

Technical Guide



Powering The Nation

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ZESCO Safety Rules

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Division:
General



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3	Sections 1,2,3,4,5,7 and 8 Revised	12/2025

Distribution

Controlled Copy No.

Assigned To: This technical guide shall be available to all employees within ZQMS.



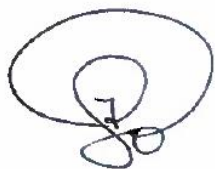
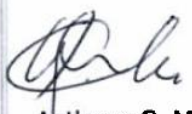
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Development, Review and Approval

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1 PURPOSE

The purpose of these rules is to outline the minimum safety standards for personnel working on or near ZESCO's Electrical, Mechanical apparatus and Civil structures to prevent persons and equipment from being adversely affected.

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

Where a conflict arises between these rules and any existing approved station specific procedures, Technical Instructions and any other that may be developed and issued in future, these rules shall take precedence.

2 SCOPE

These rules shall apply to work involving but not limited to the following on ZESCO's Electrical, Mechanical apparatus and Civil structures:

- a) High Voltage Networks;
- b) Medium and Low Voltage Networks;
- c) Operating Mobile Plant Near the Network;
- d) Excavation;
- e) Confined Space;
- f) Heights;
- g) Lifting Operations;
- h) Water bodies;
- i) Pressurised systems;
- j) Hot works;

Notes:

- i. For High, Medium and Low Voltage Networks, reference is made to generation, transmission and distribution system controlled by ZESCO which may be energised to a potential more than 50 volts AC or 75 volts DC above and below earth.*
- ii. For pressurised systems, reference is made to pressures at or above 2 bars.*



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3 REFERENCES

The Electricity Act No. 11 of 2019

CAP 441 of the Laws of Zambia, The Factories Act and the Regulations enacted thereunder

CO.14900.GRPR.00025: Hazard Identification and Assessment of Risks and Opportunities

CO.14900.GRPR.00019: Management of Personal Protective Equipment

CO.14900.GNPR.00056: Plant and Equipment Outage Planning Procedure

CO.14900.GNPR.00014: Management of Master Keys for Access to Electrical Enclosures and Apparatus

CO.14900.GNPR.00034: Working at Heights with Portable Ladders

CO.14900.GNPR.00035: Working at Heights with Scaffolds

ISO 45001: Occupational Health and Safety Management Systems, Clauses 6.1.1/6.1.2/8.1.2

4 RESPONSIBILITIES

In executing this technical guide, the following responsibilities shall be recognised:

4.1 Preparation

The Head SHEQ and Senior Manager System Operations, Safety & Grid Code shall be responsible for the preparation of this Technical Guide.

4.2 Review

The Chief Operating Officer shall be responsible for the review of this Technical Guide.

4.3 Approval

The Managing Director shall be responsible for the approval of this Technical Guide.

4.4 Distribution

The Managing Director shall be responsible for the distribution of this Technical Guide.

4.5 Duties

It is the duty of all persons who are concerned with the control of, operation



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of, and work on or near, ZESCO's Electrical, Mechanical apparatus and Civil structures to make themselves thoroughly conversant with the Statutory Acts and Regulations, ZESCO safety rules and relevant ZESCO approved General Procedures/Technical Instructions governing any work that they may have to undertake. Ignorance of the statutory Acts and Regulations, ZESCO safety rules, and General Procedures/Technical Instruction shall not be accepted as an excuse for neglect of duty.

A copy of each of the Statutory Acts and Regulations shall be kept in all substations, generating stations, Control Rooms, System Control Centres and Regional Control Centres. It is the duty of ZESCO Limited and its Contractors to comply with the provisions of these Statutory Acts and associated Regulations, and it is the duty of all agencies, workmen and persons employed in connection with the generating, transmission, distribution and utilisation of electrical energy to conduct their work in accordance with these Acts and associated Regulations.

All persons working on or near ZESCO's Electrical, Mechanical apparatus and Civil structures should be familiar with basic First Aid, basic Fire fighting, applicable General Procedures/ Technical Instructions and Emergency Preparedness Plan at the point where work will be carried out.

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5 DEFINITIONS AND GENERAL CONTENTS

5.1. Gender

All references to male gender shall be read and interpreted to mean either male or female. Where the gender clause "he" is used in these rules, when read and applied by a female shall be read and interpreted to mean "she" and shall apply to her.

5.2. Issue of ZESCO Safety Rules

A copy of the rules shall be given to Technical Employees at the point of engagement with the Corporation.

EACH TECHNICAL EMPLOYEE SHALL SIGN A RECEIPT FOR HIS COPY; THE COPY SHALL BE KEPT IN GOOD CONDITION

In an event of loss of the Safety Rules Book the concerned employee shall immediately report to the respective SHEQ Manager.

In addition, where a new version of the Safety Rules Book has been approved, it shall supersede the old version. The old version shall be surrendered to the SHEQ Manager for disposal in accordance with the Control of Records procedure CO.14900.GNPR.00002. The new version shall in turn be issued to the concerned employees.

5.3. Approved

A type sanctioned for use by the Managing Director or the person appointed to act on his behalf.

5.4. Authorised

Having appropriate ZESCO endorsement in writing, for a specific function.

5.5. Barricade

A safety barrier/screen in appropriate form that warns against or prevents access to a dangerous area in order to mitigate risk.

5.6. Commissioning

Activities carried out to ensure that new and existing equipment is safely and



accurately connected to the network and, once in service, will operate as intended.

5.7. Connected

Joined together by a conductor capable of carrying electrical current for its required function or purpose by either physically clamping or bolting conductors together or closing a circuit breaker, switch or similar device. This shall also refer to mechanical connections.

5.8. Confined Space

An enclosed or partially enclosed space that is not intended or designed primarily for human occupancy, within which there is a risk of one or more of the following:

- a) An oxygen concentration outside the safe oxygen range;
- b) A concentration of airborne contaminant that may cause impairment, loss of consciousness or asphyxiation;
- c) A concentration of flammable airborne contaminant that may cause injury from fire or explosion; and
- d) Engulfment in a stored free-flowing solid or a rising level of liquid that may cause suffocation or drowning.

5.9. Danger

A risk of loss of life, bodily injury or damage to health, equipment and environment.

5.10. Emergency

An event, actual or imminent, which endangers or threatens to endanger life, property, the environment or ability to meet system demand / requirements and requires co-ordination of a number of significant urgent actions.

5.11. Dead

Disconnected from any live system and at or about zero voltage with respect to the general mass of the earth and connected to earth.

Rotating plant shall be regarded as dead when it is stationary, the exciter and prime mover remain isolated from the source of energy.

Pressurized systems shall be regarded as dead when they are completely isolated from charging sources and at atmospheric pressure with the drain valves in open position.



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5.12. Drop Zone

The area below the immediate work area where objects could fall or be directed into if they strike other structures or objects after the fall.

5.13. Live

Electrically and/or mechanically charged.

Electrically charged apparatus shall refer to energized electrical apparatus or those subjected to hazardous induced or capacitive voltages.

Mechanically charged apparatus shall refer to mechanical apparatus that are able to store hazardously stored energy.

5.14. Switching

The operation of circuit breakers, disconnectors/ isolators or other methods of making or breaking an electrical circuit, the removal/insertion of fuses and /or the application and removal of circuit main Earths.

This term shall also apply to the operation of valves, gates or other methods of closing or opening mechanical apparatus (pipes, conduits, channels, tunnels, tanks of hydraulic nature, pressure vessels etc.) which normally act as conductors of streams of volatile liquid, gas, including compressed air or water, if operating at or over 2 bars.

5.15. Electrical Apparatus

Includes all equipment and fittings in which conductors are used or of which they form a part, or a collection of instruments, machines, tools, parts and devices used for a particular purpose in the generation, transmission and distribution of electrical energy.

5.16. High Voltage Apparatus

Any electrical apparatus that is normally operated at a voltage exceeding 650 volts.

5.17. Medium Voltage Apparatus

Any electrical apparatus that is normally operated at a voltage exceeding 250 volts but not exceeding 650 volts.



5.18. Low Voltage Apparatus

Any electrical apparatus that is normally operated at a voltage not exceeding 250 volts.

5.19. Mechanical Apparatus

All machinery, any part of which or the whole can be placed in motion by automatic, remote or direct means. It shall refer as well to pipes, conduits, channels, tunnels, tanks of a hydraulic nature and pressure vessels, the use of which may be controlled by the operation of valves, gates or portable barriers, and normally act as conductors of streams of volatile liquid, gas, including compressed air or water.

5.20. Lifting Machinery

Refers to any machinery, tools or devices used to raise, lower, or move loads e.g. crab, winch, pulley block, gin wheel, hoist, crane, sheer legs, drag-line, piling frame, aerial cable-way, aerial rope-way, overhead runway or mobile elevating work platform.

5.21. Lifting Tackle

Components or equipment used between the lifting appliance and the load, or on the load to grip it, but which is not an integrated part of the lifting appliance e.g. chain slings, hemp, synthetic or wire rope slings or similar gear, and rings, links, hooks, plate clamps, shackles, swivels or eyebolts.

5.22. Pressure Vessel

Any vessel used to store gas, water or oil that is above atmospheric pressure. This also includes any vessel connected to a compressor and/or pump.

5.23. Circuit Main Earth

Earthing equipment of an approved type that is applied by a Senior Authorised Person between the point of isolation and the point of work, on the instruction of the Controller before the Permit-to-Work or Sanction-for-Test is issued.

5.24. Working Earth

Additional earthing equipment of an approved type that is applied after the issue of a Permit-to-Work or Sanction-for-Test by the person in charge of works at the point of work.



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5.25. Earth

The conductive mass of the earth, the electric potential of which, at any point, is regarded to be at zero volts.

5.26. Earthed

Connected to the general mass of the earth in such a manner as will always ensure an immediate discharge of electrical energy without danger.

5.27. Absence of Voltage

The electrical supply to electrical apparatus has been switched off and normal operating Voltage is absent. However, residual voltage may still be present.

5.28. Dewatering

The action of removing water from a system via pumping or other approved means.

5.29. Risk Assessment

A systematic process of identifying, analysing and evaluating the potential hazards that could negatively impact people, assets, operations or the environment.

5.30. Mini Risk Assessment

These are pre-work risk assessments conducted as part of continuous risk assessment for every task, except for administrative tasks, including routine and non-routine tasks. All foreseeable hazards must be identified, effective controls established and communicated through the Workmen's Declaration process.

Note: The mini risk assessment form shall be completed when conducting mini risk assessments.

5.31. Isolating Device

Equipment used to safely disconnect a circuit or electrical/mechanical equipment from its source of energy.

5.32. Isolated

Disconnected from all sources of energy using approved isolating devices that prevent unintentional energisation or charging of electrical/mechanical



apparatus.

5.33. Rendering Inoperative

The immobilizing of a switching device electrically and/or mechanically to make it impossible to operate.

5.34. Point of Isolation

The position in the circuit at which equipment is disconnected, and where practicable, the Isolating Device is rendered inoperative and a Caution Notice affixed.

5.35. Controller

The appropriate System, Generation or Distribution Controller as defined below:

a) System Controller

A Senior Authorised Person or Authorised Person appointed by ZESCO and is on duty at ZESCO's National Control Centre, responsible for short term reliability of the Interconnected Power System (IPS), oversees controlling and operating the transmission system, dispatching generation or balancing supply and demand in real time. Such a person is also responsible for coordinating Switching, carrying out the remote operation of switchgear and consents to the issue of Safety Documents on the ZESCO network. These activities shall be supervised by the Shift Charge.

b) Generation Controller

A Senior Authorised Person or Authorised Person appointed by ZESCO, and on duty at the ZESCO's Generation Control Rooms for the purpose of controlling the generation of electrical energy. Such a person is also responsible for implementing dispatch instructions, coordinating Switching, carrying out the remote operation of the switchgear and consents to the issue of Safety Documents at the generating station. These activities shall be supervised by the Shift Charge.

c) Distribution Controller

A Senior Authorised Person or Authorised Person appointed by ZESCO, and on duty at the ZESCO's Distribution Control Centre for the purpose of controlling the distribution of electrical energy within ZESCO's distribution network. Such a person is also responsible for coordinating Switching, carrying out remote operation of switchgear and consents to the issue of



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Safety Documents on the ZESCO distribution network. These activities shall be supervised by the Shift Charge.

This shall also refer to a Senior Authorised Person specifically appointed by ZESCO to exercise the function of controller in the case of locally controlled system.

5.36. Technical Employee

This is an employee possessing a relevant technical qualification and charged with the responsibility of working on ZESCO infrastructure. The technical employees shall be Trades men, Crafts men, Technicians, Technologists and Engineers.

5.37. Senior Authorized Person

A **Technical Employee** appointed in writing by ZESCO Limited to carry out Switching, issue, receive, clear and cancel Limitation of Access, Electrical and/or Mechanical Permit to Work and Sanction for Test within the terms of his appointment.

The Senior Authorised Person should also be authorized to issue and cancel other Safety Documents such as Hot work Permit, Work in Confined Space Permit, Working at Height Permit, within the terms of his appointment.

The letter of appointment and certificate of Authorization shall state the section of ZESCO's Electrical and Mechanical apparatus, and Civil structures to which it applies and the extent to which the person is authorized to issue and cancel Limitation of Access, Permit to Work, Hot work Permit, Work in Confined Space Permit, Working at Height Permit and Sanction for Test.

This Person should have basic knowledge in First Aid and Firefighting.

5.38. Authorized Person

A **Technical Employee** appointed in writing by ZESCO Limited to carry out specific work on ZESCO's Electrical, Mechanical apparatus and Civil structures and shall:

- a) Issue, receive, clear and cancel a Working at Height Permit, Limitation of Access and Electrical Permit to Work Part A;
- b) Receive and clear Electrical and/or Mechanical Permit to Work;



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- c) Receive and clear Safety Documents such as Hot Work Permit, Work in Confined Space Permit;
- d) Where written to, receive and clear a Sanction for Test;
- e) Where written to, carry out switching remotely from Control Centre;
- f) Carry out switching on medium voltage equipment.

Such a Person shall carry out work within the terms of their appointment.

The letter of appointment and certificate of Authorization shall state the class of work the person is authorized to carry out and the section of the ZESCO's Electrical, Mechanical apparatus and Civil structures to which it applies.

This Person should have basic knowledge in First Aid and Firefighting.

5.39. Competent Person

A **Technical Employee** appointed in writing by ZESCO Limited to carry out specific work on ZESCO's Electrical, Mechanical apparatus and Civil structures. He shall be able to:

- a) Receive and clear a Limitation of Access, a Permit to Work under Part A; and
- b) Where written to, receive and clear Safety Documents such as Hot work Permit, Work in Confined Space Permit, Working at Height Permit.

The letter of appointment and certificate of Authorization shall state the class of work the person is authorized to carry out and the section of the ZESCO's Electrical, Mechanical apparatus and Civil structures to which it applies.

This Person should have basic knowledge in First Aid and Firefighting.

5.40. Ordinary Person

Technical Employee who has not been appointed as a Competent Person or Authorised Person or Senior Authorised Person as defined by the ZESCO Safety Rules.

5.41. Responsible Person

A person appointed by his employer to carry out Switching on Enterprise's own apparatus, from which ZESCO Limited apparatus can be made Live.

A register of responsible persons for the respective enterprises shall be maintained at the respective Control Centres.

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5.42. Inter-corporation Circuit Isolation and Earthing Certificate

A **Southern African Power Pool** form of declaration between National Utility System Controllers, that common user apparatus has been switched off, isolated and earthed at the points stated on the certificate and signed by both parties for the purpose of issuing Permits to Work.

5.43. Limitation-of-Access

A form of declaration signed and issued by Senior Authorised Person or an Authorised Person to a Person in charge of Work or himself if he is in-charge of Work, defining the limits of apparatus on which work may be carried out from ground level in High Voltage Substations or Power Stations or within close proximity to LIVE high voltage point.

This form must not be used for work requiring a Permit-to-Work or Sanction-for-Test. This document shall not be used for daily routine works which include, but not limited to the following:

- a) Activities which are observational in nature; and
- b) Indoor general cleaning works at ground level.

These works shall be managed by using the risk assessment process.

5.44. Electrical Permit-to-Work

A form of declaration signed and issued by a Senior Authorised Person to a person in-charge of the work or himself if he is in-charge of Work to be carried out on any High Voltage apparatus for the purpose of making known to such person exactly what apparatus has been made dead and on which it is safe to work.

It shall also be issued by a Senior Authorised or an Authorised Person to a person in charge of work above ground level provided the Minimum Safety Clearances to Live High Voltage Equipment are observed.

5.45. Mechanical Permit-to-Work

A form of declaration signed and issued by a Senior Authorised Person to a person in charge of the work to be carried out on any isolated mechanical apparatus for the purpose of making known to such person exactly what apparatus has been made dead and on which it is safe to work.



5.46. Sanction-for-Test

A form of declaration signed and issued by a Senior Authorised Person to a person in charge of testing High Voltage apparatus for the purpose of making known to such a person exactly what apparatus has been made dead for the purpose of testing and the conditions under which the testing is to be carried out.

5.47. Workmen's Declaration

Declaration on the safety Documents by the Workmen acknowledging their understanding of the key elements involved in the work. The key elements include but are not limited to:

- a) Scope of work involved;
- b) Work procedures/practices involved;
- c) Roles of each team member;
- d) Hazards associated with the job and the control measures required;
- e) Work zone setup; and
- f) Contingency plans.

Prior to acknowledgement and commencement of any work, a discussion of the above key elements shall be done at the worksite, involving all members of the Working Party, and as required throughout the job.

5.48. Suspension of Work

Work shall be suspended under the following conditions:

- a) Adverse weather;
- b) Under emergency;
- c) When Person in charge of work departs from the site of works; and
- d) When the Working Party violates safety rules.

Before suspended work can resume, the person in charge of work shall ensure the following:

- a) That the conditions of the safety documents haven't changed;
- b) Isolation and earthing points are still intact and 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;
- c) Site conditions are suitable for the work to recommence; and
- d) The Working Party is advised of any changes to conditions. This includes explaining to recipients face-to-face any new risks associated with the

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changes.

5.49. Workmen

Members of a Working Party other than the Person in Charge of Work.

5.50. Person in Charge of Switching

A Senior Authorised Person carrying out switching on high voltage or mechanical apparatus or an Authorised Person carrying out switching on medium voltage and low voltage apparatus.

5.51. Person in Charge of Work

A Competent Person, Authorised Person or Senior Authorised Person to whom a Permit to Work or Limitation of Access is issued and under whose immediate supervision work shall be carried out.

5.52. Person in Charge of Testing

A Senior Authorised Person or an Authorised Person (who has been written to for such purpose) to whom a Sanction for Test is issued and under whose immediate supervision testing shall be carried out.

5.53. Switching Instruction

It is an instruction by the 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/ Log Book.

5.54. Switching Instruction Form

An approved form on which a Senior Authorised Person in charge of switching, records Switching Instructions issued by a Controller.

5.55. Switching Instruction Log Sheet

An approved form in which a Controller records switching instructions issued to a Senior Authorised Person in charge of switching or another Controller.

5.56. Equipment Outage Application Form

A form used to request for an outage of ZESCO's Electrical, Mechanical apparatus

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and Civil structures in Generation and Transmission.

5.57. Request for Isolation

A form used to request for an outage of ZESCO's Electrical, Mechanical apparatus and Civil structures in Distribution.

5.58. Confined Space Work Permit

Document that shall be requested for by the Entry Supervisor Responsible for Work before carrying out maintenance, inspection and supervision of confined space work.

After the approval, the Confined Space Permit shall be duly authorized by the Senior Authorised Person before the commencement of the works.

5.59. Hot Work Permit

A form of declaration signed and issued by a Senior Authorised Person to a person in charge of work before any work of temporary nature involving open flames or producing heat and/or sparks is undertaken.

In an event that hot works are carried out in the workshop or open-air areas, the hot work permit shall not be required but the requisites, preventative and protective measures, prohibitions and special precautions established in the Hot Works Procedure shall be complied with.

5.60. Working at Height Permit

A form of declaration signed and issued by a Senior Authorised Person or an Authorised Person to a person in charge of work before any work can be performed where there is a risk of falling from height.

Work at height includes any activity conducted in locations at, above or below ground level where a fall could cause injury. This also encompasses access and egress routes that pose a fall risk.

5.61. Excavation Permit

This is a standard form that shall be filled-in to ensure that all concerned parties, that is mechanical, telecoms, water and sanitary, Electrical and others certify that the identified site is cleared of all waterlines, electric cables and any other similar services and hence safe to carry out excavation.



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5.62. Caution Notice

A notice in approved form applied by a Senior Authorised Person at points of isolation and associated control equipment for apparatus conveying a warning against interference with such apparatus. This notice shall also be applied on Circuit Main Earths.

5.63. Danger Live Notice

A notice in approved form attached to LIVE apparatus adjacent to apparatus on which work or testing is being carried out, by the Person in Charge of work, for the attention of the Working Party warning against coming into contact with LIVE apparatus outside the barricaded work area.

5.64. Danger Approach Notice

A notice in approved form attached to the barricade by the Person in Charge of work, for the attention of the Working Party calling attention to limit of the safe working area.

5.65. Warning Notice

A notice in approved form attached to medium/high voltage installations or their perimeter fences, calling attention to members of the public against hazardous voltages.

5.66. Warning Tag

A tag in approved form attached to apparatus, applied by a Competent or Authorised or Senior Authorised Person conveying a specific message to the operator. It shall not be used in place of a Caution Notice or other approved notices.

5.67. Valve Status Tag

A tag in approved form conveying the status of a valve. It shall be applied on valves that have no physical status indication.

5.68. Circuit Identity Wristlet

A Wristlet in approved form issued to the person in charge of work for the purpose of identifying the circuit on which work is to be carried out.

**5.69. Safety Lock**

A lock used to lock-off all Isolating Devices at the Point of Isolation. It shall have a key that is different from all other keys in the locality.

5.70. Standard Lock

A lock, used to lock-off all gates, doors to high voltage substations or switchgear, switchyards and feeder pillars. It shall have a common master key.

5.71. Non-Standard Lock

A lock having a key that is different from all other keys in the locality used to lock-off switchgear in its normal operating position. For mechanical apparatus, the lock shall be used to secure valves in their normal operating position.

5.72. Lock-out-Box

A box in approved form used to secure fuses/links and keys to Safety Locks after rendering inoperative.

5.73. Key Cabinet

A cabinet used to keep keys to Non-standard Locks and Circuit Identity Wristlets.

5.74. Earthing Party

A group or workers consisting of a Senior Authorised Person or Authorised Person accompanied by one or more Competent Persons whose duty is to apply and remove circuit main earths or working earths.

5.75. Working Party

A group or workers consisting of a Senior Authorised Person or Authorised Person or Competent Person, accompanied by one or more persons to carry out work. In exceptional circumstances where an Authorised Person or Senior Authorised Person is to work alone, the appropriate Controller shall be informed.

5.76. Failure of Supply

The unexpected interruption of power supply. A loss of supply from whatever cause to or from any part of the High Voltage system shall be immediately reported to the appropriate Controller. This includes loss of auxiliary supply.



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During failures of supply, all apparatus, equipment and conductors shall be regarded as being LIVE.

5.77. Dangerous Occurrences and Accidents

All dangerous occurrences and accidents on ZESCO's Electrical and Mechanical apparatus as well as Civil structures shall be reported immediately to the appropriate Controller. Thereafter, the procedure outlined in the respective Emergency Preparedness Plan (EPP) and Incident reporting and investigation Procedure shall be followed.

5.78. Access to Substations, Switchyards, Underground Chambers and Confined Spaces

All access to substations, switchyards, underground chambers, confined spaces shall be announced to the appropriate Control Centre and logged into the appropriate logbook. No person shall, without prior authority, enter or have access to these premises belonging to, or wholly under the control of ZESCO.

5.79. Variation of Rule

In exceptional circumstances, a rule may be varied to such an extent as may be authorised in writing by the Managing Director of ZESCO, or the person appointed to act on his behalf.

5.80. Doubts and Objections

Any person who has a difficulty in the interpretation or in the application of any particular Rule shall seek further clarification from a more senior authority.

Any person 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 resolved. If necessary, the matter shall be referred to a more senior authority.

The person issuing the instruction shall report all such objections to a more senior authority. In the case of a Control Centre when such an objection is received, it shall be recorded in the Centre's logbook.

5.81. Switching Schedule

A sequential, numbered list of precisely ordered switching operations (steps). All planned switching carried out on the high voltage network will require a switching



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schedule which is prepared, checked and approved by appropriate Senior Authorised Persons. An appropriate and updated single line diagram and other required documentation as stipulated in the Plant and Equipment Outage Planning Procedure (GNPR.00056) shall be attached.

5.82. Immediate/Direct Supervision

The Supervisor is physically present within the worksite to give aid, direction and instruction to the person being supervised.

5.83. Boxing In

Is the application of Circuit Main Earths at a location on an electrical circuit between points of isolation and the work area to create a situation where the work area is at a single potential and that in the case of inadvertent energisation, the workers are protected.

5.84. General Safety Rules

5.84.1 Clear Communication

Clear and effective communication amongst all personnel involved in ensuring the safe execution of work on, near or the vicinity of ZESCO's Electrical and Mechanical apparatus as well as Civil structures is essential to maintain safety and prevent incidents.

It is the duty of all personnel working on or near ZESCO's Electrical and Mechanical apparatus as well as Civil structures to adhere to the following communication guidelines:

- a) Clear – Ensure that what you say is easy to understand and is not confusing or ambiguous;
- b) Concise – Use proper and specific terms; and
- c) Confirmed – Information must be repeated by the receiver for confirmation.

Written documents must be clear and legible. They must be filled-in completely in accordance with ZESCO's official terminology and instructions.

Further, it is important that the parties communicating verbally speak clearly, listen carefully, and thoroughly understand the communication. Understanding can be enhanced by repeating back to the communicator and confirming the issued instructions.

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5.84.2 Worksite Risk Assessment

It is a mandatory requirement for all persons in charge of work on or near ZESCO's Electrical and Mechanical apparatus as well as Civil structures to perform a mini-risk assessment on the worksite after which the working party shall be briefed. This shall be done prior to commencement of work. The mini-risk assessment shall include:

- a) Identifying all hazards that are associated with the tasks;
- b) Assessing each risk and the likelihood of it happening;
- c) Eliminating or controlling the risks to the lowest level possible; and
- d) Reviewing the control measures continually during the course of work.

All members of the Working Party shall sign on the ZESCO mini-risk assessment form and it must be signed-off by the Person in Charge of work. (Refer to Hazard Identification and Assessment of Risks and Opportunities, CO.14900.GRPR.00025).

5.84.3 Job Briefing

It is a mandatory requirement for all persons working on or near ZESCO's Electrical and Mechanical apparatus as well as Civil structures to have a job briefing after the worksite risk assessment but before the commencement of any task and as required throughout the duration of the task and if the task changes.

During the Job Briefing, the Person in Charge of Work or Testing shall outline the tasks that are to be accomplished, the area of work, tools, equipment and material requirements, and the applicable ZESCO Safety Rules or General Procedures/Technical Instructions.

The key elements to be explained include but are not limited to:

- a) Scope of work involved;
- b) Work procedures/practices involved;
- c) Roles of each team member;
- d) Hazards associated with the work and control measures required through risk assessment;
- e) Working area; and
- f) Contingency plans e.g. Emergency Response Plan.



Prior to commencement of any work, the Working Party shall acknowledge that they have understood the job briefing.

5.84.4 Personal Protective Equipment (PPE)

It is a mandatory requirement for all persons working on or near ZESCO's Electrical and Mechanical apparatus as well as Civil structures to wear approved PPE specified for a task and/or work area. The approved PPE shall not be altered or substituted without authorisation by ZESCO. Before undertaking any work, each person must ensure that their PPE is in satisfactory condition and appropriate for the work being done. Any defective PPE must be immediately removed from use/service. (Refer to Management of Personal Protective Equipment General Procedure CO.14900.GNPR.00019 and any other relevant ZESCO approved Procedures for detailed PPE requirements).

5.84.5 Tools and Equipment

All tools and equipment to be used for any work on or near ZESCO Electrical and Mechanical apparatus as well as Civil structures shall be of an approved type and shall not be altered or substituted without authorisation by ZESCO. All tools and equipment shall be operated and maintained in accordance with the relevant ZESCO approved procedures and/or manufacturers' recommendations. It is the duty of all persons working on the ZESCO Electrical and Mechanical apparatus as well as Civil structures to ensure that defective tools and/or equipment are identified (by verification of the validity of calibration and test certificates, visual inspection and testing where possible) and removed from the work site to prevent accidental use.

5.84.6 Emergency Response Plan

It is the duty of the Person in Charge of Work or Testing to ensure that an adequate Emergency Response Plan for the worksite are established relating to the task being carried out. Where these Plans already exist in the operational area where work is being carried out, the Person in Charge of work must be fully conversant with these responses and make them known to the working party.

5.84.7 Commissioning of Apparatus

- a) The system controller must confirm with the appointed operator or authorised person that all necessary tests for commissioning were conducted. The system controller must log all relevant information,



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including the names and designations of person responsible for the tests.

- b) No apparatus must be put in service on first installation unless the apparatus has been handed over, with prior arrangement, by an appointed operator or authorised person to the system controller. All apparatus and control panels must be suitably labelled and the corresponding operating drawing or mimic must be updated before apparatus are handed over.
- c) The system controller must confirm, where necessary, the application of temporary and permanent settings of relays.
- d) Where apparatus has been disconnected from the power system for purposes other than sectionalising, by the removal of droppers or jumpers or by the opening of links which are locked out with a unique lock, the keys of which is in the custody of an appointed operator or authorised person not directly involved with the operation, the apparatus must be deemed not to be part of power system. Any earths necessary on apparatus are then the responsibility of the person in charge of the work.
- e) The apparatus being installed only becomes the responsibility of the system controller once a connection is made between such apparatus and the power system whereby it becomes possible for the apparatus to be energised.
- f) The appointed operator or authorised person must report all required details of the apparatus to the system controller and the number and positions of applied earths when handing over or handing back such apparatus.
- g) All earths applied on the apparatus to be commissioned henceforth resort under the system controller.

5.85. Rules for Work on High Voltage Network

No person, unless he is fully conversant with the nature and also the extent of the work involved, shall carry out work of any description (including maintenance, testing, repairs and cleaning) on any part of the High Voltage network, and associated apparatus unless such parts are Dead and appropriate safety documents are issued.

Electrical hazards pose a significant threat to the safety and health of employees, contractors and the public. Some common sources of electrical hazards include:

- a) Inadvertent contact with live equipment;
- b) Unauthorised work outside defined safety clearances;
- c) Faults, breakdown in insulation systems and equipment defects;



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- d) Electromagnetic induction;
- e) Effects of direct and indirect lightning storms; and
- f) Equipment becoming inadvertently live due to induced voltages or interference.

The consequences of shock or burns from the above causes on High Voltage networks may be serious or, in some circumstances, fatal.

5.86. Approved Process for Making High Voltage Apparatus Dead and Release for Work

High Voltage apparatus shall be deemed DEAD when:

- a) Switched off from ALL sources of supply;
- b) Isolated and rendered Inoperative
- c) Effectively earthed between the point(s) of isolation and the point(s) of work.

Such Dead Apparatus shall only be released for work when Safety Document has been issued and received.

5.86.1 Equipment Outage Application & Switching Schedule

Before any High Voltage apparatus is isolated to facilitate planned works or testing, an Equipment Outage Application and Switching Schedule shall be duly completed and submitted to appropriate Operator for approval. (Refer to Plant and Equipment Outage Planning Procedure CO.14900.GNPR.00056). The application shall be done using the Equipment Outage Application form for Generation and Transmission or Request for Isolation form for Distribution.

a) Switching Schedule

Before the commencement of Switching, the Person in Charge of Switching must verify the correct Switching Schedule details with the appropriate Controller. The Person in Charge of Switching must also refer to any current maps, schematic diagrams and/or other operating instructions to confirm correct location and apparatus. When ready to commence, the Person in Charge of Switching must contact appropriate Controller for permission to commence the Switching.

In the event that amendments are required while a switching schedule is being executed, all parties involved in carrying out the Switching must agree to the changes prior to any changes being



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made on the switching schedule. The Controller has the responsibility and accountability for authorising any changes.

For switching carried out under unplanned conditions (e.g. faults) the appropriate Controller and a Person in Charge of Switching shall prepare a Switching Sequence and agree how the Switching will be carried out.

5.86.2 Switching

No High Voltage switching shall be carried out without the sanction of the appropriate Controller. The Person in Charge of Switching must contact the appropriate Controller prior to carrying out any switching on the High Voltage network and associated apparatus, except in cases of emergency.

a) Operation of Circuit Breakers and Isolators

For each step of the Switching Schedule, and before performing an operation, the Person in Charge of Switching and/or Controller must verify or record:

- i. The correct schedule for the planned work at the right time and date;
- ii. The correct item number on the schedule;
- iii. The correct location;
- iv. The correct apparatus;
- v. The apparatus is in the expected state prior to operation and is fit to be operated. When switchgear shows any sign of distress before or after operating, its condition shall be reported to the Controller and it shall be examined before further operation; and
- vi. The exact time a switching instruction is issued for each step of the switching schedule (record is only applicable to this statement).

After operating the electrical apparatus, the Person in Charge of Switching and/or Controller must:

- i. Confirm that any visible contacts of the switchgear are in the final desired position on each phase;
- ii. Use mechanical or other positive indications for visual confirmation and where available, using voltage and



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- current indicators to confirm circuit breakers are open before operating the associated disconnectors (isolators) or racking out withdrawable switchgear; and
- iii. Record the confirmation time a switching operation is executed for each step of the switching schedule.

As a safety precaution, preference must be given to operating (energising/de-energising) equipment from a distance, i.e. via a remote or supervisory means. Appropriate PPE such as Arc-flash suits must be worn at all times during High Voltage Switching.

b) High Voltage Switching for Test Purposes

When a section of equipment has been isolated from the main supply system for the purpose of testing, the Controller may give a general sanction for the operation of Circuit Breakers, Isolators and earthing devices within the isolated section, and for the application of testing supplies to the isolated section on a Sanction-for-Test. The Person in Charge of the testing will then become wholly responsible for complying with these rules within the isolated section. No switch or isolator connecting the isolated section to the main system, with the exception of those for the agreed testing supplies, shall be operated without the direct sanction of the Controller. The switches and isolators within the isolated section shall be restored to their original position prior to the cancellation of the Sanction-for-Test. Any switches and isolators not so restored shall be noted on the Sanction-for-Test as exceptions in section 6.

c) High Voltage Switching Communication

When carrying out Switching, the following communication procedure shall apply:

- i. Every phone or radio voice message relating to the operation of the High Voltage system shall, whenever practicable, be written down and every such message shall be repeated in full to the sender to ensure that the instruction has been accurately received.
- ii. Where communication between the Controller and the Person in Charge of Switching is lost, all switching operations shall cease until communication is restored. When returning from a loss of communication break, the Person in Charge of Switching shall confirm with the



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- Controller that they are still working from the correct switching schedule and are at the right step.
- iii. When a Controller requires High Voltage switching to be carried out he shall communicate directly with the Person in Charge of Switching. In the absence or failure of direct communication facilities, the instruction may be relayed through a third party, observing All High Voltage communication procedures for phone or radio voice instruction relating to the operation of the High Voltage system outlined above.
 - iv. Before any High Voltage switching is carried out on ZESCO's system which may affect other interconnected systems, the System Controller authorising the switching shall communicate with the Controller(s) of the other system(s) concerned and the switching shall be agreed between them. The switching shall be recorded at all centres concerned and a Circuit Isolation and Earthing Certificate completed and signed where applicable.
 - v. Switching to the Controller's instructions, or with his consent, shall be carried out without undue delay. All switching whether to the Controller's instruction or with his consent or emergency Switching shall be reported to the Controller as soon as possible after each operation. The circumstances of any emergency switching shall be reported at the same time.
 - vi. When any person receives instructions regarding work on, or the operation of High Voltage apparatus, he shall report any objection to the implementing of such instructions to the Controller, who shall then have the matter investigated and resolved, if necessary, refer the matter to higher authority.

Note: Making live or dead by signal or pre-arranged understanding after an agreed interval of time is forbidden.

d) High Voltage Switching Instruction Recording

- i. A recording of all High Voltage switching instruction shall be entered in the appropriate station or substation Switching Instruction Logbook. The Controller shall record in his Logbook the times and particulars of all High Voltage Switching.
- ii. The Person in Charge of Switching shall record Switching Instructions on a Switching Instruction Form.



e) Switching Related to Customer Owned Networks

These are networks owned, controlled and operated by a customer. The customer is considered the operating authority of their own network and shall appoint a Responsible Person who shall carry out Switching on their behalf. A ZESCO Controller or Person in Charge of Switching is not authorised to switch in a customer network unless trained and formally authorised in writing to do so by the customer.

5.86.3 Isolating

The purpose of isolation is to safely disconnect electrical apparatus from all possible sources of electrical supply. Only approved electrical apparatus and methods of isolation can be used as isolation points. The following cannot be used as isolation points in switching schedules: reclosers, load break switches and sectionalisers (without a visible break), **with an exception of Disconnecting-Circuit Breakers, GIS Isolators and Ring Main Unit.**

Isolation can be achieved by one or more of the following methods:

- a) Fully opening the contacts of an approved device to create a visible/physical gap (air or other rated insulation) or operating a non-rackable switching device to the off position, using the mechanical indicator as proof of the opening operation, applying a Safety Lock where locking facilities are available, and applying a Caution Notice;
- b) Creating a visible gap (air or other rated insulation) by operating a rackable switching device to the off position and then racking it out to the fully withdrawn position, and locking the shutter(s) closed and applying Caution Notice(s) or racking to isolated position then locking and applying Caution notice(s); and
- c) Creating a visible/physical gap (air or other rated insulation) by the removal of fuses, links and/or connections, applying Caution Notice(s) and barriers as appropriate.

Notes:

- *Where shutters (or other apparatus) are rendered inaccessible by virtue of the positioning of circuit breakers or other apparatus which is in an alternative position (earth or testing position), locked and Caution Notice attached in that position, the shutters (or other apparatus) shall be considered isolated.*
- *Where a locking facility is available it must be used to lock the electrical apparatus in the isolated position and a Caution Notice(s) applied. If barriers are required to prevent unsafe access to live parts, only approved barricade can be used.*



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a) Safety Locks

Safety locks shall be used to lock off all points of isolation and control points of associated switchgear, where the circuit on which work is to be carried out could be energised. The keys for such locks shall be kept in the lockout box.

When the circuit on which work is to be carried out is controlled only by links, fuse links or carrier shall be removed and kept in the custody of the Person in Charge of Switching.

b) Lock-Out Boxes

Lock-out boxes fitted with locks shall be situated at suitable positions for the reception of keys which secure switches, barriers, spout shutters, lock-out equipment and other similar devices provided for the protection of personnel working under Permit-to-Work. One lock on each box shall be of a type that can be operated only by a key in the possession of a Person in Charge of Switching. The other lock(s) shall be of a type operated by non-interchangeable keys and in the custody of the person(s) in Charge of Work. Holders of all lockout box keys are personally responsible for their safe custody.

A record shall be kept by entry in the appropriate key register each time the custody of a key is transferred.

A second isolation area cannot exist within another isolation area for the purposes of issuing another Permit to Work. For other works in the same isolated area, the same isolation points shall suffice and such works shall be covered under other Relevant Permit Numbers on the Permit to Work.

Where a device or equipment that is being used as a point of isolation or a structure that supports a point of isolation for the purposes of the issuing of a Permit to Work, the device, equipment or structure must not be worked on or interfered with if the interference will in any way compromise the integrity of the isolation point and endanger people working under the Permit to Work.



5.86.4 Earthing

The purpose of earthing is to:

- a) Limit the rise in potential difference in the work area and trigger the protection equipment to disconnect supply if supply is inadvertently restored;
- b) Control induction when used in conjunction with equipotential bonding techniques; and
- c) Safely discharge electrical charges including those caused by lightning, wind, changes in ambient conditions etc.

Before electrical apparatus is earthed, the earthing point must first be established and apparatus tested for absence of voltage with an approved (appropriate system voltage range) instrument or indicator.

The following shall be recommended earth resistance values for various points of a Power System:

Point/Station	Recommended value (Ω)
Power Station	0.5
Transmission Substations	<1
Distribution Substations	<5
Tower foot resistance	<10

The choice of an earthing point shall be governed by the following hierarchy:

- i. Permanently installed earthing device (earth switch or other approved integral earthing device) where available shall take precedence and must be used.
- ii. Where a permanently installed earth point is not available, the steel structure is the next preferred earth connection.
- iii. The last preference is a temporary earth electrode:
 - Temporary earth electrodes should be located away from footpaths and work areas to minimise the risk from step potentials in the event of a fault.
 - Drive a temporary earth electrode into the ground to a minimum depth of 300mm and up to a maximum depth of 600mm. Care must be taken to avoid driving earth electrodes into an underground service.
 - Repeat the process at all points that are being earthed.

The absence of voltage test shall be performed using the following



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sequence:

- a) The instrument shall be proved to be working;
- b) The instrument shall be used to prove that the isolated circuit has absence of voltage; and
- c) The instrument shall be proved to be working.

Earths must be applied immediately after the tests have proven absence of voltage. Where practicable, this process must be repeated at all earthing points.

Insulated and un-insulated mobile plant shall be appropriately earthed when working on or near any overhead High Voltage and LV wires/conductors whether energised or de-energised.

a) Portable Earthing Devices

A portable earth can be used as Circuit Main Earth or a Working Earth.

Portable earths shall be of appropriately fault rated capacity (both conductor, insulation and clamping mechanism) for the location of their application. As a guide, they shall have a cross-section area of not less than 80 mm² copper or equivalent.

When placing earth leads, the following procedure shall strictly be adhered to:

- i. Earthing leads shall be examined for loose bolts and nuts, and broken conductor strands and insulation prior to use. Only leads found to be in good working order shall be used;
- ii. Verify the absence of voltage on the isolated circuit;
- iii. Earthing leads shall first be firmly connected to the earth system before being secured to the phases by means of an approved earthing poles or other approved apparatus. All phases shall be earthed, even if work is to be carried out on one phase. Care must be taken to ensure that good contact is made; and
- iv. When removing the earths, the earthing leads shall be disconnected from the phases first and the earthing system last.

**b) Circuit Main Earth**

No Circuit Main Earth shall be applied or removed except on the instructions of the Controller and only by a Senior Authorised Person or Authorised Person acting under his immediate supervision. Each operation shall be reported to the Controller as soon as possible after completion, and the location of connections to earth shall be recorded on the Permit-to-Work, Sanction-for-Test and Circuit Isolation and Earthing certificate. Circuit Main earths shall be counted as points of application.

An exception, is where circuit main earths are removed by the person in charge of testing under a Sanction for Test.

It is acceptable to place a Circuit Main Earth at a suitable point on an electrical circuit at any position between the point of isolation and the work area.

When a Circuit Main Earth is applied, a Caution Notice must be prominently affixed.

i. Single Point Earthing

Due to the complexity of some Substations/ Switching stations/ Generation stations and transmission/ distribution networks, it is not always possible or practicable to safely achieve Boxing In. The formally assessed risk of applying all the Circuit Main Earths at some of these sites is too onerous and outweighs the additional safety that would be achieved, therefore the next best alternative of single point earthing must be adopted.

Single point earthing is permissible under the following circumstances:

- Where the primary conductor/busbar is to remain continuous at all times;
- Permission has been granted by System Operations through the approval of the Request for Isolation/Equipment Outage Request.

The maximum safe area for work when using single point earthing is up to nine (9) metres from the applied Circuit Main Earth along a continuous primary conductor. No break must exist or be proposed in this conductor for this rule to apply.



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c) Working Earths

Working earths are used as required to ensure earths covering all potential sources of possible supply are visible from the worksite. Working earths shall be used to control induced and static voltages at the worksite.

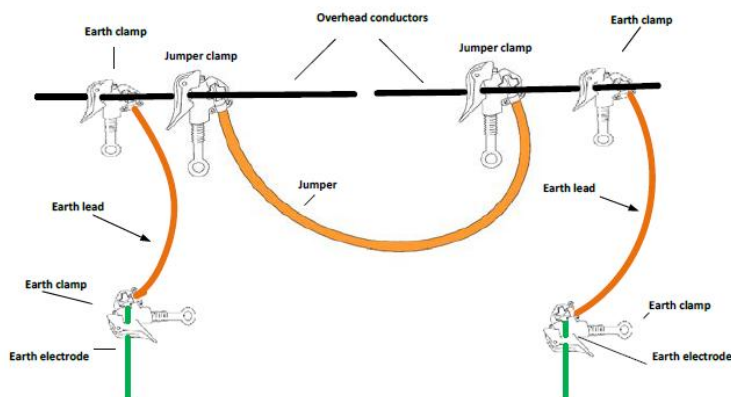
Working earths shall only be applied after the Circuit Main Earths have been applied and Permit-to-Work or Sanction for Test has been issued. Working earths must be removed before the Permit-to-Work or Sanction for Test is cleared and before the Circuit Main Earths are to be removed. All Working Earths issued and checked in must be declared on the Permit-to-Work or Sanction for Test. The working earths shall be counted per phase connection.

Working Earth shall be applied and removed, by a Person in Charge of work under Permit-to-Work or Sanction for Test, and such earths shall be accounted for at start and completion of work. Working Earths must be applied so that they remain effective even if the electrical apparatus covered by the Permit to Work is disconnected.

Working earths should be applied as close as possible to either side of the area of work and shall remain visible throughout the duration of the work. The connection to earth shall preferably be to a common working earthing system to ensure equipotential bonding.

Equipotential bonding is the practice of intentionally electrically connecting all exposed metallic non-current carrying items together as protection from earth potential rise or stray voltage.

Where a common earthing point is not practical, a jumper shall be used to connect to either side of the point of work, before disconnecting the apparatus being worked on or connecting back the apparatus that had been disconnected.



The possibility of movement or whip, of the earthing leads must be done in the mini risk assessment to determine the location of the earthing point. Lines and substation work areas must be earthed from all points of supply, except single point earthing.

d) Earthing Instruction Recording Procedure

- i. As with all High Voltage Switching, the Controller shall record in the appropriate station or substation Switching Instruction Logbook the time of application and removal of all Circuit Main Earth connections. He shall also record their location and the details of Senior Authorised Person responsible for their application or removal. At any given earthing point, the number of Circuit Main Earths to be recorded shall be one even when the number of earth leads used is three (3); for Working Earths, the number to be recorded shall be the number of actual earth leads connected.
- ii. The Person in Charge of Switching shall record instructions to apply or remove the Circuit Main Earth on a Switching Instructions Form.

5.86.5 Safety Documents

The issuance of safety documents gives authorisation for works to be performed on ZESCO Electrical, Mechanical apparatus and Civil structures and it is therefore mandatory prior to gaining access to equipment/apparatus for work purposes.

Where work is to be done on High Voltage apparatus in close proximity to live exposed conductors and above ground, the minimum safety clearances shall be observed and such work shall be carried out under the Permit to Work Part A. Notwithstanding, certain works



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like adjustments, cleaning and painting of earthed metal enclosures and of structures, etc. may be carried out on High Voltage apparatus in close proximity to live exposed conductors from ground level under a Limitation-of-Access, provided that the minimum safety clearances as specified as in rule 5.88 (minimum safety clearance) are maintained. In both preceding cases, it shall not be required that the High Voltage apparatus is made dead.

It is the duty of the person issuing the Permit-to-Work or Sanction-for-Test to ensure that the following provisions are enforced on the High Voltage apparatus on which work is to be carried out:

- a) Apparatus has been switched off from ALL possible sources of supply;
- b) Apparatus has been isolated and all practical steps taken to lock-off the Isolating devices and Caution Notices affixed;
- c) Apparatus has been effectively earthed between the point(s) of isolation and the point(s) of work;

Confirmation that the safety precautions are complete at relevant points remote from his location shall be obtained by the person issuing the Permit to Work or Sanction for Test via telephone or radio contact with the responsible Controller(s) prior to the issue of a Permit to Work or Sanction for Test.

A Permit to Work or Sanction for Test shall only be issued with the consent of the Controller, who shall retain in his custody a copy of Permit to Work or Sanction for Test issued. The Controller shall also keep track of any changes that may be made on the Permit to Work or Sanction for Test during the course of work execution.

No person holding a safety document may leave the site while the work or testing is in progress. In the event that the Person in Charge of Work or Testing must leave site, the following process shall be adhered to:

- a) The Person in Charge of Work or Testing who is temporarily leaving the worksite is not required to clear the safety document. However, the Person in Charge of Work or Testing must ensure all members of the Working Party have stopped work and have been withdrawn from the work area before he departs;



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- b) When a Person in Charge of Work or Testing returns to site after a temporary departure, they must reconfirm the safety document conditions before starting work; and
- c) The Person in Charge of Work or Testing who is permanently ceasing work and departing a worksite must clear and have the safety document cancelled prior to their departure.

When the Person in Charge of Work or Testing leaves the worksite due to an emergency and is unable to clear the safety document:

- a) All work must stop;
- b) The Controller must be notified by one member of the Working Party; and
- c) The Controller will contact the Authorised Person or Senior Authorised Person to cancel the safety document.

a) Arrangements for Direct Issue

The process for the direct issue of a Safety Document shall be as follows:

- i. The Authorised Person or Senior Authorised Person completes their copy of the Safety Document;
- ii. The Authorised Person or Senior Authorised Person issues the Safety Document with the consent of the Controller;
- iii. The Authorised Person or Senior Authorised Person explains the details of the Safety Document to the Person in Charge of Work or Testing;
- iv. The Person in Charge of Work reads aloud the contents of the Safety Document to the Authorised Person or Senior Authorised Person who confirms the accuracy of all details;
- v. The Person in Charge of Work then receives the safety document by completing the appropriate section.

A Senior Authorised Person may issue a Safety Document to himself. In such a case he shall carry out the work or testing in accordance with the appropriate rules.

Only one Sanction for Test shall be issued on the same High Voltage apparatus at any one time. **Under no circumstances should a Permit to Work be in force on any high voltage apparatus within the isolated area covered by a Sanction for Test.**

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b) Arrangements for Indirect Issue

In the event that work is to be carried out on High Voltage apparatus but where, due to special circumstances or distances involved, direct issue of the Permit to Work may not be possible, arrangements for the indirect issue of a Permit to Work shall be made by a Senior Authorised Person in accordance with the appropriate rules and its contents communicated to the person in charge of work.

The process for the indirect issue of a Permit to Work shall be as follows:

- i. The Senior Authorised Person completes their copy of the Permit to Work;
- ii. The Senior Authorised Person issues the Permit to Work with the consent of the Controller;
- iii. The Senior Authorised Person verbally relays, via radio or telephone, the details of the Permit to Work to the Person in Charge of Work who makes an accurate copy on the Permit to Work card;
- iv. The Person in Charge of Work reads back the contents of the Permit to Work card to the Senior Authorised Person who confirms the accuracy of all details;
- v. The Person in Charge of Work then receives the Permit to Work by completing section 3; and
- vi. The Senior Authorised Person shall then complete section 9 of the Permit to Work and communicates the details to the Controller.

c) Issuing of Safety Documents to Contractor Representatives

Only Contractor's Representatives who have undergone SHEQ induction and assessment as per "System Authorisation Procedure No. CO.14900.GNPR.00026" and "Management of Contractors" General Procedure No. CO.14900.GNPR.00048 or in the company of ZESCO authorised persons, shall be allowed to work on the ZESCO's Electrical, Mechanical Apparatus and Civil Structures.

d) Right to Refuse a Permit to Work or Sanction for Test

It is the responsibility of the Person in Charge of Work or Testing to ensure that the High Voltage apparatus on which work is to be carried out has been made dead and all necessary safety



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precautions are observed prior, during and after work. The Person in Charge of Work or Testing has the right to refuse to receive a Permit to Work or Sanction for Test being issued by the Senior Authorised Person if they have any safety concerns. These issues are to be resolved on site or referred to a more senior authority for review.

e) Multiple Worksites

The decision to split a worksite into multiple smaller worksites sharing common isolating and earthing points is best determined through pre-job planning. The need for multiple worksites may arise from the nature of the job or the need for different Working Parties to address multiple issues on the same apparatus during the outage. In either case, the possibility to carry out multiple tasks will be determined by the level of supervision required for the activities to be undertaken and the risks associated with those activities.

When a site is split and separate Working Parties are to undertake the work, a separate Permit to Work must be issued for each separate site, including a Person in Charge of Work at all times for each site. On all Permit to Work, the numbers of the other permits shall be recorded as "Other Relevant Permit Numbers". The Controller shall be responsible for tracking all Permit to Work numbers using a register and accordingly update the Persons in Charge of Work and the Persons in Charge of Switching. The Person in Charge of Work is responsible for local safety and the application of Working Earths at each site as appropriate.

If a single working party will work at multiple locations on the same single circuit, one Permit to Work is sufficient to cover all of the individual worksites.

f) Safety Documents that run for More than One Day

For works running for more than a day, the Safety documents shall be cleared and cancelled at the end of each shift. However, in special cases as determined by the nature of work and Risk Assessment, Safety documents may be allowed to run for more than a day. In such cases, workmen must not recommence work without the approval of the Senior Authorized Person and Person in Charge of Work or Testing who shall ensure that the following conditions have been met:



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- i. The conditions of the Permit to Work or Sanction for Test haven't changed;
- ii. Isolation and earthing points are still intact and as described on the Permit to Work or Sanction for Test;
- iii. If the isolation and/or earthing integrity has been compromised, work must not recommence until the integrity has been restored;
- iv. If site conditions are suitable for the work to recommence the Workmen shall sign the Mini risk Assessment.

The signing out of the Workmen's Declaration on the Permit to Work will only be done on the last day of the works. Between the first and last day of work, the workmen shall use the mini risk assessment form to sign in and sign out at the beginning and end of the shifts.

g) Issuing Permit to Work or Sanction for Test Relating to Interface Points between Enterprises

If the High Voltage apparatus on which work is to be carried out can be made Live from apparatus situated in a consumer's or any other party's premises, then such apparatus must be suitably isolated and earthed, and the Permit to Work or Sanction for Test shall only be issued after the Senior Authorised Person has obtained the signature on section 2 of the Responsible Person in charge of isolation and earthing of such apparatus.

h) Issuing Permit to Work Relating to Interconnected Utilities

Where the network involves another utility, the Switching shall be coordinated by the Controllers of the two utilities concerned and details of any Permit to Work or Sanction for Test issued shall be recorded at each concerned Control Centre. Between the Control Centres, the Isolation and Earthing Certificate shall be completed by the two Controllers detailing the common isolation and earthing points for the High Voltage apparatus. The isolation and earthing points shall remain so until the Permit to Work has been cleared and cancelled at each Control Centre followed by the cancellation of the Isolation and Earthing Certificate by the two Controllers of the utilities concerned.

i) Workmen's Declaration

After the receipt of the Permit to Work or Sanction for Test or Limitation of Access, but before the commencement of work, the



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Person in Charge of Work or Testing to whom such a Permit to Work or Sanction for Test has been issued shall conduct a job briefing. Thereafter, the Working Party shall sign the Workmen's Declaration to confirm that they have understood and agreed to the terms under which the job shall be executed.

After the completion, suspension or cancellation of work the Person in Charge of Work shall explain to the Working Party that work has come to an end and that the apparatus will then be made live and that it will no longer be safe for anyone to work on such apparatus. Thereafter, the Working Party shall sign off the Workmen's Declaration to acknowledge that they have been so informed. This shall be done before the Permit to Work or Sanction for Test is cleared.

If a new member intends to join the Working Party after work has already commenced, the Person in Charge of Work must immediately explain all work conditions and the new member must sign on the Workmen's Declaration.

In cases where a member of the Working Party intends to leave the worksite, they shall be required to sign off the Workmen's Declaration. On returning to a worksite, they must alert the Person in Charge of Work immediately, reconfirm all work permit conditions and sign on the Workmen's Declaration.

If a member of the Working Party is absent at the time of signing off the Workmen's Declaration, the Person in Charge of Work can clear the Permit to Work or Sanction for Test or Limitation of Access on condition that:

- i. Reasonable attempts to contact the member of the Working Party have been made. If all reasonable attempts have been made without success, the Person in Charge of Work or Testing will follow normal escalation processes to speak to their Supervisor;
- ii. The relevant Line Manager has been notified of the absence; and
- iii. The Senior Authorised Person and appropriate Controller have been notified and approval has been granted.

j) Precautions During Work Execution

The High Voltage apparatus isolated and earthed for work under the terms of a Permit to Work or Sanction for Test shall remain so until



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the Permit to Work or Sanction for Test has been cleared and cancelled.

The High Voltage apparatus isolated for testing under the terms of a Sanction for Test comes under the temporary control of the recipient of the Sanction for Test. He may, without further reference to the Controller, operate it in accordance with the appropriate rules. He may remove the Circuit Main Earth applied before and make the equipment Live from a testing supply. He will be responsible for co-ordinating all such operations on the isolated equipment and for ensuring safety during the tests.

k) Clearance and Cancellation after Direct Issue

After the work for which a Safety Document was issued has been completed or stopped by a Senior Authorised Person, the Person in Charge of the work shall immediately return the card to the Senior Authorised Person and sign the clearance declaration. The Senior Authorised Person shall then obtain the consent of the Controller for cancellation. Where applicable the declaration by Responsible Person on the Permit to Work or Sanction for Test shall be signed.

l) Clearance and Cancellation after Indirect Issue

After work for which a Permit to Work was issued has been completed or stopped by a Senior Authorised Person, the Person in Charge of the Work shall sign the clearance declaration on the Permit to Work Record Card.

He shall then communicate the declaration of Section 6 via telephone or radio to the Senior Authorised Person who issued the Permit to Work. The Senior Authorised Person shall then obtain the approval of the Controller and cancel the Permit to Work.

A Permit to Work which was issued directly may be cleared and cancelled indirectly under special circumstances.

m) Recall of Permit to Work or Sanction for Test

For operational reasons, the Controller may require an apparatus to be returned to service earlier than the time indicated on the switching schedule. When this occurs, the Person in Charge of Work will be notified by the Controller to follow normal Permit to Work or



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Sanction for Test procedures to clear and have the document cancelled to allow the return of the apparatus to a serviceable condition.

n) Loss of Safety Document Record Card

In the event of the loss of a Safety Document Record Card held by the Person in Charge of the Work or Testing, the loss shall be reported immediately to the Senior Authorized Person who shall upon obtaining consent of the Controller arrange for its replacement or cancellation.

5.86.6 Barricading and Affixing Danger Notices

Work shall not be carried out on any High Voltage apparatus that has been made Dead and released for work unless screening, where practicable, and affixing appropriate Danger Notices.

Appropriate Danger Notices shall be attached on, or adjacent to, the live apparatus and the limits of the zone in which work is to be carried out.

Danger Notices, barriers and screens shall be affixed or removed only by the Person in Charge of Work or Testing.

5.87. Access to High Voltage Enclosures and Apparatus

Securing assets against unauthorised access and operation is critical for the safety of the public, personnel and operation of ZESCO's network and infrastructure.

Gates or Barriers in substations, (including plates on access ladders), preventing access to enclosures within a station, chamber, cubicle or cell containing Live High Voltage apparatus shall normally be kept locked. The keys controlling the locks shall be kept in the key cabinet and removed only by an Authorised Person for the purpose of obtaining access to the High Voltage apparatus. Only an authorised person shall have access to any such enclosure, chamber, cubicle or cell in which a live conductor is exposed.

Smoking is strictly prohibited in all underground chambers/confined spaces. No person shall enter any underground chamber/confined spaces with exposed flames unless adequate precautions have been taken, (e.g. use of suitable natural or forced ventilation) and the consent of an authorised person obtained. When dangerous fumes and/or flammable gasses are likely to be present, precautions shall include testing by means of an approved detector. Where one



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or more persons are required to work in an underground chamber or confined space, an extra person shall be kept on duty at the entrance of the chamber/confined space and such a person shall keep in touch with the worker(s) inside the chamber/confined space.

5.88. Minimum Safety Clearance to Exposed Live Conductors

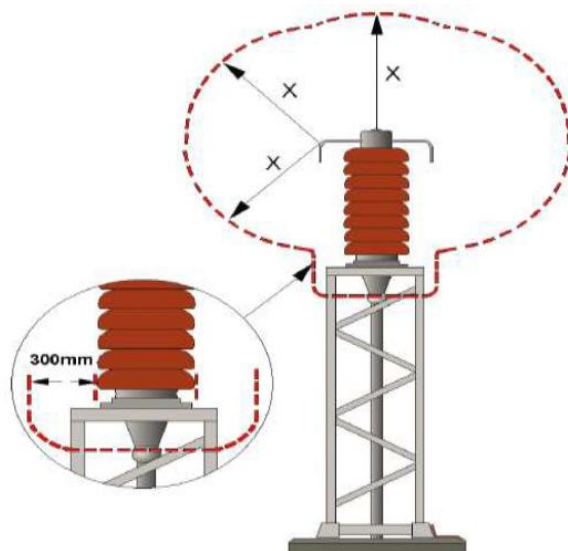
Significant risk to the safety and health of employees and contractors exist when approach to exposed live conductors is made. These risks include electric shock, arc flash, blast etc.

Therefore, when work is to be carried out near exposed live High Voltage conductors, the following minimum Safety Clearances from the exposed live High Voltage conductor shall be observed:

Rated Voltage	Minimum Safety Clearance
Upto 11kV	2.6 metres
Exceeding 11kV but not exceeding 17.5 kV	2.8 metres
Exceeding 17.5kV but not exceeding 33 kV	2.9 metres
Exceeding 33kV but not exceeding 66 kV	3.2 metres
Exceeding 66kV but not exceeding 88 kV	3.4 metres
Exceeding 88kV but not exceeding 220 kV	4.6 metres
Exceeding 220kV but not exceeding 330 kV	5.2 metres

The Minimum Safety Clearances are true for any position around the exposed live High Voltage conductor; there is no difference between horizontal, vertical or incline positions. No person, vehicles, mobile elevated platforms (including accessories), material or tools are allowed to breach these clearances.

Safety Distance 'X' (from live high voltage conductors)



The reference point for the Minimum Safety Clearance is the exposed live conductor. The movement of the conductor may implicitly mean the shift of the danger zone (area between the exposed conductor and the established Minimum Safety Clearance) relative to the conductor. This change of danger zone can place persons, tools, equipment, apparatus, branches and other items at risk if not carefully planned for.

5.89. Work near Exposed Live Conductors

5.89.1 Barricading and Accessing of Work Area

When work is to be carried out near exposed live High Voltage conductors, unless the whole station/circuit is Dead, the section which is made Dead for the work to be carried out shall be defined as far as practicable by the use of barriers or ropes arranged so that the minimum Safety Clearance from the nearest exposed live conductor to ground level, platform or access way which may be required to be used when the conductor is live are maintained.

The area to be defined at ground level shall only be that in which work is to be carried out.

If the work cannot be carried out without leaving ground level, platform or access way, the minimum Safety Clearances above shall also be observed from the nearest exposed live High Voltage conductor to the point from which work is to be carried out.



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If the work is such that the minimum Safety Clearances cannot be observed, the exposed live high voltage equipment shall be made Dead.

At ground level, a barricade in approved form shall distinguish the working area. Danger notices shall be attached to adjoining High Voltage apparatus or sections.

Where necessary to prevent danger the access and egress ways to and from the area of work shall be clearly defined in an approved manner.

5.89.2 Use of Ladders and Long Objects

- a) Ladders shall be of an approved type and of no greater length than is required for the work involved, where practicable.
- b) Ladders or long objects shall not be used without the permission of an Authorised Person or Senior Authorised Person. The movement and erection of such ladders and long objects shall be carried out only under the direct supervision of the Person in Charge of Work and when moved at ground level, they shall be carried in a horizontal orientation and as near to the ground as is practicable by two people.
- c) Portable ladders, provided for giving access to fixed ladders that terminate above ground level, shall be padlocked in a position by the Person in Charge of Work while work is being carried out on the structure.
- d) All portable ladders within substations or switching stations shall be laid flat upon the ground when not in use and fastened to a suitable anchorage where practicable.
- e) All metallic ladders and scaffolds shall be earthed and remain connected to earth in their position of use.

5.89.3 Operating Vehicles, Mobile Elevated Platforms, Cranes, Scaffolds

- a) When mobile equipment is taken into and out of a substation the route to be followed shall be agreed and defined on site by a Senior Authorised Person. 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. Rules on the use of Portable Earths shall apply.
- b) It shall also remain connected to the earthing system at the working



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- position. On removal of the equipment it shall remain connected to the earthing system until it is as clear of the exit as possible.
- c) The limits of operation of such equipment shall be defined by a Senior Authorised Person to the Person in Charge of Work and thereafter the equipment shall be erected and/or moved only within these limits under the direct supervision of the Person in Charge of the work. (Refer to clause 5.88 for minimum safety clearances).
 - d) Where proximity to live exposed conductors is apparent, during transportation or works, the minimum Safety Clearances shall strictly be observed. This includes all accessories associated with the Vehicles, Mobile Elevated Platforms, and Cranes etc. A Safety Observer shall be appointed from the Working Party whose duty shall be to monitor the limits of operation of the Vehicles, Mobile Elevated Platforms, and Cranes etc. as defined in (c) above and advise the operator wherever such limits are in jeopardy of being breached.
 - e) As these works involve working above ground, General Procedures for "Working at Heights with Portable Ladders" CO.14900.GNPR.00034 and "Working at Heights with Scaffolds" CO.14900.GNPR.00035 shall apply.

5.90. Work in Enclosures Protected by Automatic Fire Suppression Systems

- a) Before work or inspections are carried out in any enclosure in Substations/ Switching Stations and Generation Stations protected by Automatic Fire Suppression Systems, the automatic control feature shall be disabled with consent of the Controller and the equipment left on manual/hand control and a warning tag shall be attached. Doors to the enclosure in Substations/ Switching Stations and Generation Stations protected by Automatic Fire Suppression Systems shall be left open whilst work or inspections are in progress.
- b) The automatic control feature shall be restored to the automatic operation mode with the consent of the Controller immediately after the persons engaged in the work or inspections have completed the works and withdrawn from the enclosure in Substations/ Switching Stations and Generation Stations protected by Automatic Fire Suppression Systems. The doors to the enclosures shall then be closed.
- c) Precautions taken to disable the automatic control and the placing of the warning tag shall be noted on the respective safety document.

5.91. Specialised Works on High Voltage Apparatus

5.91.1 Remotely and Automatically Controlled Equipment

Before work is carried out on remotely or automatically controlled equipment such as circuit breakers, isolators, tap changing gear or air



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compressors, all remote control and automatic features shall first be rendered inoperative and, where the facility exists, the control mechanism shall be locked off in local or off position using a Safety Lock and Caution Notices applied as appropriate.

Whilst such work is in progress, no other work shall be carried out on the controlling equipment and associated wiring or relays, where there is a possibility that the automatic or remote feature could be restored. The relevant Controller shall be informed accordingly and shall log the condition of the equipment in the Switching Logbook.

5.91.2 Withdrawable High Voltage Apparatus

When withdrawable High Voltage apparatus has been disconnected from all supplies and physically removed from the cubicle, its conductors shall be discharged to Earth but need not remain connected to Earth. Where a risk assessment shows there is no danger from stored electrical energy, it is not necessary to discharge the withdrawable apparatus.

All spout shutters not required to be opened for immediate work or operation shall where practicable be locked shut or otherwise made inaccessible by approved means. A Danger Notice shall be attached on the door or approved means of barricading preventing access to the cubical or cell containing exposed live conductors.

Work, at the location, on withdrawable High Voltage Apparatus that has been disconnected from all sources of supply and physically removed from its cubicle shall be carried out under a Limitation of Access.

5.91.3 Works on Busbar Spouts, Busbars and Busbar Connections of Multi-Panel Switchboards

a) Isolation

When work is to be carried out on busbar spouts, busbars and busbar connections, the following isolation procedures shall be carried out:

- i. The section of the busbars on which work is to be carried out shall be isolated from all points of supply from which it can be made Live;



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- ii. The isolating points and the shutters of live spouts shall be locked, where practicable. When work is to take place on an indoor multi-panel switchboard, then all circuit breakers or switches that can be closed on to the busbars on which work is to be carried out shall have their mechanisms locked in the open position and the closing mechanism shall be made inoperative; and
- iii. Caution Notices shall be attached at all points where the busbars can be made live.

b) Earthing

- i. Where practicable the section of busbar on which work is to be carried out shall be proved for absence of voltage before applying the Earth. The proving for absence of voltage shall be done on the panel at which the Circuit Main Earth is to be applied.

Note: The insertion of the hand into contact spouts for this purpose is forbidden and only approved tools shall be used.

- ii. Circuit Main Earths of approved type shall be applied at a panel, other than that at which work is to be undertaken, on the isolated section of busbars.
- iii. When work is to take place on an indoor multi-panel switchboard, after all the feeder, transformer and bus-section/coupler circuits have been isolated, it is essential to earth the busbar at a minimum of two points before any Permit to Work is issued. Where two earthing points are not available, the single point earthing principle shall be applicable.

c) Safety Documents

Safety Documents shall be issued in accordance with the protocols for issuance of Safety Documents in 5.86.5.

Before obtaining the receipt signature on the Permit to Work the Senior Authorised Person who is issuing the Permit to Work shall, at the point of work, satisfy themselves that the recipient is aware of the location of all isolating and earthing points, adjacent live High Voltage apparatus as well as the safety precautions to be taken by the recipient.

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d) Work Execution

Upon receipt of the Permit to Work and before any work is carried out, then:

- i. Danger notices shall be attached, where applicable, on or adjacent to the apparatus containing live conductors and at the limits of the zone of work.
- ii. Where work is to be carried out on busbar spouts it shall be done under the close supervision of the Senior Authorised Person who shall identify the busbar spouts to be worked on and where necessary provide access by removing any locks applied to such spout shutters.
- iii. Where work is to be carried out on busbars or busbar connections the Senior Authorised Person shall identify in an approved manner where access is to be made. Access shall then be made, by the removal of the appropriate cover plates, under the close supervision of the Senior Authorised Person who shall not leave site until they are satisfied that no further access is required to complete the work. No further access shall be made to other parts of the switchboard during the course of the work.

Note: As an additional precaution, the spout to be worked on shall be retested for absence of voltage.

5.91.4 Spouts and Connections for Feeders, Voltage Transformer and Single Panel Busbar

a) Isolation

When work is to be carried out on feeder and voltage transformer spouts or connections, or on the busbar spouts or connections of a single panel, the following procedures shall be carried out:

- i. The spouts or connections on which work is to be carried out shall be isolated from all points of supply from which they can be made Live;
- ii. The isolating devices shall be locked so that they cannot be operated, and the shutters of Live spouts shall be locked shut; and
- iii. Caution Notices shall be attached at all points where the circuit can be made Live.

**b) Earthing**

- i. Where practicable the spout contacts or connections shall be checked by means of an approved voltage testing device to verify the absence of voltage.
- ii. The circuit shall be earthed with approved earthing equipment at the point of work and, where reasonably practicable, at all points of isolation from the supply.
- iii. Any special equipment used for the purposes of earthing metal-enclosed switchgear shall be of approved type but the insertion of the hand or any tool into the spouts for this purpose is forbidden.
- iv. Where the spouts are connected to an overhead line circuit on which there is likelihood of dangerous induced voltages, working earth shall be applied at a point nearest to the point of work where access to the conductors can safely be obtained.

c) Safety Documents

A Permit to Work or Sanction for Test shall be issued in accordance with clause 5.86.5.

Before obtaining the receipt signature on the Permit to Work the Senior Authorised Person who is issuing the Permit to Work shall, at the point of work, satisfy themselves that the recipient is aware of the location of all isolating, earthing points and adjacent Live High Voltage apparatus.

d) Work Execution

Immediately after the Person in charge of work has received and signed on the Permit to Work and before any work is carried out, Danger Notices shall be attached, where applicable, on or adjacent to the apparatus containing Live conductors and at the limits of the zone of work.

5.91.5 High Voltage Apparatus with Hydraulic and/or Pneumatic Plants**a) Compressed Air**

The following precautions shall be taken before any work is carried out:



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- i. If the area of work includes the compressor plant, then the supply to the prime mover of the compressor shall be switched Off and any such switch and/or control handle locked in Off or neutral position as appropriate by use of Safety Locks. A Caution Notice shall be attached at such positions;
- ii. All valves positioned between the part of the system to remain in service and the area of work shall be closed and locked in the closed position by Safety Locks, and a Caution Notice shall be attached at such positions.
- iii. In addition, the supply to any such valve that is power operated shall be rendered inoperative and where the facility exists the power supply locked in the Off position by use of Safety Locks, a Caution Notice shall be attached;
- iv. The compressed air in any area of work shall be discharged before work commences, and approved methods shall be used to ensure that the equipment or pipes concerned remain open to atmosphere for the duration of the work; and
- v. All keys for Safety Locks fitted under the provisions of this rule shall be placed in a Lockout Box.

Note:

Operating adjustments or inspections on High Voltage Apparatus which do not involve dismantling of any part of the compressed air system may be carried out provided that the apparatus has been made Dead. All such operating adjustments shall be carried out by the Person in Charge of Work.

b) Hydraulic Plant

Work on hydraulic plants shall be carried out in accordance with an approved site-specific Technical Instruction.

c) Equipment Containing Arc Quenching Media

Work on equipment containing SF₆ or other arc quenching media shall be carried out in accordance with an approved Technical Instruction.

5.91.6 Work on Transformers

a) Isolation

- i. When work is to be carried out on the connections or the windings of a transformer, the switchgear controlling all



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- windings shall be opened or the windings or connections isolated by approved means from all sources of supply.
- ii. To prevent the possibility of the transformer being made Live by back-feed, all Low Voltage fuses, MCBs and/or links on associated voltage and auxiliary transformers shall be removed or switched off and a Caution Notice attached. Where the facility exists, a Safety Lock shall be applied to the carrier.
 - iii. The transformer shall be isolated from all common neutral earthing equipment from which it may become Live. This, however, does not require the disconnection of solidly earthed neutrals or neutral equipment connected solely to the transformer on which work is to be done.
 - iv. Caution Notices shall be attached at all points of isolation including those of Low Voltage.
 - v. Keys for Safety Locks under the provisions of these rules shall be placed in a Lockout Box.

b) Earthing

The transformer shall be earthed in accordance with clause 5.86.4.

c) Safety Documents

A Permit to Work or Sanction for Test shall be issued in accordance with clause 5.86.5.

Before obtaining the receipt signature on the Permit to Work the Senior Authorised Person who is issuing the Permit to Work shall, at the point of work, satisfy themselves that the recipient is aware of the location of all isolating and earthing points, adjacent Live High Voltage apparatus.

d) Work Execution

The Person in Charge of Work shall enforce all site-specific safety precautions as is necessary and may include working at height procedures if works above ground are involved, Hot Works if open flames are involved, Working in Confined Spaces if entrances in the tank or transformer cell is involved.



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5.91.7 Work on High Voltage Reactors

a) Isolation

- i. When work is to be carried out on the connections or the winding of a reactor, the switchgear controlling the winding shall be opened or the winding or connections isolated by other approved means from all sources of supply.
- ii. Caution Notices shall be attached at all points of isolation.
- vi. Keys for Safety Locks under the provisions of these rules shall be placed in a Lockout Box.

b) Earthing

The reactor shall be earthed in accordance with clause 5.86.4.

c) Safety Documents

A Permit to Work or Sanction for Test shall be issued in accordance with clause 5.86.5.

Before obtaining the receipt signature on the Permit to Work or Sanction for Test, the Senior Authorised Person who is issuing the Permit to Work shall, at the point of work, satisfy themselves that the recipient is aware of the location of all isolating and earthing points, adjacent Live High Voltage apparatus.

d) Work Execution

The Person in Charge of Work shall enforce all site-specific safety precautions as is necessary and may include working at Height procedures if works above ground are involved, Hot Works if open flames are involved, Working in Confined Spaces if entrances in the tank or reactor cell is involved.

5.91.8 Work on High Voltage Static Capacitors

a) Isolation

Static capacitors shall be isolated from all sources of supply, locked off where practicable and Caution Notices fixed in accordance with clause 5.86.3.

**b) Earthing**

Circuit Main Earths shall be applied in accordance with clause 5.86.4.

c) Safety Documents

A Permit-to-Work or Sanction for Test shall be issued in accordance with clause 5.86.5.

Before obtaining the receipt signature on the Permit to Work the Senior Authorised Person who is issuing the Permit to Work shall, at the point of work, satisfy themselves that the recipient is aware of the location of all isolating and earthing points, adjacent Live High Voltage apparatus.

d) Work Execution

- Danger Notices shall be attached by the Person in Charge of Work, where applicable, on or adjacent to Live apparatus or at the limits of the zone of work.
- Working Earths shall then be applied to the capacitor unit terminals at the point of work.
- Capacitor units shall be short-circuited and remain so when removed from the circuit or in cases where earthing the common connections of each group of capacitors using approved capacitor earthing devices is impracticable.

5.91.9 Work on High Voltage Cables**a) Isolation & Earthing**

All cables shall be treated as Live, until made Dead. No Person shall interfere with, any High Voltage cable or conduit or trough containing a High Voltage cable unless personally instructed at the point of work by a Senior Authorised Person and has been made safe in accordance with clause 5.86.

Where any High Voltage cable is to be cut, a Senior Authorised Person, after satisfying himself that the cable has been made dead and identified, shall, before allowing work to proceed, spike the cable in an approved manner at the point at which the cut is to be made, witnessed by the person receiving the Permit to Work.

When any High Voltage joint or chamber is to be opened in



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circumstances where it is not desirable to spike the cable entering the joint or chamber a Senior Authorised Person shall prove if necessary by use of an approved appropriate cable electrical testing set, that the joint or chamber is associated with the cable which has been made Dead and on which it is safe to work. The tests shall be carried out in the presence of the person receiving the Permit to Work and shall be witnessed by him.

b) Safety Documents

A Permit to Work or Sanction for Test or a Limitation of Access shall be issued in accordance with clause 5.86.5.

c) Work Execution

- i. Danger Notices shall be attached by the Persons in Charge of Work, where applicable, on or adjacent to Live apparatus or at the limits of the zone of work.
- ii. Where work is to be carried out on the insulated sheath system of a High Voltage cable, additional precautions to prevent Danger from any sheath voltages shall be taken by ensuring that the sheath is grounded at all times.
- iii. Where work is to be carried out on any cable or ancillary equipment associated with a High Voltage cable route which may be subjected to induced voltages from other Live circuits in their proximity, then such work shall only be carried out in accordance with clause 5.86.

5.91.10 Work on High Voltage Overhead Lines

a) General Requirements for Working on Poles, Towers and High Structures

No Person shall access any pole, tower or high structure subject to the issuance of a Safety Document unless:

- i. They have confirmed that the poles, towers or supports are those detailed on the Safety Document;
- ii. They have also identified the pole, tower or support by any additional means provided e.g. Circuit identity wristlets and green flags;
- iii. The apparatus as defined on the Safety Document at the intended point of work, can be seen from ground level, to be



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connected to Earth with approved earthing equipment, located not more than two spans away from the intended point of work. If not, then before work commences the line shall be checked to verify that it is not Live and Working Earths shall be applied;

- iv. Instructed to do so by the Person in Charge of Work or Testing. All instructions given by the Person in Charge of Work or Testing shall be in the presence of all members of the Working Party who are aiding the person accessing the pole and who shall remain in visual contact with them for the duration of the work. No person shall work unaccompanied on any pole, tower or high structure;
- v. They ensure that any wood pole to be climbed has been sounded and the stay tested. No pole, the condition of which is in doubt, shall be climbed; and
- vi. They have sufficient training and tools to work at height. Before any pole, tower, high structure is climbed, the Person in Charge of Work shall examine the safety belt to be used and no safety belt, the condition of which is in doubt shall be used. All persons while at work on towers, poles and high structures shall make proper use of their safety belts and other approved climbing devices.

b) Work on Overhead Lines in Close Proximity to other Live Overhead Lines

If there are other Live overhead lines in proximity to the one being worked on, the Person in Charge of Work or Testing shall ensure that the Working Party are warned of the additional danger. If it is not possible to perform works on a line in close proximity to other overhead lines without breaching the Minimum Safety Clearances, the Live overhead lines in close proximity to the line to be worked on shall also be switched off and isolated. In the case of multiple circuits on the same structure, all such circuits shall be switched off, isolated and earthed. The details of such lines shall be recorded on the Safety Document under "Other precautions". It is the responsibility of the person in Charge of Work or Testing to ensure that a thorough risk assessment has been conducted before commencement of work after receipt of the Safety Document.

Any overhead line across which a new line is to be run shall be made Dead, or an adequate temporary cradle guard provided during the running out and binding of conductors on the new work.



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c) Use of Circuit Codes

When circuit codes are used as part of the identity of a circuit the following shall apply:

- i. The Senior Authorised Person shall write the circuit codes on the Safety Document. The Person in Charge of Work or Testing shall check that they are the correct codes and initial the statement of circuit codes in the presence of the Senior Authorised Person issuing the Safety Document. The Senior Authorised Person shall provide the Person in Charge of Work or Testing with sufficient numbers of wristlets;
- ii. The person in charge of work shall ensure that green flags are provided, and shall place such flag in a suitable position before allowing any person to ascend the structure; and
- iii. Each person who will work on High Voltage apparatus for which a Safety Document has been issued, which includes circuit codes, shall be provided with a wristlet by the document recipient, marked with the circuit codes and shall wear it in such a manner that it will be readily visible to the user during the whole period that they are engaged in the work. On conclusion of the work the wristlets shall be returned by the Person in Charge of Work or Testing to the Senior Authorised Person.

d) Working Earths

- i. When required and before work commences on a High Voltage overhead line, Working Earths shall be applied at or as near as practicable to the points of work in accordance with an approved procedure. All phase Conductors shall be earthed. Where earthed metalwork is present, the Conductors and the Earth shall also be bonded to the metalwork.
- ii. The number and position of Working Earths applied after a Permit to Work is issued shall be the responsibility of the Person in Charge of Work.
- iii. The Working Earths shall remain in position during the progress of the work and shall only be removed by the Person in Charge of Work after all other members of the Working Party have descended the pole or tower on completion of the work.
- iv. Working Earths issued shall be accounted for by the person in charge of work/testing before the safety document is cleared.

**e) Running Out or Lowering of Overhead Conductors**

When any overhead line conductor is to be raised or lowered or otherwise held on temporary supports / connections, approved method statement shall be followed to ensure that no danger is caused at locations such as road / railway crossings, where other persons may be present. Where the overhead line conductors pass over or under, or are in close proximity to other High Voltage overhead lines, a Senior Authorised Person shall determine whether the Live overhead lines are to be made Dead or whether other precautions are to be applied to adequately avoid danger. Refer to clause 5.91.10(b). The Controller responsible for the existing overhead line shall be informed of the work and where applicable, auto-reclosing facilities on the circuit concerned shall be disabled.

Any overhead line across which a new line is to be run shall be made dead, or an adequate temporary cradle guard provided during the running out and binding of conductors on the new work.

f) Work on Auxiliary Cables Suspended on Catenary Wire below High Voltage Overhead Lines

Where work is to be carried out on auxiliary cables suspended on a catenary below a Live High Voltage overhead line, the Minimum Safety Clearances shall be observed.

g) Adverse Conditions

- i. On the near approach of a lightning storm all work on overhead lines shall cease immediately. The person in charge of work shall inform the Senior Authorised Person in charge of switching who shall then inform the Controller.
- ii. No person shall patrol an overhead line alone during the hours of darkness or when visibility is impaired. If overhead lines are to be patrolled during the hours of darkness suitable lighting equipment shall be used.

5.91.11 Work on Multiple Circuit High Voltage Overhead Line Conductors**a) Isolation**

When work has to be carried out, which require conductors to be



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dead, on multiple circuit High Voltage Overhead lines, the lines shall be switched off and isolated from all sources of supply, including voltage and auxiliary transformers from which the apparatus can be made Live in accordance with clause 5.86.

The isolating devices shall be locked so that they cannot be operated and the shutters of Live spouts shall be locked shut by means of Safety Locks and the keys for the locks kept locked in a Lockout Box.

Caution Notices shall be attached at all points where the circuit can be made Live.

b) Earthing

Before issuing a Permit to Work for work on a High Voltage overhead line(s), the Senior Authorised Person shall ensure that the circuit has been identified and is Dead in accordance with clause 5.86.4.

c) Safety Documents

A Permit to Work or Sanction for Test shall be issued in accordance with clause 5.86.5.

d) Work Execution

General requirements in clause 5.91.10 (a) shall be adhered to.

5.91.12 Inspection Works of Equipment on Live Overhead Lines Involving Climbing Poles, Towers or High Structures

a) Isolation

No Isolations shall be required.

b) Earthing

No Earthing shall be required.

**c) Safety Documents**

A Permit to Work shall be issued in accordance with clause 5.86.5 and only under Part A. The Minimum Safety Clearances shall have to be maintained from the nearest Live point. Where inspection works can be carried out from ground level, the safety documents shall not be required.

d) Work Execution

- i. Before anyone is allowed to start work, the Person in Charge of Work at each pole, tower or high structure carrying Live conductors shall define the area to be worked in by removable barriers, ropes or pennants arranged so as to warn any person working on the pole, tower or high structure carrying Live conductors the Minimum Safety Clearances to be maintained in accordance with clause 5.88.
- ii. No person shall carry out inspection work in a manner that allows his arms to be extended beyond the limitations of the Minimum Safety Clearances.
- iii. Upon completion or cessation of works, the Person in Charge of Work shall inform all members of the Working Party that it is no longer safe to work on the pole, tower or high structure carrying Live conductors. He shall then remove the barriers, roping or pennants defining the work area. While removing the barriers, roping or pennants, the Person in Charge of Work shall be under observation from ground level by another Competent Person.

5.91.13 Works Involving Climbing Poles, Towers or High Structures Carrying Live Overhead Lines

- a) The work shall be carried out under the terms of a Permit to work Part A.
- b) Before anyone is allowed to start work the person in charge at each tower shall define the area to be worked in by removable barriers, notices, roping or pennants arranged so as to warn any person working on the tower not to go beyond the minimum clearance distances as stipulated in clause 5.88.
- c) No person shall work in such a manner that his arms or any tool extend beyond the limitations fixed under sub-paragraph 5.88 of these Rules.
- d) Upon completion or cessation of the work the competent Person in charge shall inform all members of the Working Party that it is no longer safe to work upon the tower and shall then remove the

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barriers, notices, roping or pennants defining the working area. Whilst removing barriers, etc., the Person in Charge of Work shall be under observation from ground level by another person.

5.91.14 Work on Generators and Generator Transformer Circuits

a) Isolation

When work is to be carried out on the generators and on directly coupled generator transformer circuits, the apparatus shall be switched off and isolated from all sources of supply, including voltage and auxiliary transformers from which the apparatus can be made Live in accordance with clause 5.86.

Precautions to be taken include the following:

- i. The generator shall be at rest unless permission has been given by a Senior Authorised Person for the work to be carried out whilst the machine is rotating;
- ii. The prime mover is isolated by means of closure of relevant gates or valves;
- iii. The excitation system shall be isolated. Where motor driven exciters are installed the switch controlling the motor shall be locked in the open position. In the case of static exciters, the field circuit switch shall be opened and locked off;
- iv. Where applicable, the automatic fire suppression system shall be disabled or put in manual mode; and
- v. The isolating arrangements shall be rendered inoperative;

Note: Site specific technical instructions shall be strictly adhered to.

b) Earthing

Before issuing a safety document on the generators and on directly coupled generator transformer circuits, the Senior Authorised Person shall ensure that the circuit has been identified and is Dead in accordance with clause 5.86.4.

c) Safety Documents

A Permit to Work or Sanction for Test shall be issued in accordance with clause 5.86.5.

**d) Work Execution**

Before any person can be allowed to work on the generator, the Person in Charge of Work shall ensure that all ornaments and other loose items such as rings, keys, coins, necklaces, watches, phones etc., which have a potential risk of dropping and lodging in the windings are removed and kept away from the generator.

Only approved hand tools shall be used while working on the generator and these shall be tied to the wrists of the Competent Persons performing the work. The tools shall be accounted for before commencement of work and on completion of the Works. The Person in Charge of Work shall ensure accountability.

Similarly, fasteners (bolts, washers and nuts etc.) removed during the course of work, shall be kept neatly in a container and shall be accounted for on completion of works. No restoration of the unit should be done until a full accountability of removed fasteners has been done.

General Procedures for "Working at Height", "Working in Confined Spaces", "Hot Works" etc. shall strictly be adhered to as dictated by the nature of work being done and prevailing site working conditions. It is the responsibility of the Person in Charge of Work or Testing to ensure that a thorough risk assessment has been conducted before commencement of work, after issuance of safety document and to ensure that site specific safety is enforced during the course of work.

Note: For directly coupled generator transformers, the Specific Procedure on maintenance of transformers shall be applicable.

5.91.15 Work on High Voltage Motors**a) Isolation**

When work is to be carried out on the High Voltage windings of motors, the apparatus shall be switched off and isolated from all sources of supply, including voltage transformers from which the apparatus can be made Live in accordance with clause 5.86.

The isolating arrangements shall be rendered inoperative.

b) Earthing

Before issuing a safety document on the High Voltage motor, the



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Senior Authorised Person shall ensure that the circuit is Dead in accordance with clause 5.86.4.

c) Safety Documents

A Permit to Work or Sanction for Test shall be issued in accordance with clause 5.86.5.

d) Work Execution

Before any person can be allowed to work on a motor, the Person in Charge of Work shall ensure that all ornaments and other loose items such as rings, keys, coins, necklaces, watches, phones etc., which have a potential risk of dropping and lodging in the windings are removed and kept away from the motor.

General Procedures for "Working at Height", "Rigging and Lifting", "Hot Works" etc. shall strictly be adhered to as dictated by the nature of work being done and prevailing site working conditions. It is the responsibility of the Person in Charge of Work or Testing to ensure that a thorough risk assessment has been conducted before commencement of work, after issuance of safety document and to ensure that site specific safety is enforced during the course of work.

Note: Site specific technical instructions shall be strictly adhered to.

5.92. Rules for Work on Medium and Low Voltage Apparatus

5.92.1 General Precautions

When work or testing is to be carried out on or near Medium or Low Voltage apparatus, precautions shall be taken to prevent Danger to persons working on the apparatus and, so far as reasonably practicable.

If the conductors are covered with insulation and screening, the adequacy of these materials to prevent danger shall be assessed by the Person in Charge of Work with regard to the nature of the work or testing. Where necessary the precautions appropriate to work on or near exposed conductors shall be applied.



Danger may arise in the following circumstances:

- a) When a person confuses apparatus which has been made Dead with that which has remained Live;
- b) When a person accidentally or inadvertently makes contact with adjacent Live Conductors; or
- c) When inadequate precautions are taken during Live work or testing.

Consequently, work on, or testing of Medium or Low Voltage apparatus shall, wherever practicable, be done while the apparatus is Dead and only by competent persons who have attained appropriate levels of authorization to carry out such works.

Additionally, approved General Procedures and Technical Instructions for the control of work shall be employed in carrying out works in order to enhance safety and quality of workmanship.

5.92.2 Work on Dead Medium or Low Voltage Apparatus

When work is to be carried out on Medium or Low Voltage apparatus, the apparatus shall be switched off and isolated from all sources of supply from which the apparatus can be made Live and Caution notices applied at all points of isolation. The apparatus shall then be earthed (short-circuited to ground).

For planned Medium or Low Voltage outages the following requirements shall be adhered to:

- a) Switching Schedule shall be prepared and approved by Line Supervisor;
- b) Request for Isolation Forms shall be submitted to the appropriate Controller after approval by Line Supervisor;
- c) Customers shall be notified at least one week before the outage; and
- d) Switching and Isolations shall be done in line with the approved Switching Schedule on the outage planned date.

a) Medium or Low Voltage Switching

All switching operations shall be performed by Authorised Persons using approved switching schedules. Where the operation of the Medium or low voltage network is not co-ordinated or controlled in real time by the appropriate Controller, the Person in Charge of



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Switching shall be responsible for the local co-ordination and control of the Medium or Low Voltage network.

b) Medium or Low Voltage Isolations

Only approved electrical apparatus and methods of isolation shall be used as isolation points. This shall be achieved by creating any of the following:

- i. A visible gap (air or other rated insulation) by the removal of fuses and/or links;
- ii. A physical gap (air or other rated insulation) by operation of rated switchgear; or
- iii. A visible gap (air) removing jumpers on a section.

Points of Isolation shall be rendered inoperative.

Caution Notices shall be securely affixed at all points of isolation.

c) Earthing

The apparatus shall be Earthed with approved earthing device or earthing leads at all points of isolation or between such point of isolations and the point of work, as far as reasonably practicable. Earth connections shall be applied or removed by an Authorised Person.

The procedure for earthing shall be in accordance with clause 5.86.4.

d) Safety Documents

An appropriate safety document shall apply to gain access to the Medium or Low Voltage apparatus that has been made Dead for work or testing purposes.

Where the Medium or Low Voltage apparatus on which work is to be carried out may become Live from the customer's System, the following precautions shall be taken by the Person in Charge of Switching to prevent danger:

- i. Ensure that the equipment is isolated from the customer's System by the Responsible Person;



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- ii. The apparatus shall be Earthed between the point of work and the customer's System;
- iii. The Responsible Person shall be required to sign on the Permit to Work before work can commence and the apparatus shall not be made Live until the Permit to Work has been cleared and workmen withdrawn from work site.

e) Notices and Barricades

The Person in Charge of Work shall take precautions by screening or barricading to avoid Danger from inadvertent contact with adjacent Live apparatus including, where necessary, the fixing of Danger Notices to apparatus containing Live Conductors, adjacent to other Live Conductors and at the limits of the zone in which the work may be carried out. Only approved screens or barriers shall be permitted for use to prevent unsafe access to live parts.

f) Work Execution

Before work commences the apparatus and conductors shall be identified and tested for absence of voltage at the point of work by means of an approved voltage testing device.

g) Additional Precautions for Work on Dead Low Voltage Cables

The following precautions shall be taken:

- i. All damaged cables shall be treated as Live until it has been made Dead;
- ii. Unless the point of work can be physically traced from a point where the cable is accessible and has been proved Dead at that point, it will normally be necessary to treat the cable as if it is Live and test each core with an approved voltage testing device; or
- iii. If the cable has been damaged or is faulty this test shall be made at a safe distance from the suspected point of damage / fault. The cable shall then be physically traced from the point of test to the suspect point of damage / fault. Appropriate precautions shall be taken to avoid danger from electric shock and explosive arcing until the point of damage / fault is located and the cable made Dead.

When work is to be carried out on an auxiliary cable which may be subject to induced voltage from a High Voltage



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circuit, additional precautions to prevent danger from these voltages shall be taken in accordance with approved procedures.

h) Additional Precautions for Work on Dead Medium or Low Voltage Overhead Lines

Bare Medium or Low Voltage conductors shall be Earthed using approved earthing leads. Where insulated but unscreened conductors are present, the requirements for Live working shall be observed until the conductors have been made Dead.

Any unearthed steelwork such as an offset bracket or the upper portions of stay wires above the insulator shall be treated as Live until it or the conductors have been made Dead.

i) Requirements for Medium or Low Voltage Construction Works of Lines and Commissioning of New Installations

Where work or testing involves the initial connection, or the re-arrangement of conductors to a customer, connection shall not be done to that customer until checks have been carried out at an appropriate point on the system to ensure the polarity, phase rotation and earthing arrangements are acceptable. Refer to New Installations Electrical Wiring Inspection and Testing at Customer Premises (CO.14900.GNPR.00011).

No Medium or Low Voltage overhead line shall be erected or dismantled under a Live High Voltage line or in proximity to other Live Medium or Low Voltage line without the authority of a Senior Authorised Person who shall ensure that all necessary precautions are put in place before commencement of work and when necessary, for example because of insufficient clearance, the Live line is made Dead. When a Low Voltage overhead conductor is to be raised or lowered or otherwise held on temporary supports / connections, appropriate precautions shall be taken to ensure that no danger is caused at locations such as road / rail crossings etc. where other persons may be present.

Any overhead line across which a new line is to be run shall be made dead, or an adequate temporary cradle guard provided during the running out and binding of conductors on the new work.



When work or testing of the Medium and Low Voltage System is planned, precautions shall be taken to safeguard the integrity of the Medium and Low Voltage System and in the process prevent, so far as is reasonably practicable danger to the public.

5.92.3 Work on Live Medium or Low Voltage Apparatus

No Medium or Low Voltage Live works shall be carried out except in accordance with an approved procedure or technical instruction. This approved procedure shall adequately prevent danger from electric shock and inadvertent short-circuiting of the conductors.

Where Live work is to be carried out under an approved procedure or technical instruction, the Person in Charge of the Work shall make an assessment of the site conditions. Live work shall only commence where site conditions enable the work to be done safely. If the site conditions become unfavourable, Live works shall be suspended. In particular the following requirements shall be assessed:

- a) The apparatus to be worked upon shall be visually inspected to see that it is in a satisfactory condition as per the MV Overhead line inspection checklist;
- b) There shall be adequate working space and safe means of egress;
- c) The work space and the apparatus to be worked on shall be adequately illuminated; and
- d) If the work is outdoors, the weather conditions shall not be unduly adverse.

No person, unless they are conversant with specific procedures or technical instructions for works on Live systems and appropriately authorised, shall carry out Live work on ZESCO Medium and Low Voltage System. During the execution of works, the Person in Charge of Work shall be responsible for all safety precautions on site and give adequate step by step instructions.

Only tools and equipment approved for that purpose shall be used for work on, or the testing of Live Medium and Low Voltage apparatus.

No person shall carry out work which involves, or is equivalent to the manipulation of bare Medium and Low Voltage Live apparatus or conductors unless accompanied by another Competent Person who shall be available to render or obtain assistance in an emergency.



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5.92.4 Additional Precautions for Work on Live Medium or Low Voltage Cables

The cable to be worked on shall be identified by approved means. All metalwork adjacent to the point of work shall be adequately shrouded with approved insulating material to prevent inadvertent contact. The metallic sheaths of cables shall be bonded to each other with an approved insulated conductor before jointing and before cutting to ensure the continuity of the electrical circuit through the sheath.

Unless alternative approved procedures allow, during all work, including the change of cut-outs, only one conductor shall be made bare at a time and as a minimum, approved electrician gloves shall be used.

5.92.5 Additional Precautions for Work on Live Medium or Low Voltage Overhead Lines

Where work is to be carried out on Live overhead lines, any unearthed steelwork such as offset brackets or the upper portions of stay wires above the insulator shall be tested for absence of voltage using an approved voltage testing device.

When work is to be carried out on insulated but unscreened Live Medium and Low Voltage Conductors, approved electrician gloves shall be worn and approved insulated tools used, to prevent danger that may arise if the insulation has deteriorated or is damaged.

Before any wooden pole is climbed, the stay wires, if provided, shall be checked. The pole shall be sounded and no pole the condition of which is doubtful, shall be climbed. The pole may only be climbed after a risk assessment has been conducted by a Person in Charge of Work.

In addition, no person shall climb any pole unless he is wearing and makes proper use of an approved and effective safety belt and is within visual range of another member of the Working Party.

In the event of the approach of a lightning storm, work on the lines shall cease immediately.



5.92.6 Application of High Voltage Rules to Work on Medium or Low Voltage Apparatus

Where Safety Rules applicable to work on High Voltage Systems, apparatus are applied to Medium and Low Voltage Systems, apparatus and conductors, this shall be in accordance with approved procedures under clause 5.86.

This will apply in instances where work is carried out on medium voltage or low voltage systems in close proximity to high voltage lines or apparatus.

5.92.7 Testing and Adjustment of Live Medium or Low Voltage Apparatus

Testing and adjustment, including functional testing, may be made with the Medium and Low Voltage apparatus Live provided that approved insulated tools and instruments are used.

If the testing or adjustment requires covers to be removed so that terminals or connections that are Live, or can be made Live, are exposed or temporarily disconnected, then precautions shall be taken to prevent unauthorised access to, or interference with, the apparatus. Such precautions shall include, where necessary, direct supervision by the Person in Charge of Work or the erection of suitable barriers or screening and the display of Danger Notices.



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5.93. Mechanical Safety Rules

5.93.1 General Precautions

When work or testing is to be carried out on or near mechanical apparatus, precautions shall be taken to prevent Danger to persons working on the apparatus and, so far as reasonably practicable.

Danger may arise in the following circumstances:

- a) Confusing mechanically charged apparatus with dead apparatus;
- b) Accidentally or inadvertently coming into contact with rotating parts or pressurized systems; or
- c) Inadequate precautions taken during work or testing.

Consequently, work on, or testing of mechanical apparatus shall, wherever practicable, be done while the apparatus is Dead and only by persons with appropriate levels of authorization to carry out such works.

Additionally, approved Specific Procedures and Technical Instructions shall be employed in carrying out works in order to enhance safety and quality of workmanship.

5.93.2 Work on Mechanical Apparatus

When work is to be carried out on Mechanical apparatus, the following steps shall be taken:

- a) The apparatus shall be switched off;
- b) The apparatus shall be isolated;
- c) Caution notices applied at all points of isolation; and
- d) Discharging of Stored energy. The apparatus shall then remain in a state that will ensure a continuous discharge of energy to the atmosphere in the case of pressurized system or other approved means for other systems. (Earthing)

For planned outages on mechanical apparatus, the following requirements shall be adhered to:

- a) Switching Schedule shall be prepared by the Senior Authorised Person and approved by Line Manager;



- b) Equipment Outage Application Form shall be submitted to the relevant Line Director for further approval and consequently to the Controller for execution;
- c) Customers and other stakeholders shall be notified at least one week before the outage;
- d) Switching and Isolations shall be done in line with the approved Switching Schedule on the outage planned date, but taking into consideration any changes in system status; and
- e) Released for work by means of Safety Documents.

5.93.3 Mechanical Apparatus Switching

All switching operations on primary mechanical apparatus shall be performed by Senior Authorised Persons using approved switching schedules. Where the operation of the mechanical system is not co-ordinated or controlled in real time by the appropriate Controller, the Person in Charge of Switching shall be responsible for the local co-ordination and control of the mechanical system.

5.93.4 Mechanical Apparatus Isolations

Only approved isolating devices and methods of isolation shall be used for isolation of mechanical apparatus. These shall include operation of valves, gates or other methods of closing or opening mechanical apparatus (pipes, conduits, channels, tunnels, tanks of a hydraulic nature, pressure vessels etc.) which normally act as conductors of streams of volatile liquid, gas, including compressed air or water, if operating at or over 2 bars. The isolating devices shall be operated in such a way as to disconnect the apparatus from all sources of energy.

Where work is to be carried out on mechanical apparatus that is electrically driven, the switch controlling the supply to the motor shall be switched off and the motor shall be isolated. The isolation devices at points of isolation shall be rendered inoperative.

5.93.5 Discharging of Stored Energy (" Mechanical Earthing")

The stored energy in the mechanical apparatus shall be discharged using approved methods and its continuous discharge shall be ensured.

This shall be carried out by a Senior Authorised Person before the issuance of Safety Documents.



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5.93.6 Safety Documents

The Permit to Work process shall apply to gain access to the mechanical apparatus that has been made dead for work or testing purposes in accordance with clause 5.86.5.

5.93.7 Notices and Barricades

Suitable precautions shall be taken by screening or barricading to avoid Danger from inadvertent contact with the adjacent pressurized, compressed or rotating systems.

Where necessary, Danger Notices shall be affixed to such apparatus and at the limits of the zone in which the work may be carried out. Only approved screens or barricades shall be permitted for use to prevent unsafe access to Live parts.

5.93.8 Work Execution

Before work commences the apparatus shall be identified and absence of stored energy shall be proven by approved means.

The Person in Charge of Work or Testing shall be responsible for maintaining all local site safety precautions required to ensure that the work is carried out safely, by conducting a mini risk assessment as per procedure CO.14900.GNPR.00042.

If the state of any of the safety precautions has been altered, it must be returned to its original state as at the time of release of the equipment for work. If the alterations have not been returned to original state, all such exceptions shall be indicated on the Permit to Work.

5.93.9 Works on Mechanical Apparatus

a) Turbines

i. Isolation & Earthing

When work is to be carried out on the Turbine Runner and all associated equipment (guide vanes, spiral casing, manholes, needle valves, head-cover, shaft seals etc.), the following precautions shall be adhered to:



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- The associated generator to which the Turbine Runner and associated equipment form a part shall be switched off and isolated;
- The relevant gates or valves (e.g. Main In-let Valve, hydraulic gates, etc.) for supply of water shall be closed and rendered inoperative. The isolation of hydraulically controlled valves shall include switching off supply to motors from which the hydraulic pumps are controlled, isolating the switches/breakers for the hydraulic pump controls, and closing of control valves for the hydraulic circuit and locking them in closed position. Where applicable, the appropriate drain valves shall be locked in open position and caution notices applied.
- Where applicable, the penstock shall be drained by opening appropriate drain valves. The valves shall be locked in open position and caution notices applied;
- The draft tube or tail race gates or valves shall be closed and where applicable apply Caution Notices on controlling valves;
- The spiral casing shall be completely drained and drain valve locked in open position where applicable and caution notices attached; and
- Isolate the Hydraulic Governor System both electrically and mechanically and render inoperative.

Note: Site Specific Technical Instructions Shall be Strictly Adhered To.

ii. Safety Documents

A Permit to Work shall be issued in accordance with clause 5.86.5.

iii. Work Execution

All works on turbines shall be guided by approved Technical Instructions.

Only approved tools and materials shall be used while working on Turbine Runners and associated equipment. The tools shall be accounted for before commencement of work and on completion of the Works. The Person in Charge shall enforce this accountability.



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Similarly, fasteners (bolts, washers and nuts etc.) removed during the course of work, shall be kept neatly in a container and shall be accounted for on completion of works. No restoration of the unit should be done until a full accountability of removed fasteners has been done.

General Procedures for "Working at Height", "Working in Confined Spaces", "Hot Works" etc. shall strictly be adhered to as dictated by the nature of work being done and prevailing site working conditions. It is the responsibility of the person in Charge of Work or Testing to ensure that a thorough risk assessment has been conducted at the point at which work shall be carried out before the commencement of work after the safety document has been issued. It is the responsibility of the Person in Charge of Work to ensure that site specific safety is enforced during the course of work.

If the state of any of the safety precautions has been altered, it must be returned to its original state as at the time of release of the equipment for work. If the alterations have not been returned to original state, all such exceptions shall be indicated on the Permit to Work.

b) Work on Hydraulic Governor Systems

i. Isolation & Earthing

When work is to be carried out on Hydraulic Governor Systems and all associated equipment (servo motors, pressure vessels, pipes, valves, oil tanks etc.), the following precautions shall be adhered to:

- The associated generator to which the Hydraulic Governor Systems and associated equipment form a part shall be switched off and isolated;
- The relevant gates or valves (e.g. Main Inlet Valve, hydraulic gates) for supply of fluids shall be closed and rendered inoperative. The isolation of hydraulic system for hydraulically operated gates shall include closing and locking in closed position of the hydraulic control valves and additionally, switching off supply to motors from which the hydraulic pumps are controlled, isolating the switches/breakers for the hydraulic pump controls.



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Where applicable, the appropriate drain valves shall be locked in open position and caution notices applied.

- Where applicable, the penstock shall be drained by opening appropriate drain valves. The valves shall be locked in open position;
- Isolate the Hydraulic Governor System by closing all relevant hydraulic control valves and locking them in closed position, where practicable. Additionally, switching off the switches/breakers that control the supply for the hydraulic pumps and locking them in open position. Attach caution notices; and
- Where applicable, open the drain valves for the pressure vessels in order to de-pressurize the system. Where practicable, lock the valves in open position. Attach caution notices.

Note: Site Specific Technical Instructions Shall Be Strictly Adhered To.

ii. Safety Documents

Safety Documents shall be issued in accordance with clause 5.86.5.

iii. Work Execution

All works on Hydraulic Governor Systems and associated equipment shall be guided by approved Technical Instructions.

Only approved tools and materials shall be used while working on Hydraulic Governor Systems and associated equipment. The tools shall be accounted for before commencement of work and on completion of the Works. The Person in Charge of Work shall enforce this accountability.

Similarly, fasteners (bolts, washers and nuts etc.) removed during the course of work, shall be kept neatly in a container and shall be accounted for on completion of works. No restoration of the unit should be done until a full accountability of removed fasteners has been done.

General Procedures for "Working at Height", "Working in Confined Spaces", "Hot Works" etc. shall strictly be adhered to as dictated by the nature of work being done and prevailing site working conditions. It is the responsibility of the person in Charge of Work or Testing to ensure that a thorough risk



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assessment has been conducted at the point at which work shall be carried out before the commencement of work after the safety document has been issued. It is the responsibility of the Person in Charge of Work to ensure that site specific safety is enforced during the course of work.

If the state of any of the safety precautions has been altered, it must be returned to its original state as at the time of release of the equipment for work. If the alterations have not been returned to original state, all such exceptions shall be indicated on the Permit to Work.

c) Work on Waterways

i. Isolation & Earthing

When work is to be carried out on Waterways and all associated equipment (intake and outfall structures, Main Inlet Valves, Penstocks, Tail Race, Draft Tube, Gate slots and seals, Drain valves, pipes, etc.), the following precautions shall be adhered to:

- The associated generator to which the Waterways and associated equipment form a part shall be switched off and isolated;
- The relevant gates or valves (e.g. Main Isolating Valve, hydraulic gates) for supply of water shall be closed and rendered inoperative. The isolation of hydraulic system for hydraulically operated gates shall include closing and locking in closed position of the hydraulic control valves and additionally, switching off supply to motors from which the hydraulic pumps are controlled, isolating the switches/breakers for the hydraulic pump controls and attaching caution notices. Where applicable, the appropriate drain valves shall be locked in open position and caution notices applied.
- Where applicable, additional stop-Logs shall be closed upstream of the normal operating gate in order to facilitate works on the normal operating gate slots;
- The penstock shall be drained by opening appropriate drain valves. The valves shall be locked in open position and caution notices attached;
- The draft tube or tail race gates or valves shall be closed



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- and apply Caution Notices on controlling valves;
- The spiral casing shall be fully drained and drain valve locked in open position and caution notices attached;
- Where applicable, stop-Logs shall be closed down stream of the tail race gates or valves in order to facilitate works on tail race gates or valves; and
- Isolate the Hydraulic Governor System.

Note: Site Specific Technical Instructions Shall Be Strictly Adhered To.

ii. Safety Documents

A Permit to Work shall be issued in accordance with clause 5.86.5.

iii. Work Execution

All works on Water ways and associated equipment shall be guided by approved Technical Instructions.

Only approved tools and materials shall be used while working on Water ways and associated equipment. The tools shall be accounted for before commencement of work and on completion of the Works. The Person in Charge of Work shall enforce this accountability.

Similarly, fasteners (bolts, washers and nuts etc.) removed during the course of work, shall be kept neatly in a container and shall be accounted for on completion of works. No restoration of the unit should be done until a full accountability of removed fasteners has been done.

General Procedures for "Working at Height", "Working in Confined Spaces", "Hot Works" etc. shall strictly be adhered to as dictated by the nature of work being done and prevailing site working conditions. It is the responsibility of the person in Charge of Work or Testing to ensure that a thorough risk assessment has been conducted at the point at which work shall be carried out before the commencement of work after the safety document has been issued. It is the responsibility of the Person in Charge of Work to ensure that site specific safety is enforced during the course of work.

If the state of any of the safety precautions has been altered, it must be returned to its original state as at the time of release

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of the equipment for work. If the alterations have not been returned to original state, all such exceptions shall be indicated on the Permit to Work.

d) Work on Cooling Water Systems

i. Isolation & Earthing

When work is to be carried out on Cooling Water Systems and all associated equipment (cooling water valves, strainers, coolers, pipes etc.), the following precautions shall be adhered to:

- The associated generator to which the Cooling Water System and associated equipment shall be switched off, isolated and earthed where applicable;
- The relevant valves for supply of water shall be closed and rendered inoperative. Where applicable, the appropriate drain valves shall be locked in open position and caution notices applied;
- Where applicable, the penstock shall be drained by opening appropriate drain valves. The valves shall be locked in open position;
- Isolate the cooling water system using the appropriate valves. This shall include both inlet and outlet valves on either side of the point of work. Where practicable, lock in closed position and attach caution notices; and
- Open the cooling water circuit drain valves in the isolated zone and lock in open position. Attach caution notices.

Note: Site Specific Technical Instructions Shall Be Strictly Adhered To.

ii. Safety Documents

A Permit to Work shall be issued in accordance with clause 5.86.5.

iii. Work Execution

All works on Cooling Water Systems and associated equipment shall be guided by approved Technical Instructions.



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Only approved tools and materials shall be used while working on Cooling Water Systems and associated equipment. The tools shall be accounted for before commencement of work and on completion of the Works. The Person in Charge of Work shall enforce this accountability.

Similarly, fasteners (bolts, washers and nuts etc.) removed during the course of work, shall be kept neatly in a container and shall be accounted for on completion of works. No restoration of the unit should be done until a full accountability of removed fasteners has been done.

General Procedures for "Working at Height", "Working in Confined Spaces", "Hot Works" etc. shall strictly be adhered to as dictated by the nature of work being done and prevailing site working conditions. It is the responsibility of the person in Charge of Work or Testing to ensure that a thorough risk assessment has been conducted at the point at which work shall be carried out before the commencement of work after the safety document has been issued. It is the responsibility of the Person in Charge of Work to ensure that site specific safety is enforced during the course of work.

If the state of any of the safety precautions has been altered, it must be returned to its original state as at the time of release of the equipment for work. If the alterations have not been returned to original state, all such exceptions shall be indicated on the Permit to Work.

e) Work on Pressurised Systems

i. Isolation & Earthing

When work is to be carried out on Pressurised Systems and all associated equipment (compressors, pressure vessels, pipes, valves, accumulators etc.), the following precautions shall be adhered to:

- Precautions must be taken to ensure that associated generators to which the pressurised system and associated equipment form a part are not affected by works planned on pressurised system;
- The relevant valves for supply of pressurised fluid between point of work and the system that shall remain in operation shall be closed and isolated. Where two



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series connected valves are available, these shall be used as points of isolation. Non-return valves shall not be considered as isolating valves unless they are capable of being rendered inoperative. Where practicable, the isolating valves shall be locked in closed position and caution notices attached;

- Where it is not practical to isolate the point of work from the system without shutting down the entire Pressurised System, the switches/breakers controlling the supply for the Air Compressors shall be switched off and isolated. The switches shall be locked in open position and caution notices attached;
- Where applicable, the pressurized system between the isolating valves and the point of work shall be depressurized by opening the relevant drain valves to the atmosphere. The valves shall be locked in open position and caution notices attached. These drain valves may include the drain valves of the pressure vessels in circuit; and
- Where work is to be carried out inside the pressure vessels the Working in Confined Space Procedure shall apply.

Note: Site Specific Technical Instructions Shall Be Strictly Adhered To.

ii. Safety Documents

A Permit to Work shall be issued in accordance with clause 5.86.5.

iii. Work Execution

All works on Pressurised Systems and associated equipment shall be guided by approved Technical Instructions.

Only approved tools and materials shall be used while working on Pressurised Systems and associated equipment. The tools shall be accounted for before commencement of work and on completion of the Works. The Person in Charge of Work shall enforce this accountability.

Similarly, fasteners (bolts, washers and nuts etc.) removed during the course of work, shall be kept neatly in a container and shall be accounted for on completion of works. No



restoration of the unit should be done until a full accountability of removed fasteners has been done.

General Procedures for "Working at Height", "Working in Confined Spaces", "Hot Works" etc. shall strictly be adhered to as dictated by the nature of work being done and prevailing site working conditions. It is the responsibility of the person in Charge of Work or Testing to ensure that a thorough risk assessment has been conducted at the point at which work shall be carried out before the commencement of work after the safety document has been issued. It is the responsibility of the Person in Charge of Work to ensure that site specific safety is enforced during the course of work.

If the state of any of the safety precautions has been altered, it must be returned to its original state as at the time of release of the equipment for work. If the alterations have not been returned to original state, all such exceptions shall be indicated on the Permit to Work.

Note: *It is forbidden to use compressed air to clean oneself or any article of clothing.*

iv. Statutory Inspections of Pressure Plant

Every pressure vessel shall be inspected every three years by the Government Inspector and the results of such inspection shall be entered in a General Register of Factories for such plant.

A Government Inspector will inspect the pressure plant in accordance with sections 58 to 62 of the Factories Act and only plant that has been certified fit shall be used.

v. Precautions for Handling Cylinders

In the case of compressed gases, the following specific safety precautions shall be adhered to:

- Compressed gases shall be used in a safe manner;
- With the sole exception of compressed breathing air, compressed gas cylinders shall not be taken into confined spaces;
- Cylinders shall be handled with care and not dropped, jarred or exposed to extreme temperatures;



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- Cylinders shall have the valve protective cap or other approved protective device in place at all times, except when secured in position for actual use;
- Cylinders shall not be moved by rolling or lifting by the valve or valve cap. A suitable trolley, cradle or other approved device shall be used to move cylinders according to Safety Data Sheet (SDS);
- Compressed gas cylinders, in use or in storage shall be secured by chain or metal strap to prevent them from falling or being knocked over;
- Propane and other fuel gas cylinders shall not be stored inside any operating building. Separate, approved, storage buildings or shelters shall be used;
- Electrical grounding of pressurized cylinders and bulk storage facilities and distribution headers shall be maintained at all times; and
- The following specific precautions shall apply in addition to the requirements prescribed in the Management of Chemicals Procedure (CO.14900.GNPR.00040):

– Oxygen Cylinder

Oxygen cylinders in storage shall be separated from fuel gas cylinders and other combustible materials, especially oil and gas, by a minimum distance of 6 m or by a 1.5 m high non-combustible barrier.

Oil, grease, or similar materials shall not be allowed to come into contact with oxygen cylinders as they may cause an explosion on contact with compressed oxygen.

– Acetylene Cylinders

These shall be properly secured and always used, transported and stored in a vertical position. They are to be protected from sparks, flames, and contact with energized equipment.

– Nitrogen Cylinders

While not toxic or flammable, it can replace oxygen and cause suffocation if present in large amounts in a confined space. Some transformers are shipped charged



with nitrogen. Entry procedures on confined spaces are to be used when performing transformer work.

– **Breathing Apparatus**

They shall be kept ready for use through regular inspection, proper storage in clean and accessible locations and maintained fully charged at all times.

Proper pressure-reducing regulators must be used as cylinder pressures regularly exceed 2000 psi (138 Bar).

f) Drainage Systems

i. Isolation & Earthing

When work is to be carried out on Drainage Systems and all associated equipment (pumps, valves, pipes etc.), the following precautions shall be adhered to:

- Ensure that alternative means of water evacuation from the drainage pits are available before isolating the apparatus on which work is to be carried out. This is to avoid any means of flooding of the facility while work is being carried out on the isolated apparatus;
- Close and render inoperative the Drainage System valves on either side of the point of work, where applicable. Where practicable, lock in closed position. Where work is to be carried out on the drain valve connected to a generator Waterway in such manner that there is no other valve before the connection to the generator Waterway, the Waterways for the generator shall be isolated as per Waterway isolation in clause 5.93.9 (c);
- Where applicable, open the drainage water circuit drain valves in the isolated zone and lock in open position where practicable; and
- Where work is to be carried out on a pump, switch off, isolate and render inoperative the switches to the pump motors.

Note: Site Specific Technical Instructions Shall be Strictly Adhered to.



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ii. Safety Documents

A Permit to Work shall be issued in accordance with clause 5.86.5

iii. Work Execution

All works on Water Drainage Systems and associated equipment shall be guided by approved Technical Instructions.

Only approved tools and materials shall be used while working on Water Drainage Systems and associated equipment. The tools shall be accounted for before commencement of work and on completion of the Works. The Person in Charge of Work shall enforce this accountability.

Similarly, fasteners (bolts, washers and nuts etc.) removed during the course of work, shall be kept neatly in a container and shall be accounted for on completion of works. No restoration of the unit should be done until a full accountability of removed fasteners has been done.

General Procedures for "Working at Height", "Working in Confined Spaces", "Hot Works" etc. shall strictly be adhered to as dictated by the nature of work being done and prevailing site working conditions. It is the responsibility of the person in Charge of Work or Testing to ensure that a thorough risk assessment has been conducted at the point at which work shall be carried out before the commencement of work after the safety document has been issued. It is the responsibility of the Person in Charge of Work to ensure that site specific safety is enforced during the course of work.

If the state of any of the safety precautions has been altered, it must be returned to its original state as at the time of release of the equipment for work. If the alterations have not been returned to original state, all such exceptions shall be indicated on the Permit to Work.

Note: Site Specific Technical Instructions Shall Be Strictly Adhered To



g) Work on Fire Hydrant Systems

i. Isolation & Earthing

When work is to be carried out on Fire Hydrant Systems and all associated equipment (Storage tanks, pressure vessels, pipes, valves etc.), the following precautions shall be adhered to:

- Precautions shall be taken to ensure that contingency firefighting means are available before isolating the apparatus on which work is to be carried out. This is to avoid a situation where a facility is incapacitated in terms of firefighting means while work is being carried out on the isolated apparatus;
- Close and render inoperative all Fire Hydrant System valves on either side of the point of work, where applicable. Where practicable, lock in closed position and attach caution notice;
- Where work is to be carried out on the Fire Hydrant valve connected to a generator Waterway in such manner that there is no other valve before the connection to the generator waterway, the waterways for the generator shall be isolated as per Waterway isolation in clause 5.93.9 (c);
- Where practicable, open the Fire Hydrant water circuit drain valves in the isolated zone and lock in open position where practicable. Apply caution notice;
- Where work is to be carried out on a pump, switch off, isolate and render inoperative the switches to the pump motors; and
- Where necessary, open the drain valves for the storage tanks or pressure vessels in order to de-pressurize the system. Where practicable, lock the valves in open position.
- When work is to be carried out inside storage tanks or pressure vessels the Working in Confined Spaces Procedure shall apply.

ii. Safety Documents

A Permit to Work shall be issued in accordance with clause 5.86.5.

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iii. Work Execution

All works on Fire Hydrant Systems and associated equipment shall be guided by approved Technical Instructions.

Only approved tools and materials shall be used while working on Fire Hydrant Systems and associated equipment. The tools shall be accounted for before commencement of work and on completion of the Works. The Person in Charge shall enforce this accountability.

Similarly, fasteners (bolts, washers and nuts etc.) removed during the course of work, shall be kept neatly in a container and shall be accounted for on completion of works. No restoration of the unit should be done until a full accountability of removed fasteners has been done.

General Procedures for "Working at Height", "Working in Confined Spaces", "Hot Works" etc. shall strictly be adhered to as dictated by the nature of work being done and prevailing site working conditions. It is the responsibility of the person in Charge of Work or Testing to ensure that a thorough risk assessment has been conducted at the point at which work shall be carried out before the commencement of work after the safety document has been issued. It is the responsibility of the Person in Charge of Work to ensure that site specific safety is enforced during the course of work.

If the state of any of the safety precautions has been altered, it must be returned to its original state as at the time of release of the equipment for work. If the alterations have not been returned to original state, all such exceptions shall be indicated on the Permit to Work.

Note: Site Specific Technical Instructions Shall be Strictly Adhered to.

h) Utility Water Reticulation Systems

i. Isolation & Earthing

When work is to be carried out on Utility Water Reticulation Systems and all associated equipment (storage tanks, pressure vessels, pipes, valves, pumps etc.), the following precautions shall be adhered to:



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- Close and render inoperative all Utility Water Reticulation System valves on either side of the point of work, where applicable. Where practicable, lock in closed position and attach caution notice;
- Where work is to be carried out on the Utility Water Reticulation valve connected to a storage tank in such manner that there is no other valve before the connection to the storage tank, the storage tank shall be drained in order to facilitate the works. The drain valve shall remain open for the duration of the works. Caution notice shall be attached;
- Where practicable, open the utility water reticulation drain valves in the isolated zone and lock in open position where practicable;
- Where work is to be carried out on a pump, switch off, isolate and render inoperative the switches to the pump motors. Attach caution notice;
- When work is to be carried out inside storage tanks the Working in Confined Spaces Procedure will apply.

ii. Safety Documents

A Permit to Work shall be issued in accordance with clause 5.86.5.

iii. Work Execution

All works on Utility Water Reticulation Systems and associated equipment shall be guided by approved Technical Instructions.

Only approved tools and materials shall be used while working on Utility Water Reticulation Systems and associated equipment. The tools shall be accounted for before commencement of work and on completion of the Works. The Person in Charge of Work shall enforce this accountability.

Similarly, fasteners (bolts, washers and nuts etc.) removed during the course of work, shall be kept neatly in a container and shall be accounted for on completion of works. No restoration of the unit should be done until a full accountability of removed fasteners has been done.

General Procedures for "Working at Height", "Working in Confined Space (CO.14900.GNPR.00062)", "Hot Works" etc. shall strictly be adhered to as dictated by the nature of work



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being done and prevailing site working conditions. It is the responsibility of the person in Charge of Work or Testing to ensure that a thorough risk assessment has been conducted at the point at which work shall be carried out before the commencement of work after the safety document has been issued. It is the responsibility of the Person in Charge of Work to ensure that site specific safety is enforced during the course of work.

If the state of any of the safety precautions has been altered, it must be returned to its original state as at the time of release of the equipment for work. If the alterations have not been returned to original state, all such exceptions shall be indicated on the Permit to Work.

***Note:** Site specific Technical Instructions shall be strictly adhered to.*

5.94. Other Relevant Procedures for Work on ZESCO Network and Infrastructure

5.94.1 Working on or Near Water Bodies

For works on or near water bodies, special attention shall be given to the following provisions:

- a) Prior to commencement of work of any nature on or near a water body, precautions shall be put in place to prevent drowning. These shall include:
 - i. A risk assessment;
 - ii. The provision of life jackets to all persons involved in the work;
 - iii. The provision of life ring and safety rope to be used for rescue operations;
 - iv. Appropriate PPE for persons working under water. This shall include a complete diver's kit (swim suit, breathing apparatus, watch, depth gauge, goggles/face mask, fins, belts and weights etc.); and
 - v. Where work to be carried out involves the use of boats or any other approved vessels, the boats or approved vessels shall be appropriate for the task and shall have been inspected by the Government Inspector and issued with a valid certificate. No vessel shall be used unless it has been certified.



- b) During the works, no person shall be allowed to work alone. They should be in the company of another competent person who can provide rescue operations in case of an emergency.

5.94.2 Vegetation Management

Vegetation control must be done in accordance with approved "Bush Clearance and Maintenance within Overhead Power Line Servitudes TR.12400.SPPR.00191" procedure.

5.95. Treatment for Electric Shock

5.95.1 Freeing from Contact

Switch off supply immediately or send someone to do so. Do not attempt to remove a person from contact with high voltage unless suitable articles insulated for the system voltage are used for this purpose. When attempting to free a person from contact with low or medium voltage use appropriate rubber gloves, boots or mat, or insulated stick, but if these are not available use any non-conductive item to drag the person free. Whatever is used must be dry.

***Note:** Immediate and speedy action is necessary.*

5.95.2 After Release

Do not waste time moving the casualty. Confirm if the casualty is conscious and responsive.

5.95.3 Emergency Action Plan

- a) If conscious and responsive monitor the condition and ensure it does not deteriorate. Observe the patient and call for medical help.
- b) If the patient is not responsive, check for signs of breathing. If the patient is breathing, confirm there is a pulse. Put the patient in recovery position. Observe the patient and call for help.
- c) If the patient is not responsive and is not breathing, confirm that there is a pulse. Call for help. Clear the airways and apply pulmonary resuscitation. Continue doing so until the patient starts breathing or until medical help arrives. If the patient starts breathing put the patient in recovery position. Do not give up efforts to restore natural breathing until told to do so by a doctor.
- d) If the patient is not responsive, is not breathing and has no pulse, call for medical help and commence cardio-pulmonary



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resuscitation. Continue doing so until the patient has a pulse/starts breathing or until medical help arrives. If the patient starts breathing put the patient in recovery position. Do not give up efforts to restore natural breathing until told to do so by a doctor.

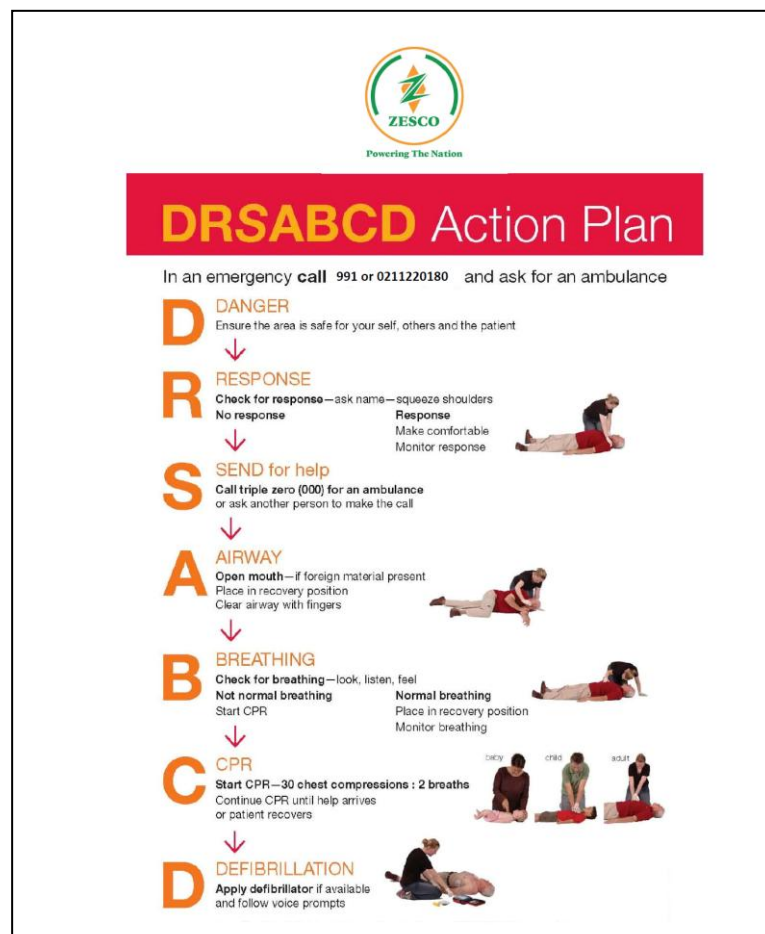
5.95.4 Burns

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

5.95.5 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.

5.95.6 First Aid Emergency Action Plan





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6 DEVELOPMENT

This safety rules do not contain any processes.

7 RECORDS

In the execution of this document the records generated shall include and be managed as indicated in the table below:

Record Name	Retention Period	Archive Period	Location Stored	Responsible Person	Disposal Method
Limitation of Access	2 Years	3 Year	Operations Office	Head of Operations	Shredding
Electrical Permit to Work	2 Years	3 Year	Operations Office	Head of Operations	Shredding
Suction for Test	2 Years	3 Year	Operations Office	Head of Operations	Shredding
Mechanical Permit to Work	2 Years	3 Year	Operations Office	Head of Operations	Shredding
Confined Space Permit	2 Years	3 Year	Operations Office	Head of Operations	Shredding
Hot Work Permit	2 Years	3 Year	Operations Office	Head of Operations	Shredding
Working At Height Permit	2 Years	3 Year	Operations Office	Head of Operations	Shredding
Excavations Permit	2 Years	3 Year	Operations Office	Head of Operations	Shredding
Switching Schedule	5 Years	0	Outage Scheduling System/Outage management System	Head of Operations	ICT shall delete records



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8 APPENDICES

Appendix 1: List of Applicable Forms

No.	Title of Form	Document Number
1.	Southern African Power Pool Inter-Corporation Circuit Isolation and Earthing Certificate	CO.14900.EXTD.01088
2.	Limitation of Access	CO.14900.FORM.00116
3.	Equipment Outage Application	CO.14900.FORM.00117
4.	Request for Isolation	CO.14900.FORM.00121
5.	Electrical Permit to Work	CO.14900.FORM.00118
6.	Mechanical Permit to Work	CO.14900.FORM.00119
7.	Sanction for Test	CO.14900.FORM.00120
8.	Switching Instructions	CO.14900.FORM.00122
9.	Confined Space Permit	CO.14900.FORM.00032
10.	Hot Work Permit	CO.14900.FORM.00033
11.	Working at Height Permit	CO.14900.FORM.02716
12.	Excavation Permit	CO.14900.FORM.00152



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Appendix 2: Caution Notice



CAUTION



DO NOT INTERFERE OR OPERATE!
MEN WORKING ON THIS CIRCUIT



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Appendix 3: Danger Notice

 DANGER	
	LIVE APPARATUS! KEEP AWAY MAY SHOCK, BURN OR KILL 



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Appendix 4: Danger Approach



DANGER



YOU ARE APPROACHING LIMIT OF SAFE
WORKING AREA!

APPARATUS BEYOND THIS POINT IS
LIVE.

DO NOT APPROACH OR INTERFERE!





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Appendix 5: Warning Notice



WARNING



Keep Out!

Hazardous Voltage Inside

High Voltage Equipment Inside will cause
Injury or Death

No Trespassing

Call ZESCO LTD, 0211-363636

If you see people inside





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Appendix 6: Warning Tag



• FRONT

BACK



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Appendix 7: Valve Status Tag

The image displays two views of a yellow valve status tag against a black background. The tag is octagonal with a metal eyelet at the top. The back view (left) features a 'Remarks:' label followed by seven horizontal lines for text entry, and the phrase 'SEE OTHER S' at the bottom. The front view (right) is titled 'VALVE STATUS' and contains five checkboxes with corresponding labels: 'OPEN', 'HALF OPEN', 'CLOSED', 'DO NOT CLOSE', and 'DO NOT OPEN'. A horizontal line is positioned between the 'CLOSED' and 'DO NOT CLOSE' options. The words 'Back' and 'Front' are written in large, grey, italicized font above their respective tag views.

Back

Remarks: _____

SEE OTHER S

Front

VALVE STATUS

☐ OPEN

☐ HALF OPEN

☐ CLOSED

☐ DO NOT CLOSE

☐ DO NOT OPEN

Appendix 8: Fire Extinguishers



Fire Extinguisher Type



Fire Type	Material Type	Powder	Foam	CO ²	Water	Wet Chemical
CLASS A	Solids (e.g. wood, plastic, paper)	✓	✓	✗	✓	✗
CLASS B	Flammable Liquids (e.g. solvents, paint, fuels)	✓	✓	✓	✗	✗
CLASS C	Gases (e.g. butane, propane, LPG)	✓	✗	✗	✗	✗
CLASS D	Metals (e.g. lithium, magnesium)	✓	✗	✗	✗	✗
ELECTRICAL	Equipment (e.g. computers, servers, TVs)	✓	✗	✓	✗	✗
CLASS F	Cooking Oils (e.g. cooking fat, olive oil)	✗	✗	✗	✗	✓
Some examples of businesses that may need this extinguisher		Outdoor locations, garages, welding workshops, forecourts.	Schools, offices, hotels, shops, hospitals, apartments.	Offices, server rooms.	Schools, hospitals, shops, apartment blocks.	Kitchens, canteens, restaurants.