ENERGY REGULATION BOARD

SAFETY RULES FOR THE ELECTRICITY SUPPLY INDUSTRY IN ZAMBIA

DRAFT I

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1.0 INTRODUCTION

1.1 Purpose

The purpose of these Safety Rules (Rules) are:

a) To establish a system of uniform and safe operating practices in the Electricity Supply Industry (ESI) to provide for:

   i) Safety of all persons who are involved in construction, installation, commissioning, operations and maintenance
   ii) Safeguarding of electrical apparatus and installations
   iii) Safeguarding of the environment and members of the public
   iv) Continuity of power supply

b) For Enterprises to develop specific safety procedures and technical instructions for their operations in compliance with these Rules

1.2 Scope

a) These Rules shall apply to electrical facilities, associated plant and Apparatus under the ownership or control of Enterprises

b) The Rules shall apply to work:

   i) On or in close proximity to all parts of the generation, transmission and distribution system, and customer Apparatus
   ii) Associated with the inspection and/or commissioning of the Apparatus of the generation, transmission and distribution system

1.3 Application

These Rules shall apply, in conjunction with ZS 418: Electrical Safety Code, to the provision of access to work on or near Power System Apparatus and may involve:

a) Authorisation to enter Restricted Areas
b) Outage planning and coordination
c) Preparation of Switching Schedules
d) Emergency and/or Black Start conditions
e) Isolating and proving dead
f) Earthing
g) Issuing, receiving, clearing and cancelling Safety Documents

1.4 Reference Documentation

These Rules have been developed with reference to but not limited to the following:

a) Energy Regulation Act No. 12 of 2019
b) Electricity Act No. 11 of 2019
c) The Factories Act Cap. 441
d) Mining Regulations
e) SI 79 of 2013: Electricity (Grid Code) Regulations
f) ZS 418 – Electrical Safety Code – Code of Practice
g) Safety rules for institutions in the ESI

These Rules are not intended to supersede any of the statutory Acts and regulations but rather to supplement them.

1.5 Document Review

These Rules will be subject to review every five (5) years. However, ad hoc reviews may be triggered by a policy shift, change in law or need for enhanced clarity in the Rules. Such reviews may be initiated by any interested party in writing and communicated to the Energy Regulation Board (ERB) for consideration by the Safety Liaison Committee (SLC).

These Rules and any amendments shall be ratified by the ERB and published on the ERB website.

2.0 DEFINITIONS

2.1 General Definitions

Apparatus	:	any device installed or that forms part of a system for generation, transmission or distribution of electricity
Approved	:	a device or method that has been evaluated and selected from alternatives that meet the specific requirements of the job and authorised in writing by the Appointed Official
Authorisation	:	a formal process that an enterprise puts in place to train, evaluate and certify its technical employees to attain different levels of responsibility as required by the enterprise in accordance with these Rules
Barricade	:	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 the person in charge of works
Black Start	:	the provision of generating equipment or power source that, following a total system collapse (Blackout), is able to start

		without an outside electrical supply and energise a defined portion of the transmission or distribution system so that it can act as a start-up supply for other capacity to be synchronised as part of a process of re-energising the entire Interconnected Power System (IPS)
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 electrical energy
Dead	:	at or about earth potential or zero voltage and not connected to a live conductor or live part of an electrical system
Earthed	:	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
Electrical installation	:	an assembly of associated electrical equipment supplied from a common origin to fulfil a specific purpose and having certain coordinated characteristics
Electrical system	:	a system in which all the conductors and Apparatus are electrically connected to a common source of electromotive force
Energised	:	live and encompasses any motive force used to drive equipment
Enterprise	:	an entity engaged in the generation, transmission, distribution and supply of electricity
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
Established Earth Point	:	the point for connection of earthing devices to the general mass of earth
Limitation-of-Access	:	a written declaration on the approved form signed and issued by an Authorised Person/Senior Authorised Person to a Person in Charge of work in any generating station, switching station or substation defining the limits of the area within which the work is to be performed. It is issued for all works at ground level
Live	:	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
Live area	:	any well-defined and enclosed area within generating station, switching stations or substation containing exposed live conductors
Lock-out box	:	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
Log	:	books, Log sheets, diaries, completed Safety Document forms, Switching Schedules and other records which together form a complete record of operating events in an operating area
Permit-to-Work	:	a written declaration on an approved form and signed by an Authorised person/Senior 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
Power System	:	all Apparatus associated with the generation, transmission, distribution and supply of electricity. This includes civil, mechanical and electrical assets
Priority Loads	:	are critical and essential loads that are given preference in the distribution of power during outages or periods of limited supply ensuring that they receive power before other loads. These loads include but not limited waterworks, health facilities, underground mines, airports, security installations
Regulator	:	means "The Energy Regulation Board"
Restricted Area	:	a defined area of the Power System where access is controlled
Safety Document	:	a written form that outlines the necessary precautions, guidelines and rules to ensure safe work practices when working on electrical systems, apparatus or installations
Safety Notice	:	a notice suitably inscribed and securely displayed and conveying a warning against interference
Sanction-for-Test	:	a written declaration on an Approved form and signed by an Authorised person/Senior 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
	:	
Switching Instruction	:	it is an instruction by the System Controller issued to a Senior Authorised Person in charge of switching for the purpose of safely carrying out a switching and shall be duly recorded in the Switching Instruction Form/Pad and Logbook
	:	
Switching Instruction Form/Pad	:	an approved form on which the Person in Charge of switching, records Switching Instructions issued by a System Controller
	:	
Switching Instruction Logbook	:	a book in approved form in which a System Controller records switching instructions issued to a Person in Charge of switching
Switching Schedule	:	a document, approved by the Enterprise, which lists and records sequential operations to ensure safe and reliable operation of the Power System

System Operator	:	an entity responsible for the short term reliability of an Interconnected Power System, which is in charge of controlling and operating the transmission system and dispatching generation or balancing the supply and demand in real time in a non-discriminatory manner
Tag	:	an approved warning label or Safety Notice used in accordance with Approved procedures
Tagged	:	marked to indicate that the normal operation of Apparatus, tools and equipment is restricted.

2.2 Personnel Definitions

Appointed Official	:	a person with the relevant engineering competence in an enterprise charged with the overall responsibility for the respective aspects requiring approval.
Chief Executive	:	the top-ranking official in the Enterprise, often referred to as the Chief Executive Officer or Managing Director.
Ordinary Person	:	a person without sufficient training or experience to enable them to avoid the dangers associated with the Power System.
Competent Person	:	any person who in relation to any duty or function has had adequate training and experience so as to perform such duty or function without avoidable danger to oneself, other persons, animals, equipment, infrastructure and the environment.
Authorised Person	:	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. The certificate of appointment shall state the class of work the person is authorised to carry out, and the electrical Apparatus or section of the electrical network to which it applies
Senior Authorised Person	:	an Authorised Person who holds greater responsibility, including issuance and cancellation of Safety Documents (e.g. Permits-To-Work, Sanction-for-Test, etc), carrying out switching, isolating and earthing operations on any Apparatus connected to the Power System
System Controller	:	a person responsible for controlling and coordinating all activities necessary to achieve safe and reliable operation of the Power System
Person in Charge	:	a Competent Person to whom Safety Documents can be issued. This is for the purposes of carrying out work (as a supervisor), testing or switching operations.

3.0 DUTIES AND RESPONSIBILITIES

3.1 Regulator

The Regulator shall be responsible for:

a) Monitoring compliance of Enterprises to these Rules
b) Take enforcement action where appropriate in instances of non-compliance with these Rules
c) Periodic review of these Rules as outlined under section 1.5 above

3.2 Enterprise

The Chief Executive of an Enterprise shall:

a) Provide safe systems of work
b) Develop specific procedures and technical instructions for their operations in compliance with these Rules
c) Provide a copy of these Rules to each employee who is required by virtue of his employment to have specific knowledge of these Rules and for such issue, the employee shall sign a receipt which shall be retained by the Enterprise
d) Ensure that all persons who have a role in carrying out these Rules are appropriately trained and authorised, to fulfil their assigned roles and responsibilities
e) Maintain a register of all authorised persons, detailing the level of authorisation and responsibilities
f) Ensure compliance with these Rules
g) Provide appropriate personal protective equipment (PPE) and tools to enable employees to meet the requirements of the work to be undertaken
h) Establish an appropriate organisational structure for the effective operation and control of the Power System
i) Develop and implement emergency preparedness plans, firefighting and First Aid procedures

3.3 Employees

a) All persons working on or in close proximity to Power System Apparatus have a responsibility to exercise due care and diligence in the performance of the work activities including having Authorisation to meet the requirements of these Rules.
b) Employees charged with the responsibility to perform duties on the Power System shall:
   i) Carefully study and comply with these Rules
   ii) Provide evidence of appropriate training and authorisation
   iii) Use approved PPE and tools appropriate for the work being undertaken
   iv) Conduct risk assessments prior to undertaking any works on the power system
   v) Familiarise themselves with methods of first aid, rescue techniques and fire protection systems

vi) When in doubt as to the safe performance of any assigned work, seek clarification from the supervisor or the person in charge

4.0 GENERAL SAFETY PROVISIONS

4.1 Communication

a) There shall be established clear, concise and effective communication protocols essential to maintain safety and prevent incidents and accidents. The communication protocols shall include legible written and clear verbal instructions which may be read back to the communicator for confirmation and recording
b) All parties involved shall ensure adherence to the established communication protocols

4.2 Training and Competence

4.2.1 Power System Safety Training

a) Enterprises shall establish and implement clear procedures that ensure that their Employees are adequately and regularly trained in the operations of the Power System
b) There shall be documented evidence of all personnel trained with their respective areas of responsibilities clearly defined

4.2.2 Authorisation

The following categories of persons responsible for carrying out work, switching operations, issuing and receiving of Safety Documents shall require specific authorisation training as outlined below:

a) Competent Person – general entry level training required for the person to work on or near Power System Apparatus
b) Authorised Person – specific and supervisory level training allowing the person to either issue, receive or manage Safety Documents, or to operate Power System Apparatus
c) Senior Authorised Person – high level training allowing persons to issue, receive and cancel Safety Documents as well as operate Power System Apparatus

4.2.3 Competence

a) All works within the scope and application of these Rules shall only be carried out by persons that:
    i) Receive appropriate training and authorisation for the work concerned
    ii) Receive training and demonstrate competence in first aid procedures, firefighting and emergency response relevant to the nature of the work
    iii) Demonstrate competence in the relevant work procedures and safety instructions

b) All authorisation certifications shall have a maximum validity of five (5) years after which refresher, reassessment and reappointment shall be required
c) All authorised persons who are redeployed, shall be reassessed in their new areas of responsibility
d) Formal induction training shall be required for all authorised persons, who by virtue of their appointment, frequently conduct switching operations and have been absent for a minimum period of one (1) month

4.3 Hazard Identification and Risk Assessment

4.3.1 Risk Assessment in Work Areas

a) Persons in charge of work on or near Power System Apparatus, shall perform a risk assessment on the work area involving all members of the working party prior to commencement of work
b) Where different work teams are involved in works on the Power System, the persons in charge of the teams shall ensure joint detailed risk assessments are conducted
c) All identified risks shall be mitigated or controlled and documented for sign off by the working parties

4.3.2 Risk Assessment on Interface Points of the Interconnected Power Systems

An enterprise and its customer shall undertake joint risk assessments at interface points on the IPS to assess and mitigate risks in accordance with the provisions of the Grid Codes with consent of the System Operator, where applicable.

4.4 Personal Protective Equipment

a) Appropriate personal protective equipment (PPE) shall be used for any work to be undertaken on the power system
b) The protective equipment shall conform to the applicable standards and industry best practice

4.5 First Aid Equipment

First aid equipment and materials shall be readily available, accessible and where practicable, conspicuously located.

4.6 Tools and Safety Equipment

a) All tools and equipment to be used for any work on the power system shall be of an approved type and shall not be altered or substituted

b) All tools and equipment shall be operated and maintained in accordance with acceptable standards

4.7 Carrying of Equipment

When carrying or moving objects in the vicinity of energised Apparatus, extreme care shall be taken to avoid:

i) Infringement of the safety clearances and appropriate Enterprise procedures; and/or
ii) The hazards associated with moving Apparatus

4.8 Incident Reporting

a) All reportable incidents shall be communicated to the Regulator as provided for in the Electricity Act
b) Employees shall be responsible to report all incidents to their employer through respective reporting procedures
c) All Enterprises shall develop and implement failure mode and root cause analysis procedures
d) The System Operator shall conduct a post-fault analysis after a major incident that affects the Power System and a detailed report of the root cause and remedial measures to prevent recurrence, submitted to the Regulator

5.0 SAFETY CLEARANCES TO ENERGISED ELECTRICAL APPARATUS

This section makes reference to the Wayleave Code of Practice which provides for the protection and safety of personnel found near energised electrical Apparatus.

a) Due consideration shall be given to safety clearances when planning work near energised electrical Apparatus
b) The safety clearances to be observed when carrying out work near energised electrical Apparatus are shown in Table 5-1 below. The clearances apply to bare, covered and insulated conductors

Table 5-1: Safety Clearance Distances [*Source: ZS 418 Part 2 – Table 4.1*]

	Normal operating voltage between bare line conductors	**Distance to the nearest unscreened energised conductors in air**	**Distance to the nearest part to earth potential of an insulator supporting an energised 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

6.0 ENTRY TO RESTRICTED AREAS

a) Access to Restricted Areas shall be controlled for the safety of persons entering a potentially hazardous environment and to maintain system security. All persons accessing a Restricted Area shall comply with the Approved procedures
b) Access to work areas shall be under the supervision and control of the person in charge of work and appropriate physical limits defined
c) Appropriate safety notices shall be displayed at suitable locations to minimise danger

7.0 OUTAGE MANAGEMENT

7.1 General Provisions

a) An enterprise shall develop procedures for outage management for the safe and reliable operation of the Power System
b) Enterprises shall notify the System Operator of all outages impacting the Power System in accordance with the provisions of the Grid Codes

7.2 Switching Schedules

a) Switching Schedules shall be used for isolation, restoration, commissioning, decommissioning or reconfiguration of Power System Apparatus and shall be completed in accordance with Approved outage management procedures
b) A Switching Schedule may not be required in the event of an emergency in which case immediate action shall be taken to prevent injury to people or damage to Apparatus. The resulting actions shall be reported immediately to the appropriate control room and recorded as soon as practicable in the appropriate Log

7.3 Switching Instructions

a) All switching instructions shall be recorded on a Switching Instruction Form/Pad and signed off by the person conducting switching operations
b) Switching instructions specified in a) above, shall be recorded in a Switching Instruction Logbook by the System Controller
c) Switching instructions shall be retained for a specified period of time and availed whenever required before archiving and disposal

8.0 POWER SYSTEM BLACK START

8.1 Black Start Procedures

a) The System Operator shall develop a national Black Start Procedure in collaboration with other Enterprises in the ESI
b) It shall be the responsibility of each Enterprise to develop their specific Black Start Procedures in coordination with the System Operator
c) Black Start Procedures specified in a) above shall be reviewed every three (3) years or whenever there are major network changes on the power system or identified inadequacies during its implementation

8.2 Implementation of Black Start Procedures

a) Declaration of a national blackout requiring implementation of Black Start shall be done by the System Operator
b) The System Operator shall coordinate restoration of power supply to Priority Loads
c) In order to ensure the effectiveness of the implementation of the Black Start Procedures, communication systems shall be adequate, available at all times, in good working order and provided with back-up power supply independent of the primary power supply source
d) No person shall in any way distract the attention of the person in charge of operating the system during a power blackout.
e) No person other than the authorised personnel specified in the Black Start Procedure shall enter the Control Centre. Notices to this effect shall be posted at the entrance to every Control Centre.
f) Enterprises may be required to avail standby power supply for Black Start.

9.0 ISOLATION

Isolation is provided to ensure disconnection from all possible sources of energy in the process of making Apparatus safe for the work to be performed.

9.1 General Principles of Isolation

In undertaking isolation procedures, the Enterprises shall adhere to the following general principles:

a) All isolation operations shall be identified on a Switching Schedule
b) Apparatus shall be isolated by the use of an Approved procedure
c) Isolated apparatus shall be rendered incapable of being energised without premeditated and deliberate action
d) Where isolation points have provision for locking, such locking arrangements shall be used to prevent re-energising. If the isolation point is not fitted with a built-in provision for locking, an alternative lock or other means of immobilising a point of isolation shall be used
e) Appropriate Safety Notices shall be displayed at isolation points
f) When an isolation point is used for multiple Safety Documents it shall:
    i) have separate Safety Notices or tags for each Safety Document: or
    ii) have a separate Safety Notice or tag for each Switching Schedule; or
    iii) be tagged in accordance with Approved Switching Schedule procedure; or
    iv) be cross locked in accordance with Approved isolation procedures; or
    v) have Lock-out boxes fitted with locks situated at suitable locations for the reception of keys which secure switches, barriers, spout shutters, lock-out equipment and other similar devices provided for the protection of persons working under the Safety Document
g) Safety Notices or Tags shall be suitably displayed, and include relevant information such as:
    i) "Do Not Operate"
    ii) "Do not Interfere"
    iii) "Applied to" (print description and status of apparatus)
    iv) "Applied by" (print name)
    v) "Signed" (Signature); and
    vi) "Date" (Date of safety notice placement)
h) Apparatus operated via remote control subsequent to local isolation shall be Tagged on the SCADA system or manually in the Control Centre such that a premeditated action is needed to remove such tagging
i) Isolation and restoration, including the application and removal of Safety Notices or tags, shall only be undertaken by the Person in Charge of switching
j) Apparatus used as a point of isolation shall not be worked on
k) No isolation points shall be altered. However, where the need arises during the switching process, such alterations shall only be done with the consent of the System Controller

9.2 Principles of Electrical Isolation

a) An isolation point shall have a break of a distance appropriate to the voltage and insulating medium that is visible if possible.

Where the isolation point does not have a visible break, it shall:

i) Be withdrawn to the isolated position; or
ii) Be proven dead and Approved earthing devices applied to confirm isolation; or
iii) Have control circuits isolated, locked (as appropriate) and Tagged. Where isolation is performed by a miniature circuit breaker (MCB) or circuit breaker (CB) which cannot be locked, further isolation shall be required i.e. withdrawal of all applicable fuses/links to provide a double break.

b) Voltage Transformer (VT) and Capacitor Voltage Transformer (CVT) secondaries shall be isolated by the withdrawal of all applicable fuses/links or by opening an isolation switch or MCB. The fuses/links shall be secured or the isolation switch/MCB shall be locked. Applicable VT selection switches shall be Tagged
c) In addition to the above, for work on a CVT secondary termination box a risk assessment shall be carried out to determine the need for additional isolation or other safety measures to guard against any exposed high voltage terminal associated with the secondary of the CVT. Further isolations by the withdrawal of fuses/links or opening MCB's or slide disconnect links to provide a double break from low voltage (LV) supplies may be required
d) Where isolation of LV circuits requires the withdrawal of fuses/links, all subsequent exposed live terminals shall be made safe
e) Where customers remain connected within a dead section of the Power System, then a risk assessment shall be carried out to determine the need for additional isolation or other safety measures to guard against alternative sources of supply e.g. customer generators and solar cells, Approved procedures must be followed

NOTE: Where a switch truck/carriage has been removed from its cubicle, other safety measures shall be taken to prevent access to live conductors, e.g. spout shutters locked, busbar covers installed, switchgear door locked and tagged.

9.3 Principles of Mechanical Isolation

a) Apparatus shall be unwound, untensioned or drained, vented and depressurised to prevent uncontrolled movement, or otherwise made safe for work
b) An isolation device shall have an appropriate design to withstand the hydraulic, pneumatic, or mechanical energy
c) All necessary gates, valves and mechanical linkages utilised as isolation points shall be restrained and locked in position and Tagged
d) Rotating and linear actuating apparatus shall be stationary, and where appropriate, constrained and/or its motive force and control circuits isolated
e) Pressure vessels, penstocks, piping, ducts, and vents shall be isolated, and drained where appropriate, to ensure their condition/status remains unchanged for the duration of the work
f) Valves utilised as drains shall have Safety Notices placed on them or be Tagged
g) Motorised valves and gates shall have their control and/or power circuits isolated

h) Where energised Apparatus cannot be de-energised, an appropriately designed and approved locking device shall be used to prevent movement
i) Systems used to apply and maintain seals, shall be monitored for the duration of the work.
j) Where the integrity of the isolation device is questionable, further isolation or additional safety measures shall be put in place
k) Where practical, the apparatus shall be proven de-energised

10.0 EARTHING

Apparatus shall be Earthed to ensure and maintain the effective dissipation of electrical energy to the general mass of earth.

The correct application of earths and the maintenance of Earthed and equipotential work area conditions, aid in providing a safe work area.

10.1 General Principles of Earthing

a) Electrical apparatus shall be isolated from the Power System and proved dead prior to earthing
b) Each conductor in a multi-phase circuit shall be proved dead
c) Proving dead shall be done as close as possible to the earthing position
d) Only Approved voltage detection/indication devices shall be used
e) Only Approved earthing devices shall be used
f) Earthing circuits shall not contain fuses
g) Earthing devices shall be applied/operated with Approved tools and methods by appropriately trained employees
h) Earthing devices shall be short-circuited and applied to all phases
i) When applying earthing devices manually, handling of the earthing device shall be kept to a minimum
j) Earthing devices shall be applied with a minimum of time between proving dead and application
k) Earthing devices shall be applied to an Established Earth Point
l) Established Earth Points shall be selected on the following prioritised basis:
    i) Station earth grid, integral earth switch position or approved structure earthing points
    ii) Pole mounted transformer high voltage earth only
    iii) Earth rod of an installed pole stay wire
    iv) Galvanised pole reinforcing rods; and
    v) Approved temporary earthing rod installed to a minimum depth of 600 mm into the ground
m) All work shall be done between earths unless, due to lack of space or design, it is not physically possible to apply more than one set of earths. These situations may include pole substation high voltage droppers, machine stator windings and high voltage motors

n) Earths shall be placed as close as practicable to the work area
o) For apparatus where earths cannot be applied at or within sight of the work location/area and retained for the duration of the Safety Document, earths shall be applied at or near all points of isolation, provided that:
    i) For station apparatus: no work shall commence on isolated busbars and apparatus until they have been positively identified and proved dead at the work location; and
    ii) For underground cables: no work shall commence on any isolated underground cable until its identity at the work location has been established beyond any possible doubt. If there is any doubt, high voltage cables shall not be worked on until spiked or cut with an approved device
p) Equipotential work area conditions shall be created and maintained by the:
    i) Placement of earths where the conductor will not be broken within an isolated and earthed section and there are no earths immediately adjacent to the work area; or
    ii) Application of additional safety measures where the conductor will be broken within an isolated and earthed section.

    Additional safety measures may comprise the application of more earths connected to the same physical Established Earth Point, bridging, bonding and short-circuiting, or any required combination of these.
q) Circuit main earths shall only be removed as per the conditions of the relevant Safety Document.
r) Mobile plant and/or other equipment such as scaffolding being used in the vicinity of energised conductors shall be earthed in accordance with Approved procedures.
s) Earthing details shall be entered in the Approved Logbook.
t) When applied, earth switches, other than those used for discharging, shall be locked and tagged.

NOTE:

1. Cables may hold electrical charge for a considerable time following isolation or testing. After testing, or isolation, they shall be treated as energised or live until Earthed. After earths are removed, electrical charge may build up in the cable over time.
2. No remote earthing shall be allowed on power system apparatus.

10.2 Earthing Device Application

a) Prepare earthing device for application by:
    i) Connecting portable earth tail to an Established Earth Point; or
    ii) Placing circuit breaker/isolating switch in appropriate position to prove dead. Prove operation of the voltage detection device in accordance with the manufacturer's instructions where applicable
b) Prove dead by:
    i) A voltage detection device as close as possible to the earthing position; or
    ii) Checking integrated voltage indication device.

Where it is not possible to prove dead, confirm dead through the status of interlocks, circuit breakers, disconnectors and local SCADA systems.

c) Immediately prove operation of the voltage detection device in accordance with the manufacturer's instructions where applicable. `
d) Apply earthing device.
e) Record details of applied earthing device in the Approved Logbook.

10.3 Connecting and Disconnecting Portable Earthing Devices

a) When connecting portable earthing devices to any Apparatus, the connection to earth shall always be made first and in removing such device, disconnection from earth shall be made last. Portable earthing devices shall be applied and removed using an Approved earthing pole
b) When multiple portable earthing devices have been used, and end-clamps are in close proximity to each other on the same structure, all conductor end-clamps shall be removed before any of the earth end clamps
c) When a portable earth device earth end-clamp has become detached, with the conductor end clamp still connected, an additional earth shall be applied in parallel before the faulty earth is removed

11.0 BARRICADING OF A WORK AREA

a) Work area barricading shall be provided to direct movement of the working party to the area in which it is safe to work under the terms and conditions of the Safety Document.
b) All barricaded work areas shall:
    i) Be established prior to the issue of the Safety Document.
    ii) Be defined by barricades erected to indicate, as clearly as possible, the area in which work is to be performed. Where it is not possible and/or practicable to use physical barricades, Approved procedures shall be followed.
    iii) Be arranged so that the Apparatus to be worked on is accessible without interfering with the barricades.
    iv) Have a clearly defined entry point. This may require separate entry points for personnel and vehicles.
c) Employees shall not cross under/over or interfere with barricades that barricade a work area except in an emergency situation that threatens the safety of personnel, Apparatus or the environment and then only with due consideration for personal safety.

12.0 SAFETY DOCUMENTS

No work on the Power System shall be undertaken without the issuance of a Safety Document. The Safety Documents include, among others, the following:

i) Permit-to-Work
ii) Sanction-for-Test

iii) Limitation-of-Access
iv) Isolation form
v) Inter-corporation circuit isolation and earthing certificate
vi) Excavation permit
vii) Confined space permit
viii) Hot work permit
ix) Working at height permit
x) Risk assessment form

12.1 General Principles of Safety Documents

a) The issue and receipt of Safety Documents, and the transfer of Person in Charge shall occur at the location/work area with the consent of the System Controller.
b) Safety Documents are issued by Authorised Persons/Senior Authorised Persons with the consent of the System Controller to a Person in Charge who shall independently determine that safe conditions exist at the work area noting all hazards/danger points, control measures and/or conditions for testing, prior to accepting the Safety Document.
c) The original copy of any Safety Documents shall be under control of the Person in Charge. The Safety Document shall be readily available for inspection at the location/work area at all times that the working party is on site.
d) Where an isolation is provided that allows access to multiple items of Apparatus, multiple Safety Documents may be issued. Where multiple Safety Documents are issued, they shall be coordinated/recorded on a central Log.
e) While testing is being carried out under a Sanction-for-Test, there shall be no other Safety Documents issued on that item of Apparatus.
f) Copies of all Safety Documents used to make work areas safe shall be produced on request.

12.2 Issuance of a Safety Document at a Remote Work Area

In circumstances where the isolation and circuit main earthing points, if applicable, are remote from the work area (due to distance), and the direct issue of Safety Documents cannot be done, the Safety Documents may be issued indirectly with the consent of System Controller in accordance with Approved procedures.

12.3 General Requirements before Issuance of Safety Documents

Before a Safety Document is issued:
a) The location, Apparatus and work area shall be made safe for the work as described in the Safety Document
b) When working in the vicinity of Live Apparatus, all known hazards or danger points shall be identified and listed on a risk assessment form

c) The Senior Authorised Person and the Person in Charge shall agree on the conditions of the Safety Document with consent of System Controller. The Person in Charge shall inform the Senior Authorised Person of any intended use of special tools, vehicles or plant, which may have a bearing on the preparation of the work area
d) The work area shall be prepared so that the Safety Clearance Distances cannot be encroached without crossing a barricade. Where it is not possible to use physical barricades, an approved alternative method shall be used to barricade the boundary between the safe work area and energised Apparatus. When this is not practical it shall be noted under the hazards/danger points of the Safety Document
e) The Authorised Person/Senior Authorised Person shall issue the Safety Document at the work area with consent of System Controller explaining the status of the Apparatus and describe the hazards and any relevant information to the Person in Charge

12.4 Issuance and Cancellation of Safety Documents

12.4.1 Issue

a) The Authorised Person/Senior Authorised Person shall complete the details of the Safety Document on condition that the general requirements have been met
b) Should any hazards/danger points exist at the work area they shall be described on the Safety Document
c) The Authorised Person/Senior Authorised Person in conjunction with the Person in Charge shall identify at the work area the status of the Apparatus and site, the hazards/danger points and any relevant information
d) When the Person in Charge agrees to the conditions of the Safety Document, the Senior Authorised Person with consent of System Controller issues the Safety Document by signing in the relevant position
e) The Safety Document becomes effective when the Person in Charge receives the Safety Document number and signs to acknowledge receipt of the Safety Document
f) On receipt of the Safety Document the Person in Charge assumes control of the work area
g) The Person in Charge ensures the members of the work team understand the status of Apparatus and site covered by the Safety Document. The members of the work team then sign on to the Safety Document
h) The System Controller records the issue of the Safety Document in the Log

12.4.2 Cancellation

a) On completion of the work as described on the Safety Document, all members of the work team named on the Safety Document, shall sign off, noting the time and date
b) The Person in Charge clears the Safety Document and shall state whether the Apparatus is or is not available for service subject to any limitations that may be applicable

c) The Safety Document is then cancelled by the Senior Authorised Person with consent of System Controller
d) The System Controller records the cancellation of the Safety Document in the Log

12.5 Safety Document where Testing is Required

a) Where Apparatus is required for testing to be carried out safely, the Person in Charge of testing shall first complete the Sanction-for-Test. The working party shall then acknowledge the commencement of the testing by signing in the appropriate section of the Sanction-for-Test.
b) Where testing requires that circuit main earths or other safety measures be removed, they shall only be removed immediately prior to the test and replaced immediately after the test is completed
c) In situations where the members of the working party leave the work area before tests are completed, they shall sign off in the Sanction-for-Test.

12.6 Transfer of Safety Document

When work on equipment is to be continued by another person, the original Safety Document shall be cleared and cancelled, stating work incomplete. Then a fresh/new Safety Document shall be issued to the person taking over the work after verifying all points of isolation and/or earthing and details of work covered and remaining.

12.7 Clearing and Cancelling of a Safety Document under Exceptional Circumstances

a) Should unforeseen circumstances arise such that a Person in Charge of work is unable to clear the Safety Document for reason beyond his/her control, such Safety Document may be cleared and cancelled by System Controller with the permission of the Appointed Official
b) When a member of the working party who signed on the Safety Document is not able to sign off due to circumstances beyond one's control, the Person in Charge of work shall bring it to the attention of the Appointed Official, through the System Controller, who shall sanction for clearance and cancellation of the Safety Document

12.8 Supervision of Works

No person holding a Safety Document may leave the work area while the work is in progress. Should that person decide to leave the work area, work shall be suspended, and the workers shall be withdrawn from the work area.

12.9 Suspension of Works

a) Where work is suspended due to either adverse weather, an emergency, the absence of the Person in Charge of work or a violation of safety, the Safety Document shall remain in force
b) Before the resumption of suspended work, the Person in Charge of work shall ensure the following:
    i) That the conditions of the work area as detailed in the Safety Documents remain unchanged. In the event that the conditions of the work area have changed, the working party shall be briefed of the changes and new risks associated with the changes
    ii) Isolation and earthing points are still intact and are as described on the Safety Document. In the event that the isolation and/or earthing integrity has been compromised, work must not recommence until the integrity has been restored in accordance with Approved procedures

13.0 PROVISION AND USE OF LOCKS AND KEYS

13.1 Access Control to Power System Enclosures

a) An enterprise shall ensure that access to rooms or spaces containing electrical installations is controlled by use of appropriate locking systems
b) Entrances not under observation of an authorised person shall be appropriately locked

13.2 Issuance of Access Control Keys

Keys to enclosures containing Apparatus shall only be issued to suitably authorised persons in accordance with Approved procedures and a record shall be kept.

13.3 Custody of Lock-out Box Keys after Isolation

Once isolation is undertaken, the custody of Lock-Out Box keys shall be the responsibility of each Person in Charge who has applied a lock to the Lock-out box.

13.4 Loss of keys to Lock-Out Box

Should the Person in Charge lose a key, he/she shall suspend the work and immediately report such incident to the System Controller who shall then decide the next course of action.

14.0 CONSTRUCTION, COMMISSIONING, DECOMMISSIONING OF POWER SYSTEM APPARATUS

The Enterprise shall construct, install and commission its Apparatus connected to the IPS in accordance with the provisions of the Grid Codes.

14.1 Construction

Construction of Power System Apparatus shall be in accordance with the provisions of the relevant Electrical Safety (ZS 418) and Construction (ZS 690, ZS 691 and ZS 692) Standards.

14.2 Commissioning

a) No Apparatus must be connected to the IPS on the first installation without prior notification of the System Operator and all relevant pre-commissioning test reports submitted.
b) All Apparatus and control panels to be commissioned must be suitably labelled and the corresponding single line diagrams/drawings and associated supervisory control and data acquisition (SCADA) systems updated and displayed accordingly.
c) All Apparatus commissioned and connected to the Power System, shall be subject to the scope and application of these Rules.

14.3 Decommissioning

a) No Apparatus must be decommissioned from the IPS without prior notification of the System Operator and the decommissioning protocol submitted accordingly.
b) All single line diagrams/drawings and associated supervisory control and data acquisition (SCADA) systems for Apparatus to be decommissioned must be updated accordingly.