer shall not permit the use of 100% leather positioning straps or non-locking snap hooks.

## **4.2 Electrical installations**

### **4.2.1 Maintenance requirements**

All electrical installations shall be operated and maintained according to appropriate standards so as to minimise danger to persons, animals, infrastructure and the environment.

### **4.2.2 Safety notices, signs and tags**

- (a) The following notices shall be displayed at suitable locations within an electrical installation, and elsewhere as may be necessary to minimise danger:
- i) A notice bearing the designation of the installation and the voltage levels;
  - ii) A notice prohibiting unauthorised persons from operating and interfering with installed electrical apparatus;
  - iii) A notice containing the procedure to be followed in case of fire;
  - iv) A notice containing directions for the treatment of persons suffering from electric shock (Refer to Appendix A);
  - v) A notice prohibiting the entry of unauthorised persons;
  - vi) Warning sign to read “Danger – High Voltage”; and
  - vii) Any other notices that may enhance safety.

**NOTE:** The “skull and cross bone” sign shall not be used for electrical installations.

- (b) Safety signs and tags shall comply with applicable standards.

### **4.2.3 Electrical drawings and diagrams**

Where there is installed electrical equipment, there shall be kept and displayed:

- (a) At the office of the appointed person, plans or distribution diagrams showing the general electrical arrangements for all such apparatus;
- (b) At each substation, accurate distribution diagrams showing the electrical arrangement of each main circuit immediately associated with the substation’s switchgear, provided that in the main substation having no more than three main circuits, adequate labelling of the switchgear shall suffice; and
- (c) A map depicting the safe evacuation routes and emergency assembly points, where applicable.

### **4.2.4 Inspection**

#### **(a) Equipment in service**

Electrical equipment shall be inspected and maintained at such intervals as prescribed by the manufacturer, relevant codes and industry best practice. Equipment found to be defective shall be put in good order or permanently disconnected.

#### **(b) Idle equipment**

Infrequently used equipment shall be inspected and tested before use to determine its fitness for service. Idle equipment energised but not connected to a load shall be inspected and maintained at such intervals as prescribed by the manufacturer, relevant codes and industry best practice.

#### **(c) Emergency equipment**

Equipment maintained for emergency service shall be inspected and tested at such intervals as prescribed by the manufacturer, relevant codes and industry best practice.

#### (d) New equipment

New equipment shall be inspected and tested in accordance with the manufacturer's guidelines, relevant codes, and industry best practice before being placed in service.

### 4.3 Access to live or energised areas

- (a) Access to substations shall be kept locked when unattended.
- (b) Access to other live areas must be barricaded when unattended.
- (c) No person except an Authorised person or a person acting under the supervision of an authorised person in possession of relevant safety documents shall have access to any such live area.
- (d) In the case of pole mounted substations and towers, anti-climbing devices shall be fitted and maintained at every support structure within 3 m of the ground to serve as a deterrent to unauthorised persons.

### 4.4 Conductors within a live area

- (a) All exposed conductors within a live area shall be regarded as being live unless they are verified to be dead and an earth conductor seen to be attached.
- (b) No person shall touch the insulation which supports any exposed conductor unless the conductor is proved dead and earthed.

### 4.5 Safety clearance to live conductor

- (a) A specified safe distance shall be maintained at all times during construction work and other non-electrical work for the movement of machinery or bulky loads. This distance shall be measured from the nearest bare live part or conductor.
- (b) The safe lateral distance shall be as shown in Table 4-1 below as follows:

**Table 4-1: Safety clearance distances**

	Normal operating voltage between bare line conductors	Distance to the nearest unscreened live conductors in air	Distance to the nearest part to earth potential of an insulator supporting a live conductor
1.	Not exceeding 11 000 volts	2.6 m	2.5 m
2.	Exceeding 11 000 volts but not exceeding 33 000 volts	2.8 m	2.5 m
3.	Exceeding 33 000 volts but not exceeding 66 000 volts	3.1 m	2.5 m
4.	Exceeding 66 000 volts but not exceeding 88 000 volts	3.2 m	2.5 m
5.	Exceeding 88 000 volts but not exceeding 132 000 volts	3.6 m	2.5 m
6.	Exceeding 132 000 volts but not exceeding 220 000 volts	4.3 m	2.5 m
7.	Exceeding 220 000 volts but not exceeding 275 000 volts	4.6 m	2.5 m
8.	Exceeding 275 000 volts but not exceeding 330 000 volts	5.2 m	2.5 m

If the specified safe distance cannot be maintained, the work shall be carried out as electrical work, where appropriate arrangements shall be put in place to ensure that the required degree of safety is provided.

### 4.6 Isolating and proving dead

- (a) Except as provided for in Chapter 7, no work shall be carried out on electrical equipment or apparatus until the person responsible for the work is satisfied that the equipment has been isolated from all sources of supply and proved dead and a permit-to-work issued.
- (b) Reliance shall not be placed on making live (energising) or dead by pre-arranged understanding or signal.

#### **4.7 Work on towers, poles and high structures**

- (a) When working on towers, poles or high structures, all persons shall use appropriate fall protection equipment while climbing, transferring, or transitioning across obstacles on poles or structures, unless doing so is not feasible or creates a greater hazard.
- (b) Fall protection equipment shall be inspected before use by the employee to ensure that the equipment is in safe working condition.
- (c) The competent person in charge of the work shall check all the protective equipment and clothing for appropriateness and soundness before allowing anyone to climb the tower, pole or high structure.
- (d) Fall arrest equipment shall be attached to a suitable anchorage.
- (e) The employee shall determine that all components of the fall protection system are properly engaged and that the employee is secure in the line-worker's body belt, harness, or any other fall protection system.
- (f) Snap hooks shall not be connected to each other.
- (g) Wire rope lanyards shall be used in operations where the lanyard is subject to being cut. Wire rope lanyards shall not be used in the vicinity of energised lines or equipment.

#### **4.8 Use of instruments**

Information on tools, equipment and devices shall be available including their characteristic features and how they are to be used, stored, maintained, transported, inspected, tested and calibrated.

#### **4.9 Mobile equipment**

- (a) Access and movement of mobile equipment in the vicinity of live conductors shall be agreed, defined and under direct supervision of an Authorised person.
- (b) When cranes or other equipment such as preformed scaffoldings are taken into and out of a substation the route to be followed shall be agreed and defined on site by an Authorised Person.
- (c) The equipment shall be connected to the substation earthing system as near to the entrance as possible and shall remain connected to the earthing system all along the defined route. It shall also remain connected to the earthing system at the working position. On removal of the equipment, it shall be connected to the earthing system until it is as clear of the exit as possible.

#### **4.10 Use of ladders and long objects**

- (a) All ladders shall be soundly constructed and properly maintained and shall, where liable to slip, be properly secured or fitted with effective devices to prevent skidding, or be firmly held by a person stationed at the foot of the ladder.
- (b) Ladders to be used in the vicinity of live conductors shall be of an approved non-metallic type and of no greater length than is required for the work involved, where practicable.
- (c) Ladders or long objects shall not be used without the permission of an Authorised Person.
- (d) The movement and erection of such ladders and long objects shall be carried out only under the direct supervision of the Competent Person in charge of the work and when moved at ground level they shall be carried only in a horizontal position and as near the ground as practicable by at least two people.
- (e) Portable ladders, provided for giving access to fixed ladders, which terminate above ground level, shall be padlocked in position by an Authorised Person while work is being carried out on the structure.
- (f) All portable ladders within substations shall be laid flat upon the ground when not in use and locked to a suitable anchorage where practicable.

#### **4.11 Working off ground level**

No person may leave ground level in live areas except when covered by an applicable safety document.



#### **4.12 Adverse weather conditions**

In the event of the approach of a lightning storm, no work shall be carried out on overhead lines, buried cables and outdoor substations.

#### **4.13 Working on oil tanks**

- (a) No person shall enter a tank which has recently been emptied of insulating oil or any other flammable substance until an Authorised person is satisfied that it is safe to work.
- (b) Smoking or exposed flames, or any heat sources which may cause ignition, shall be prohibited in the vicinity of open tanks containing, or which have contained insulating oil or any other flammable substance until the precautions specified in (c) have been taken.
- (c) Work on such tanks involving the application of heat shall be forbidden until all practicable steps have been taken to prevent fire or explosion, either by the removal of the flammable substance and any fumes or by rendering them non-explosive and non-flammable.

#### **4.14 Work on compressed air systems**

- (a) No maintenance work other than the floating of safety valves and relief valves or the testing of pressure gauges and alarms shall be carried out in or on the above plant until an Authorised Person has issued an applicable safety document.
- (b) The applicable safety documents shall not be issued until the plant has been isolated from all possible sources of supply, and the pressure contained in the vessel or pipe work reduced to atmospheric pressure.
- (c) Whenever possible shutting off shall be done in two different places along the same line. A non-return valve shall not be considered as a shut-off valve unless it is capable of being rendered inoperative.
- (d) No person shall use compressed air to clean themselves or any article of clothing.
- (e) An Authorised Person shall ensure that every pressure vessel is inspected, tested and certified annually by the Government Inspector; the result of such inspection shall be entered in a logbook for such plant.

#### **4.15 Firefighting equipment**

- (a) All substations must be equipped with appropriate firefighting equipment in accordance with ZS 692.
- (b) Before work or inspection is carried out in any substation or enclosure protected by automatic fire extinguishing equipment, the automatic control feature shall be rendered inoperative and the equipment left in manual control mode and a notice to this effect displayed. Doors to such substations or enclosures shall be left open whilst work or inspection is in progress.
- (c) Automatic control shall be restored immediately after the persons engaged on the work or inspections have withdrawn from the protected enclosure.
- (d) Due caution shall be applied in the selection of appropriate firefighting equipment to be used on live electrical equipment, in compliance with applicable Zambian or international standards.
- (e) After the discharge of firefighting equipment emitting dangerous fumes all personnel shall leave the area until it is thoroughly ventilated, or else suitable breathing apparatus shall be worn.

#### **4.16 Competence of personnel**

No person shall work or be instructed to work on electrical equipment unless that person is a Competent person or is under the direct supervision of a Competent person.

#### **4.17 Safety documents**

- (a) Forms of safety documents where used, shall be designed in such a way as to secure maximum safety of personnel, infrastructure, equipment and environment.

Safety documents applicable to electrical works include the following:

- i) Permit-to-work;
  - ii) Sanction-for-test;
  - iii) Limitation of access;
  - iv) Isolation form;
  - v) Inter-connection circuit isolation and earthing certificate;
  - vi) Excavation permit;
  - vii) Confined space permit;
  - viii) Hot work permit; and
  - ix) Working at height permit.
- (b) The following features should be included in the safety documents specified under (a) above but shall not be limited to:
- i) Unique document identification number;
  - ii) Date and time;
  - iii) Validity period;
  - iv) Utility name;
  - v) Location/station;
  - vi) Apparatus/ equipment;
  - vii) Type of work to be carried out;
  - viii) Where applicable, number and positions of earths;
  - ix) Declaration by issuing officer/officer (name, signature, date and time of issue);
  - x) Declaration by receiver (name, signature, date and time); and
  - xi) Worker's declaration - actual work done, clearance/cancellation (date, time, signature of responsible person).

## **5 WORKING ON EQUIPMENT ABOVE STANDARD MINIMAL VOLTAGES**

### **5.1 Safety documents**

- (a) No person shall work on any equipment or apparatus which has been connected to a standard minimal voltage (and above) until the relevant safety documents have been issued by an Authorised person.
- (b) Under no circumstances shall more than one sanction-for-test be in effect on the same equipment and at the same time. No Sanction-for-test shall be issued on an apparatus which already has a valid Permit-to-work.
- (c) Except under circumstances which may prevent the authorised person from issuing the permit-to-work or sanction-for-test or any other safety document in accordance with laid down procedures, the Authorised person shall not issue the safety document to himself.

### **5.2 Isolating, locking off and earthing**

Before issuing the relevant safety documents such as a permit-to-work or a sanction-for-test, the Authorised person shall ensure that the following procedure is applied in the specified order, unless there are special reasons for doing otherwise in respect of all points of supply which may feed electrical power to the equipment:

- (a) The supply from all sources is switched off, isolated and locked off.
- (b) The equipment is proved dead.
- (c) The equipment or apparatus is effectively earthed.
- (d) Lockable switches and/or busbar and circuit orifice shutters are locked.
- (e) Safety notices are displayed on control panel(s) and/or switches supplying power to the equipment.

### 5.3 Safety testing before earthing

#### (a) Switchgear having enclosed busbars

Where earthing gear exists as an integral part of switchgear having enclosed busbars, earthing shall be carried out by making use of this gear. Where no such earthing gear exists, the supply switch shall be racked out and the busbar and circuit orifice shutters locked in the closed position with locks having individual keys.

#### (b) Exposed conductors

Before any portable or fixed earthing device is applied to an exposed electrical conductor, the conductor shall be tested by means of an approved safety testing device suitable for withstanding the normal circuit voltage without danger. Such testing device shall be proved to be in good working order before and after use.

#### (c) Lock out boxes

- i) Lock-out boxes fitted with locks shall be situated at suitable positions for the reception of keys which secure switches, barriers and spout shutters.
- ii) Lock-out equipment and other similar devices shall be provided for the protection of men working under Permit-to-work.
- iii) One lock on each box shall be of a type that can be operated only by a key in the possession of an Authorised Person.
- iv) The other lock shall be of a type operated by non-interchangeable keys.
- v) Holders of all lockout box keys are personally responsible for their safe custody.
- vi) Appropriate systems shall be put in place to account for custody of any key at any particular time.

### 5.4 Use of portable earthing devices

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

- (a) Earthing leads shall be examined for loose nuts and bolts and broken strands and insulation of the earth prior to use and only leads found to be in good working order shall be used.
- (b) Verify that the circuit is dead by approved methods. Where a voltage detector is used, the indicator on the detector must be tested before and after verification.
- (c) Earthing leads of adequate capacity shall be firmly connected to the earth system before being secured to the phases by means of an approved apparatus and care must be taken to ensure that good contact is made. When removing earths, they shall be disconnected from the phases first and the earth last.
- (d) All phases shall be earthed even if work is to be carried out on one phase.
- (e) Earthing leads for use at generating stations, substations and overhead lines shall have a cross-sectional area capable of carrying the full short circuit current for the rated withstand time. The clamps shall be of an approved type and adequate capacity.

### 5.5 Supervision of Works

- (a) All electrical works shall be supervised by a Competent person.
- (b) A permit holder shall not leave the work area. Should a situation arise compelling the permit holder to leave a work area, the workers shall immediately be withdrawn and the permit cancelled. A new permit-to-work shall be issued to another Competent person before work can resume.

### 5.6 Remote or Automatic Control Features

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

## 6 MAKING CIRCUITS LIVE AFTER COMPLETION OF WORK ON EQUIPMENT

- (a) Prior to cancelling a relevant safety document such as permit-to-work or sanction-for-test, the Authorised person cancelling the permit-to-work or sanction-for-test shall ensure that:
  - i) The work is completed and safe to make live.
  - ii) The work place is cleared of all persons.
  - iii) All tools and materials used in carrying out the work have been removed from the working area.
  - iv) The work place is left clean.
  - v) All the earths that may have been applied by the permit holder in the specified work area on the system have been removed.
- (b) When the relevant safety document is cancelled, the equipment or apparatus shall be considered live and no work shall be carried out until a further permit has been issued.
- (c) The Authorised person shall ensure that all earths on the system established under clause 5.2 are removed.
- (d) Before the removal of safety notices affixed to the control panel and making live of the circuit, an Authorised person shall ensure that no persons remain within any live chamber or substation other than those necessary to assist in the operation of closing isolators and circuit breakers.

## 7 WORK ON LIVE ELECTRICAL LINES AND EQUIPMENT

### 7.1 General requirements

All employees working on live electrical lines, equipment or apparatus shall observe all precautions and rules specified in this section in addition to those contained in section 4.5.

- (a) The distances specified in section 4.5 shall be maintained from all earthed objects and from other conductors, lines, and equipment whose potential is different from that to which conductive equipment are bonded in order to maintain the equipotentially live work environment in an isolated state.
- (b) When working on live equipment and lines, one of the following safeguards shall be applied:
  - i) Insulate employee from live parts;
  - ii) Isolate or insulate the employee from earth and earthed structures, and potentials other than the one being worked on
- (c) Employees shall not place dependence for their safety on the covering (non-rated insulation) of conductors.
- (d) All employees working on or in the vicinity of equipment exposed to voltages higher than those guarded against by the safety protective equipment shall assure themselves that the apparatus on which they are working are free from dangerous leakage or induction, or have been effectively earthed.
- (e) Cutting into insulating coverings of live conductors:
  - i) A supply cable to be worked on as dead that cannot be positively identified or determined to be dead shall be pierced or severed at the work location with a tool designed for the purpose;
  - ii) Before cutting into a live supply cable, the operating voltage shall be determined and appropriate precautions taken for handling conductors at that voltage; and
  - iii) When the insulating covering on live conductors or cables must be cut into, the employee shall use a tool designed for the purpose. While doing such work, suitable eye protection and insulating gloves

with protectors shall be worn. Employees shall exercise extreme care to prevent short-circuiting conductors when cutting into the insulation.

- (f) Metal measuring tapes, and tapes or ropes containing metal threads or strands, shall not be used closer to exposed live area, and should not approach live equipment closer than the distance specified in 4.5. Care should be taken when extending metallic ropes or tapes parallel to and in the proximity of live lines because of the effect of induced voltages.
- (g) Equipment or material of a non-insulating substance that is not bonded to an effective earth and which extends into a live area, and which could approach live equipment closer than the distance specified in 4.5, shall be treated as though it is live at the same voltage as the line or equipment to which it is exposed.

## **7.2 Training**

Employees shall be trained in live work practices, which include rubber glove, hot stick or bare hand method, before being permitted to use these techniques on live lines.

## **7.3 Equipment**

- (a) Insulated aerial devices, ladders and other support equipment used in live work shall be evaluated for performance at the voltages involved. Tests shall be conducted to ensure the equipment's integrity. Insulated aerial devices used in bare-hand work shall be tested before the work is started to ensure the integrity of the insulation.
- (b) Insulated aerial devices and other equipment used in this work shall be maintained in a clean condition.
- (c) Tools and equipment shall not be used in a manner that will reduce overall insulating strength of the insulated aerial device.

When working on insulators under live-line procedures, the clear insulation distance shall be not less than the distances specified in 4.5.

## **7.4 Bonding and shielding for bare-hand method**

- (a) A conductive bucket liner or other suitable conducting device shall be provided for bonding the insulated aerial device to the live line or equipment.
- (b) The employee shall be bonded to the insulated aerial device by using conducting shoes, leg clips, or other suitable means.
- (c) Adequate electrostatic shielding in the form of protective clothing that has been evaluated for electrical performance shall be provided and used where necessary.
- (d) Before the employee contacts the live part to be worked on, the aerial device shall be bonded to the live conductor by means of a positive connection.

## **7.5 Requirement for assisting employee**

No employee shall work alone outdoors or indoors on or dangerously in the vicinity of live conductors or parts.

## **7.6 Opening and closing switches**

Manual switches and disconnectors shall always be closed by a continuous motion. Care should be exercised in opening the switches to avoid serious arcing.

## **7.7 Working position**

Employees should avoid working on equipment from any position from which a shock or slip will tend to bring the body toward exposed parts whose potential is different from that of the employee's body. Work should, therefore, generally be done from below, rather than from above.

## **7.8 Protecting employees using switches and disconnectors**

When equipment or apparatus is to be disconnected from any source of electrical energy for protection of employees, the switches, circuit breakers, or other devices designated and designed for operation under the load involved at sectionalising points shall be opened or disconnected first. When making live, the procedure shall be reversed.

## **7.9 Making connections**

In connecting dead equipment or lines to a live circuit by means of a conducting wire or device, employees should first attach the wire to the dead part. When disconnecting, the source end should be removed first. Loose conductors should be kept away from exposed live parts.

## **7.10 Switchgear**

Switchgear shall be made dead prior to performing work involving removal of protective barriers unless other suitable means are provided for employee protection. The personnel safety features in switchgear shall be placed after work is completed.

## **7.11 Current transformer secondaries**

The secondary of a current transformer shall not be opened while live. If the entire circuit cannot be properly made dead before working on an instrument, a relay, or other section of a current transformer secondary circuit, the employee shall bridge the circuit with jumpers so that the current transformer secondary will not be opened.

## **7.12 Capacitors**

Before employees work on capacitors, the capacitors shall be disconnected from the live source, short circuited, and earthed. Any line to which capacitors are connected shall be short circuited and earthed before it is considered dead. Since capacitor units may be connected in series, parallel, each unit shall be shorted between all insulated terminals and the capacitor bank before handling. Where the tracks of capacitor are on unearthed racks, the racks shall also be earthed. The internal resistor shall not be dependent upon the discharge capacitors.

## **7.13 Gas insulated equipment**

Employees working on gas insulated cable systems or circuit breakers shall be instructed concerning the special precautions required for possible presence of arcing by products of sulphur hexafluoride (SF<sub>6</sub>).

**NOTE:** By products resulting from arcing SF<sub>6</sub> gas insulated systems are generally toxic and irritant. Gaseous by products can be removed for maintenance on the compartments by purging with air or dry nitrogen. The solid residue that must be removed is mostly metallic fluoride. This fine powder absorbs moisture and produces fluorides of sulphur and hydrofluoric acid, which are toxic and corrosive.

## **7.14 Attendant on surface**

While electric supply personnel are in a manhole, an employee shall be available on the surface in the immediate vicinity to render assistance from the surface. This shall not preclude the employee on the surface from entering the manhole to provide short term assistance.

# **8 PROTECTION OF ELECTRICAL EQUIPMENT**

The protection characteristic of an electrical installation should not be altered such that it compromises the expected performance of the system.

## **9 MAINTENANCE OF SWITCHGEAR AND PLANT BATTERIES**

Switchgear and plant batteries shall be regularly monitored, tested and maintained to ascertain their integrity and capacity, and should operate as required.

## **10 ENVIRONMENTAL PROTECTION**

In the case of operations and maintenance of electrical equipment, no substance shall be disposed of without complying with the environmental rules provided for in the Environmental Management Act No.12 of 2011 and relevant regulations or industry best practice.

**DRAFT STANDARD FOR PUBLIC COMMENTS**

## **APPENDIX A - TREATMENT OF ELECTRIC SHOCK (Informative)**

### **A.1 EFFECT OF ELECTRICITY ON THE BODY**

- (a) Burn at the point of entry, leaving small dark skin in some cases.
- (b) Internal clotting of blood or rupture of vessels.
- (c) Injuries to brain and nerve tissue leading to unconsciousness and paralysis.
- (d) Loss of cardiac beat (rhythm, fibrillation) leading to unconsciousness or death in severe cases.
- (e) Severe burns at site of exit.

### **A.2 GENERAL FIRST AID INSTRUCTIONS**

- (a) Do not touch the victim until the victim is free from the electrical current.
- (b) Free the patient from electricity by:
  - i) Switching off the current immediately; or
  - ii) Pulling the connecting plug from the socket; or
  - iii) Disconnecting the plug by pulling on the cable; or
  - iv) Pushing or knocking the victim from contact using a non-conductor (wood, stick, etc).
- (c) Immediately check for breathing – if no sign observed, proceed to provide artificial respiration and send for help.
- (d) Keep the patient warm.
- (e) Look for any other injuries such as:
  - i) Fractures;
  - ii) Wounds due to fall; or
  - iii) Internal injuries due to current flow inside the body.
- (f) Seek for expert opinion.

### **A.3 FURTHER INSTRUCTIONS FOR HIGH VOLTAGE**

- (a) High voltage can kill instantly by touch or simply getting near to the line.
- (b) When there is a victim, KEEP AWAY.
- (c) Do not try to rescue the victim.
- (d) Notify authority.
- (e) Erect a cordon immediately around the victim at a safe distance.

### **A.4 ARTIFICIAL RESPIRATION**

#### **A.4.1 Holgor Nielsen method**

- (a) Lay the patient face downwards with head turned slightly to one side with arms raised and bent and the side of the head resting where the hands join.
- (b) Slap the patient between the shoulders smartly with the hand several times.
- (c) Kneel on your right knee opposite the patient's head and place your left foot by the patient's elbows (see figure 1).



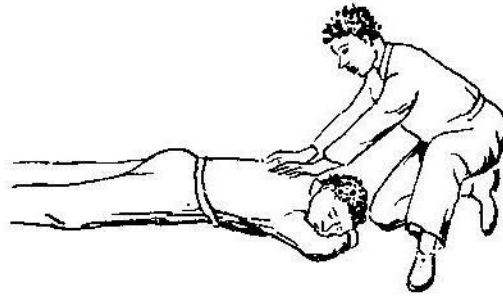


Figure 1

(d) Promote artificial respiration by:

**FIRST MOVEMENT** – Keep your arms straight the palms of your hands on the patient's shoulder blades and your thumbs on his spine. Rock forward with firm pressure taking 2½ seconds for this movement (see figure 2).

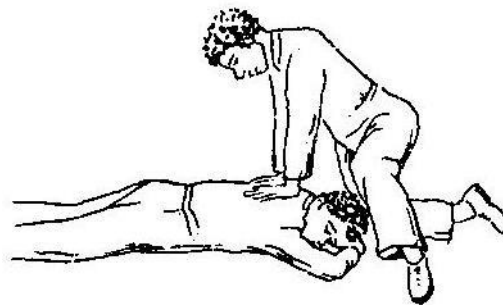


Figure 2

**SECOND MOVEMENT** – Release pressure gradually and slide your hands on the patient's elbow and then raise the patient's arms and pull slightly towards you taking 2½ seconds for this movement (see figure 3).

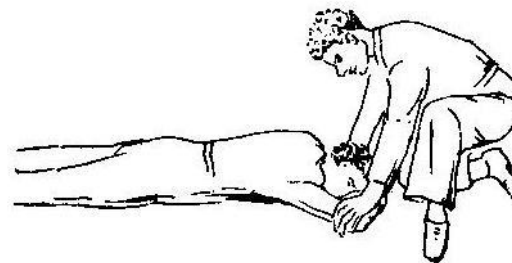
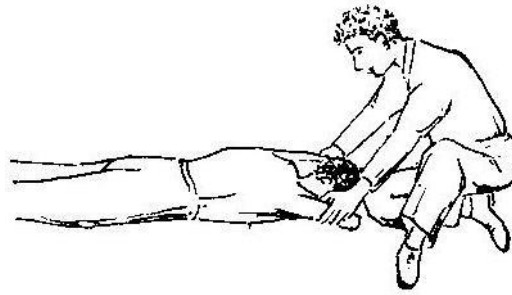


Figure 3

**THIRD MOVEMENT** – Lay the patient's arms down again and replace your hands on the patient's shoulder blades (see figure 4).



**Figure 4**

**REPEAT THE WHOLE MOVEMENT TWELVE TIMES TO THE MINUTE.**

- (e) If there are chest injuries – Lay the patient face downwards with head turned slightly to one side with arms raised and bent and the side of the head resting where the hands join. Grasp the patient’s elbows towards you taking 2½ seconds for this movement. Return the arms to the first position and repeat the movements at the rate of 12 times per minute.
- (f) If the arms are injured:
  - i) Lay the patient downwards with his arms in such a position as to minimize risk or increasing injury.
  - ii) Keep your arms straight with palms on the patient’s shoulder blades and your thumbs on spine. Rock forward with firm pressure for 2½ seconds for this movement.
- (g) DO NOT give up efforts to restore natural breathing until told to do so by a doctor.

#### **A.4.2 Silvester method**

- (a) Rapidly get the patient flat on his back.
- (b) Make sure his throat is not blocked
- (c) Push a firm thick pad (cushion, folded coat or blanket) under the shoulder
- (d) Bend the head right back
- (e) Position yourself rapidly by kneeling at the patient head, with each hand grasp of the patient’s wrist and cross them over the lower part of the chest.
- (f) Keeping your arms straight, rock forward steadily, do this until your arms are about vertical. The weight of your body presses through your arms on the patient’s chest, by compressing the chest; it expels air from the lungs.
- (g) Rock backwards and release pressure, still holding the patient’s wrist, you sweep his arm in a wide arc up and outwards and then downwards until they are nearly on the ground. This widens the patient’s chest and ‘draws air into his lungs.
- (h) Return to your first position and repeat this exercise for 4 times and feel patient’s neck pulse. If present, carry on with this method. If not apply cardiac massage.

#### **A.4.3 Burns**

Burns should be treated with “Burn Dressings” and covered to exclude the air.

#### **A.4.4 Physical Shock**

In addition to suffering from electrical shock it is also probable that the patient will be suffering from physical shock and it is important that this condition be treated. The patient must be kept warm with blankets or coats and if available hot water bottles should be applied to the feet.

**APPENDIX B – SAFETY DOCUMENTS  
(Informative)**

**B.1 PERMIT-TO-WORK**

Permit-to-work No.....

Permit-to-Work Valid from: (date)..... to (date).....

**Direct/Indirect Issue (delete whichever is not applicable)**

Station:..... Date:..... Time:.....

<b>Apparatus:</b>
<b>Work to be carried out:</b>
<b>Number and Positions of Earth:</b>

**DECLARATION BY A CUSTOMER AUTHORISED PERSON (IF APPLICABLE)**

I have read this permit to work and I certify that where applicable the apparatus is switched off and isolated on these premises. Safety devices and earths will not be removed until this permit to work has been cancelled and permission has been obtained from the control engineer.

Signed:..... Designation: .....

Time: .....hrs Date: ..... Location: .....

**Permit-to-work issued by:**

Name: .....

Date: ..... Time: .....

I, the **Authorised Person**, accept the apparatus detailed in this permit as having been prepared in accordance with System Regulations and I am satisfied that the work can be safely carried out:

Authorised Person: .....Signature.....

Date: ..... Time: .....

**WORKERS' DECLARATION**

We, the undersigned declare that the work to be done under this Permit is fully understood and agree that the work can be carried out in accordance with the System Regulations. We appreciate the nature of such work		We, the undersigned, whose names appear on this Permit have been notified by the Authorised Person that the apparatus referred to above is about to be returned to service and is therefore to be regarded as live.	
<b>SIGN ON</b>		<b>SIGN OFF</b>	
Workers Names*	Workers' Signature	Workers' Names*	Workers' signatures

**CLEARANCE**

I, the **Authorised person**, whose name appears above, has notified all the workers concerned that the apparatus referred to above is about to be returned to service and is therefore to be regarded as live, and I am satisfied that the apparatus is ready to be returned to service in accordance with the System Regulations.

Date: ..... Time: ..... Signature: .....

**DECLARATION BY A CUSTOMER AUTHORISED PERSON (IF APPLICABLE)**

I have been told that this permit to work has been completed.

Signed ..... Designation: .....

Time: .....hrs Date: ..... Location: .....

**CANCELLATION**

I, the Authorised Person, declare that all Danger Notices, Circuit earths, Screens and barricades applied for the purpose of this permit to work have been removed and that the permit to work is now cancelled.

Authorised Person..... Signature: .....

Date: ..... Time: .....

**NOTE:** 1 Any cancellation or alteration on this Permit-to-work renders it void  
2 \*Enter Workers' names in block letters

**B.2 SANCTION-FOR-TEST (LIVE) APPARATUS**

Sanction No.: .....

Date: ..... Time: ..... Hours

Location: .....

Apparatus to be tested.....

Voltage of apparatus..... Isolation Certificate No.: .....

Testing to be carried out. ....

**The above apparatus is LIVE for test purposes.**

**Issue**

Sanction issued by the following Authorised Person (issuing) .....

Name (Block Letters): ..... Signature: .....

Sanction approved by the following Authorised Person (isolating):

Name (Block Letters): ..... Signature: .....

The above instructions are clearly understood

Sanction issued to the following Authorised Person(s) (testing):-

Name (Block Letters): ..... Signature: .....

**Clearance**

Testing of the above apparatus has been completed.

Authorised Person(s) (testing): ..... Signature: .....

Cancellation (Delete as applicable): .....

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1) The above apparatus is LIVE and is NOT safe to be energised for operational use, and no permit-to-work shall be issued.

Authorised Person (issuing) .....(Signature)

Authorised Person (isolating).....(Signature)

Date ..... Time.....Hours

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2) The above apparatus is safe to be energised for operational use and padlocks have been removed.

Authorised Person (issuing) .....(Signature)

Authorised Person (isolating) .....(Signature)

## APPENDIX C - BIBLIOGRAPHY

1. IEEE C2: 2023 – National Electrical Safety Code, published by the Institute of Electrical and Electronics Engineers.
2. Guide to Mining Regulations, Zambia
3. Copperbelt Energy Corporation System Regulations, Fourth Edition 2020
4. ZESCO Limited Safety Rules, Version 2, 2020
5. Mopani Copper Mines Electrical Safety Rules
6. Lunsenfwa Hydro Power Company Electrical Safety Rules
7. Mopani Copper Mines Electrical Standards For Electrical Unit And Installations (STD-EN-207B)

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