



# **ELECTRICAL SAFETY RULES**

**November 2019**

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**Endeavour  
Energy**

# Endeavour Energy

## Electrical Safety Rules

November 2019

## Endeavour Energy Electrical Safety Rules

### Associated Procedures List

<b>Document No.</b>	<b>Title</b>
GAM 0089	Authorisations Governance and Management
GSY 0091	Low Voltage Access Authority
GSY 0093	Non-network Systems
GSY 1004	Isolation and danger tagging
GSY 1015	Excavation
GSY 1088	Access authority for high voltage work and/or test
GNV 1044	Commissioning of electrical apparatus which has never been commissioned or which has been worked on
GNV 1051	Working on structures with communications transmitters
GNV 1058	Fallen Conductors
GNV 1068	Application of yellow taped areas in zone and transmission substations
GNV 1070	Access Authority procedure for work on transmission mains and joint use mains
GNV 1086	Switching Folder

## Amendment Summary for November 2019 Issue

<b>Amend No:</b>	<b>Rule Number</b>	<b>Page</b>	<b>Change</b>
00103	6.28	35	New clause "Cable penetrations including in cable ducts"
00109	9.4	67	Amended to address work practice restrictions from previous
00110	6.9.5	18	Amended to require insulating gloves for LV operating
00111	8.1.6.1	52	Enable temporary disabling of SEF protection for switching
00112	6.20.1.5	26	Enable removal of a DT by an authorised switching officer
00113	7.1.5	42	Amended requirements for the isolation of streetlight circuits
00114	Various	Various	Changes to role titles
00115	6.8.2	15	Amended requirements for making safe fallen HV conductors
00116	6.23.5	29	Amended methods for notification of entry to a substation
00117	Section 7	41-47	Amended section 7 following review of live low voltage work

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## 1.0 PURPOSE

To provide minimum safe work practices for persons, when working or testing on or near electrical apparatus associated with the distribution of electricity.

The Endeavour Energy Electrical Safety Rules define the accepted safe methods for working on or near Company electrical assets and are the minimum accepted standard. Work practices which exceed the minimum standard may be accepted following appropriate review and approval.

These Rules form a part of the Endeavour Energy Electricity Network Safety Management System (ENSMS) produced to meet the requirements of the Electricity Supply (Safety and Network Management) Regulation 2014 (or as amended).

## 2.0 SCOPE

The safety measures prescribed in these Rules are to be observed at all times by Endeavour Energy employees, contractors, and Authorised Persons working for Accredited Service Providers, working or testing on or near electrical apparatus or assisting with work or test on or near electrical apparatus, which includes:

- work or test carried out on or near high voltage electrical apparatus;
- work or test carried out on or near low voltage electrical apparatus, owned or leased by Endeavour Energy for supply of electricity to the public or for the provision of a service to the public;
- work or test carried out on or near any electrical apparatus, in electrical stations containing high voltage electrical apparatus or in generating stations; and
- Work or test carried out on station battery banks.

Note: The use of approved procedures, work method statements or workplace instructions which meet or exceed the requirements of these Rules is accepted.

### 2.1 Exceptional work

Approval for exceptional work may be given by the General Manager **Safety and Environment** where a change request has been completed, all safety issues considered and assessed and control measures implemented and completed.

For any such approval to be given it must be proved that existing rules and procedures will prevent the work from being done.

An application for approval of exceptional work must be supported by a plan of work, a description of the process to be adopted, a risk analysis, steps to be taken to advise all persons involved of the actions to be implemented and any emergency control measures to be applied.

Applications must be in writing. Approval or refusal of the application will also be in writing.

## 2.2 Ability to declare rules

The **General Manager Safety and Environment**, upon **their approval** can declare a rule with immediate effect. Subsequent to the proclamation, a copy of the document must be submitted to the **Electricity Network Safety Management System Committee** for assessment for permanent changes to the Electrical Safety Rules.

## 3.0 REFERENCES

Board Policy 3.0 – Health & Safety

Board Policy 9.1.10 – Network Electrical Safety

Company Procedure (Network Asset Management) GAM 0046 – Amendment, Distribution and Communication of Electrical Safety Rules

Company Procedure (Health & Safety) GSY 0051 – Health, Safety and Environment Incident Management

Company Procedure (Health & Safety) GSY 0072 – Working at Heights

Company Procedure (Health & Safety) GSY 1015 – Excavation

Company Procedure (Health & Safety) GSY 1066 – Worksite Hazard and Risk Assessment

Division Procedure (Network) GNV 1072.00 – High Voltage Live Work Safety

Endeavour Energy Electricity Network Safety Management System (ENSMS) (as amended)

AS 2444: Portable Fire Extinguishers and Fire Blankets

AS/NZS 3012: Electrical installations – construction and demolition sites

AS 4741: Testing of connections to low voltage electricity networks

National Electricity Network Safety Code, ENA NENS 01

National Electricity Network Safety Code ENA NENS 09 – Selection, Use and Maintenance of Personal Protective Equipment for Electrical Hazards

*Electricity Supply (Safety and Network Management) Regulation 2014*

*Work Health and Safety Act 2011 (NSW)*

*Work Health and Safety Regulation 2017(NSW)*

WorkCover NSW Work Near Overhead Powerlines - Code of Practice 2006

## 4.0 DEFINITIONS

**Shall - indicates a statement is mandatory**

**Should - indicates a recommendation**

**May - indicates the existence of an option**

For the purpose of these Rules:

### **Access Authority for work or test**

A pre-printed form which, when issued in accordance with a documented procedure adopted by the employer, gives permission to the holder and work party to work on or near, or test, electrical apparatus. Usually associated with HV and related apparatus, it shall:

- define the electrical apparatus on or near which work or test may be carried out;
- describe the nature of the work to be carried out; and

- define the safe area for work.

**Accredited service provider (ASP)**

An individual or entity accredited in accordance with the Electricity Supply (Safety and Network Management) Regulation 2014 (or as amended). Note: an accredited service provider can be an individual, partnership, or company. (Note: in addition to accreditation issued by the Regulator, an ASP must hold authorisation from Endeavour Energy for work on or near our network.)

**Apparatus**

An item or combination of items of plant or equipment.

**Approved**

Having appropriate employer endorsement in writing for a specific function.

**Approval to work (ATW)**

See Low Voltage Access Authority (LVAA).

**Authorised person**

A person with technical knowledge or sufficient experience who has been approved, or who has the delegated authority to act on behalf of Endeavour Energy, to perform the duty concerned.

**Authorised switching officer**

A worker, authorised in writing for operation of the network within the limitations specified on their authority card.

**Authority to energise**

All procedures for the cancellation of Access Authorities, laid down in these Safety Rules, have been carried out and that electrical apparatus may be energised safely.

**Barrier**

(see **Screens**)

**Cable**

An insulated conductor or two or more such conductors, laid together, either with or without fillings, reinforcement or protective coverings.

**Competent person**

A person having the skills, knowledge and attributes needed to complete a task.

**Conductor**

A wire, cable or form of metal designed for carrying electric current.

**Crane**

A crane or hoist of a mobile or crawler type, or an elevating work platform or part thereof, and includes the gear ancillary to the use of the crane.

**Customer installation**

An Electrical Installation owned by a network customer, that may be isolated from the network by removing service fuses, opening main switch(es) or disconnecting service mains.

**Danger tag**

An approved tag, which when affixed in accordance with approved procedures to a device gives warning against any operation of that device.

**De-energised**

Not connected to a source of electrical supply but not necessarily isolated.

**Disconnected apparatus (completely disconnected)**

Electrical apparatus which cannot be energised by operating work because of the absence of electrical connections to any source of electrical supply.

Specifically, to be disconnected apparatus, electrical apparatus must be able to be visually confirmed at any time as being separated from all sources of electrical supply:

- (a) in excess of the specified minimum safe approach distance for authorised persons and be secured to prevent the mains, cables or apparatus coming closer than that distance; or
- (b) by a secured barrier or screen.

Additionally, Network Mains must be earthed and short circuited by approved means at all points of disconnection.

Note that for the purposes of this definition “secured” means by use of permanent line, connection, or other hardware, requiring a tool to install and remove.

**Disconnection and Reconnection Instruction (D&R)**

A written sequence of actions to operate equipment on the high voltage system. (It may include low voltage switching in association with these actions.)

**Earthed**

Electrically connected to the general mass of the earth.

**Electrical apparatus (*electricity works*)**

Any electricity power lines or associated equipment or electricity structures that form part of a transmission or distribution system.

**Electrical station**

Any enclosed substation or switching station, whether of the indoor, outdoor or underground type.

**Employee**

A worker in the employment of the employer (whether under a contract of employment or apprenticeship) and includes a contractor and a person employed by a contractor, who carries out work for the employer.

**Employer**

In the case of Endeavour Energy employees and contractors (and their sub contractors) directly engaged by Endeavour Energy, Endeavour Energy is the employer. For Authorised Persons engaged by an Accredited Service Provider to perform work, the Accredited Service Provider is the employer.

**Energised**

Connected to a source of electrical supply.

**Excavation**

Work involving the penetration of the ground or surface of the earth including cutting or caisson, chasing, boring, piercing or the digging of trenches, ditches, shafts, wells, tunnels, drifts and rises below the finished levels of the ground surface or finished ground levels. This also includes works involving the movement or placement of soil or other surface materials by removing, boring or forcing objects into the ground or the surface of the earth.

**Exposed conductor**

An electrical conductor, approach to which is not prevented by a barrier of rigid material or by insulation which is adequate under a relevant Australian Standard specification for the voltage concerned and which is in sound condition.

**Extra low voltage**

Voltage normally not exceeding 50 volts alternating current (a.c) or 120 volts direct current (d.c).

**Generating station**

Any building or enclosure where electrical energy is able to be generated at high voltage, or at low voltage where the output is transformed to high voltage.

**Hazard/risk assessment**

The assessment performed by which work processes and locations are assessed to determine the presence of hazards and indicates the appropriate method to safely manage the risk.

**Hazardous low voltage or mechanical apparatus:**

All hazardous low voltage, mechanical, pneumatic, hydraulic or gas filled equipment associated with high voltage electrical apparatus, which may present a danger to persons in certain work situations. It may also refer to low voltage electrical apparatus for the supply of electricity to the public, such as low voltage overhead line or underground cables forming part of the low voltage distribution system and includes alternating current and direct current control and power systems for circuit breakers, transformers, etc. These may be referred to in the Special Conditions section of Access Authorities as 'local safety precautions'.

**High voltage**

A voltage normally exceeding 1,000 volts alternating (a.c) or 1,500 volts direct current (d.c).

**High voltage cage or room**

A fully fenced or walled area, room or compartment identified by a notice, containing exposed high voltage conductors which do not maintain standard safety clearances. High voltage cages or rooms may be located within high voltage switchyards or elsewhere. Entry to High Voltage Cages or rooms is only permitted under Access Authority. (Note: Entry for operating work by appropriately authorised persons is permitted provided that safe approach distances can be maintained.)

**Instructed person**

A person adequately advised by an Authorised Person or who has sufficient training and experience in the safety requirements for the work being undertaken to enable them to avoid the dangers which electricity may create.

**Insulated**

Separated from all other possible conductors by a rated value of non-conductive material, as in a covering or barrier, or by sufficient gap in air to prevent flashover or short circuit.



**Isolated (or isolate)**

Disconnected from all possible sources of electrical energy by opening switches, withdrawing circuit breakers, removing fuses, opening links, opening connections, tying back bonds and rendering them incapable of being made live unintentionally by the application of danger tags (and locks where possible).

**Live**

Connected to a source of electrical supply or subject to hazardous induced or capacitive voltages.

**Live line indicating devices**

Includes any testing equipment, such as live line testers, used for proving high voltage electrical apparatus live or de-energised.

**Live line work**

The application of approved techniques by trained, qualified and authorised persons on live high voltage electrical apparatus. It includes all work performed on the components of a line energised at, or capable being energised to high voltage due to isolation, earthing and short circuiting and the issuing of an Access Authority **not** being carried out.

**Low voltage**

A voltage normally exceeding 50 volts alternating current (a.c) or 120 volts direct current (d.c), but not normally exceeding 1,000 volts alternating (a.c) or 1,500 volts direct current (d.c).

**Low Voltage Access Authority (LVAA)**

A pre-printed form which, when issued in accordance with a documented procedure adopted by the employer, gives permission to the holder and work party to work on or near, or test, electrical apparatus (usually associated with network LV only isolations) where an Access Authority is not required.

**LV auto isolation**

Control system at a source of LV supply, designed to automatically isolate and remain isolated whilst the Network element to which it is connected is de-energised. (Customer installed Low Voltage generation systems with active anti-islanding protection in accordance with Australian Standards are deemed to achieve LV Auto Isolation.)

**LV protective bonds**

Approved bonds which short circuit all phase and neutral conductors when required under these Rules.

**Mains (Network Mains)**

Conductors, including cables and earthing conductors, owned or leased by Endeavour Energy and forming part of the network, but not including control, protection, communications, or other secondary system conductors.

**Megger**

To carry out an insulation test, or continuity test on electrical apparatus using an insulation tester. (Note: 'Megger' is a commonly used term which is also a commercial brand name.)

**Mobile plant**

cranes, elevating work platforms, tip trucks or similar plant, any equipment fitted with a jig or boom and any device capable of raising or lowering a load.

**Near (on or near)**

A situation where there is a reasonable possibility of a person, either directly or through any conducting medium, coming within the relevant safe approach distances specified in these Rules in Table A.

**Network**

All of the electrical apparatus used in the supply of electricity. The terminology adopted to describe the various elements of the network includes:

- Transmission Network - All electrical apparatus operating at nominal voltages of 33,000 volts a.c and above.
- High Voltage Distribution Network - All electrical apparatus operating at nominal voltages above 1,000 volts a.c and less than 33,000 volts a.c.
- Low Voltage Distribution Network - All electrical apparatus operating at nominal voltages between extra low voltage and 1,000 volts a.c.

**Network operator**

For the purpose of these Rules and the network to which they apply, Endeavour Energy is the network operator.

**Neutral conductor**

The conductor of a low voltage system which is earthed at its origin.

**New or Disconnected Apparatus form (NODA)**

A form which, when issued in accordance with a documented procedure approved by the Network operator, gives permission to workers to work on or near, or test, disconnected apparatus where an Access Authority or LVAA is not required.

**Observer / Safety Observer**

Is a worker whose sole duty is to observe the work that is in progress and to ensure that work is carried out in accordance with approved procedures and these Rules. A safety observer may carry out the duties of a nominated rescuer if competent to do so.

**Operational earths**

Earthing and short circuiting equipment applied to electrical apparatus to satisfy the requirements for the issuing of an Access Authority, as distinct from working earths. Operational earths may only be applied or removed, with the approval of the System Operator.

**Operating Agreement**

A written agreement on which an undertaking is given by an authorised person for a network operator or other organisation, that the electrical apparatus specified will remain isolated and/or earthed until the written agreement has been cancelled. The document is used in cases where the Network Operator or organisation concerned is undertaking switching operations for the other party. (An Operating Agreement is not an Access Authority.)

**Operating work**

Work involving the following:

- operation of switching devices, links, fuses, or other connections intended for removal or replacement;

- locking and tagging electrical apparatus;
- proving electrical conductors de-energised, earthed, and short-circuited;
- issuing of Access Authorities and Operating Agreements; and
- the application of a procedure endorsed by the Electrical Safety Committee, in the use of approved testing equipment for commissioning activities where Access Authority for Test conditions cannot be met.

### **Ordinary person**

A person without sufficient training or experience to enable them to avoid the dangers which electrical apparatus may create.

### **Overhead line**

An aerial conductor together with insulators, hardware, cross arms or other associated electrical equipment erected or in the course of erection out of doors for the purpose of supplying electricity. It does not include any pole or support located within a fence surrounding an electrical station.

### **Personal issue**

Means the issue of an Access Authority where there must be direct instruction by the Issuer to the Holder during the issuing process.

### **Phasing/phased**

A test to determine whether energised conductors may be satisfactorily connected together.

### **Qualified**

A worker who is trained and competent to use appropriate skills to complete a given task. (**Electrically qualified** means: a worker who is trained and competent in an electrical trade or profession such as a linesman, electrical fitter/mechanic, cable joiner, electrical engineer or engineering officer, system electrician, distribution powerline or other electrically qualified person.)

### **Rescuer / Nominated rescuer**

A worker, competent to carry out the appropriate rescue and resuscitation in constant communication with the work party and located such that no delay in carrying out a required rescue will occur. Specifically the rescuer must be at the work site where the rescue would be required.

### **Screens (screened)**

A barrier of either insulating material or conductive material fitted with an earthing bond suitable for connection to earth medium.

### **Spiking**

Driving a metal spike into a screened cable ensuring that at least one core of the cable is connected to the metal sheath or screen using approved cable spiking equipment.

### **SWER**

The single wire earth return system.

### **Switching folder**

A printed envelope which documents all Access Authorities for Work or Test, Operating Agreements or LVAA forms issued and cancelled and associated conditions for the associated work site including the connection of earthing apparatus. Access Authorities, hazard

assessments and all switching instructions shall be stored in the folder. All associated paperwork shall be returned to the folder and the folder returned for filing.

### **Switching station/switch yard**

Any premises or structure containing or carrying electrical apparatus, but does not include any structure carrying only one switch and/or fuse unit (such as an air break switch).

### **System Operator**

The authorised person responsible for the operation of all or a designated part of the electrical network.

### **Totally enclosed electrical apparatus**

Electrical apparatus in which the conductors are totally enclosed within it and which can only be exposed by unbolting or unlocking covers or shutters which prevent normal access. High voltage insulated cables with metallic earthed screens shall be regarded as totally enclosed apparatus.

### **Vehicle**

A truck (non-tipping), car utility or other general purpose conveyance used for the carriage of persons or goods.

### **Voltage**

Potential difference between conductors and between conductors and earth.

### **Warning tag**

A tag affixed to apparatus giving a warning against the operation of the apparatus due to defect, change of normal condition or operation, or unusual situation.

### **Work area/site**

A location at which work is to be performed. Under Access Authority conditions the Access Authority defines the work site. Where live line work is within a work site, it takes precedent over all other work.

### **Worker**

A person is a worker if the person carries out work in any capacity for a person conducting a business or undertaking, including work as:

- (a) an employee; or
- (b) a contractor or subcontractor; or
- (c) an employee of a contractor or subcontractor; or
- (d) an employee of a labour hire company who has been assigned to work in the person's business or undertaking; or
- (e) an outworker, ie, a person who performs work for an employer at their own home or at another location that is separate from their employer's factory, workshop, office or worksite; or
- (f) an apprentice or trainee; or
- (g) a student gaining work experience; or
- (h) a volunteer.

### **Working earths**

Earthing and short circuiting equipment erected, in addition to operational earths, to fulfil the requirements of these Rules.

## 5.0 NOT USED

Reserved for future use.

## 6.0 GENERAL

### Basic Safety Principles

***ALL ELECTRICAL APPARATUS SHALL BE REGARDED AS LIVE  
UNTIL PROVED DE-ENERGISED.  
Contact with live electrical apparatus will cause severe injury or death.***

***In all cases of electric shock or suspected electric shock the victim shall immediately be transported to hospital or medical centre for treatment.  
All cases of electric shock or suspected electric shock shall be reported as required by Company Procedure (Health & Safety) GSY 0051 – Health, Safety and Environment Incident Management.***

***Hazard and risk assessments shall be carried out for all types of work performed under these Rules.***

### 6.1 Training and qualifications

#### 6.1.1 Employer responsibility

The employer shall ensure that appropriate training courses and assessments have been undertaken for the respective workers so that they can carry out the required tasks safely and competently.

#### 6.1.2 Worker responsibility

A worker shall not carry out work on or near the network unless the worker has been authorised to carry out the specified function. Authorisation requires that the worker:

- has received training which is appropriate for the type of work concerned; and
- is capable to safely perform the work required to be undertaken; and
- has demonstrated competency of the relevant work procedures and safety instructions; and
- has, during the previous 12 months, received appropriate instruction in the following procedures that are relevant to the nature of the work:
  - resuscitation;
  - releasing a person from live electrical apparatus;
  - rescuing a person from a pole, structure or elevating work platform; and
  - rescuing a person from a confined space.

All persons required to work in construction areas must hold a **SafeWork NSW 'General Construction Induction'** card. Visitors to construction areas shall be inducted into the site and supervised.

## 6.2 Reporting of electrical incidents/accidents

**All electrical incidents and accidents shall be reported as required by Company Procedure (Health & Safety) GSY 0051 – Health, Safety and Environment Incident Management.**

## 6.3 Reporting hazardous electrical situations

All hazardous electrical situations shall be guarded until made safe and shall be reported as soon as possible to the System Operator.

Any person observing someone committing a breach of these Rules shall warn them of the hazard involved and then report the matter to the person's supervisor or their own manager or supervisor.

## 6.4 Safe approach distances

### 6.4.1 Safe approach distances for Authorised Persons and Instructed Persons

Persons shall not allow any portion of their bodies or any object which they are in contact with (except when using approved equipment for testing, operating or working on live electrical apparatus) to come within the safe approach distances of live exposed electrical apparatus shown in Table A.

**Table A – Safe Approach Distances for Authorised Persons and Instructed Persons**

Nominal Voltage (a.c volts)	Safe Approach Distance (mm)	
	Authorised Person	Instructed Person
Up to and including 1,000	500	1000
Above 1,000 up to and including 22,000	700	1200
Above 22,000 up to and including 66,000	1000	1500
Above 66,000 up to and including 132,000	1500	2000
Above 132,000 up to and including 220,000	2500	3000
Above 220,000 up to and including 330,000	3000	3500
Above 330,000	4000	4500

### 6.4.2 Safe approach distances for ordinary persons

Ordinary persons shall maintain the safe approach distances given below in Table B.

**Table B – Safe Approach Distances for Ordinary Persons**

Nominal Voltage (a.c volts)	Minimum safe approach distance
Up to and including 132,000	3.0 metres
Above 132,000 up to and including 330,000	6.0 metres
Above 330,000	8.0 metres

#### 6.4.3 *Safe approach distances for persons operating plant in close proximity to electrical apparatus*

The operation of plant in the proximity of live overhead lines (which includes cranes and elevating work platforms) is governed by the WHS Act 2011, the WHS Regulation 2017 and associated Codes of Practice.

When loading or unloading equipment using plant, great care shall be taken to ensure that no part of it, or its load, comes within the safe approach distance relevant to the voltage concerned. The safe approach distance for plant operated by workers who have not been authorised is given in Table B above. For plant operated by authorised persons, safe approach distances given in Table A above can apply.

The authorised operator is responsible for ensuring there is a safety observer in place at all times during plant operation within the approach distance provided in Table B. The safety observer shall:

- be authorised to observe plant operating near overhead electrical apparatus; and
- while the plant is in motion, only have the duty to observe the operation of the plant; and
- only observe one item of plant at any one time.

The safety observer working with an EWP must be competent to carry out the role of nominated rescuer, and be familiar with the emergency procedures for the EWP they are observing. Under emergency conditions, the safety observer may operate the plant for the purpose of rescue without another observer being required.

Workers shall not be in contact with any part of the plant and the ground or earthed situation during the period the plant is being operated within the safe approach distance given in Table B above. The authorised operator may operate the controls of the plant while standing on the ground or while in contact with an earthed situation only if one or more of the following provisions are complied with:

- the controls are effectively insulated for the nominal voltage of the conductors near the plant;
- for plant operating near low voltage apparatus only, the operator wears low voltage insulating gloves and approved leather outer gloves on each hand;
- the operator stands on an equipotential metallic mat which is electrically connected to all metalwork associated with the controls; or
- radio or similar controls with no physical connection to the plant are being utilised and the operator is located further from the plant than the distances specified in Table A above.

Note that any plant, including the controls, or any load carried or moved by the plant, or any tools, may be considered to be insulated only if they comply with the insulation requirements of a relevant Australian Standard, is appropriately labelled, and the test certificate is in date. The insulated portions of the plant shall be clearly identified by appropriate markings and/or labels.

The plant must bear the notices depicted in the WorkCover Code of Practice for Work Near Overhead Power Lines which must be visible to the operator at each set of controls.

#### 6.4.4 *Safe approach distances for scaffolding in close proximity to electrical apparatus*

When metal scaffolding or other portable metal structures are being erected, moved or used in electrical stations or elsewhere, the provisions of the AS 4576, 1995 and the Guide to

Scaffolders, shall be observed at all times. This requires a minimum clearance of four metres to be maintained, unless the electrical apparatus being worked on has been isolated, earthed and short-circuited, and an Access Authority has been issued.

Scaffolding that is closer than four (4) metres to any exposed live electrical apparatus in an electrical station shall be earthed by a trailing earth, capable of carrying the maximum prospective fault current, to the electrical station earth grid.

#### *6.4.5 Safe approach distances for excavation near underground cables*

Prior to commencing any excavation work, a search shall be conducted to identify and locate any underground cables that may be in the vicinity of the excavation. For planned work, this includes contacting the Dial Before You Dig service (phone 1100, or [www.1100.com.au](http://www.1100.com.au)) and reviewing network asset information where available.

Underground cables in the work area shall be exposed by hand or other approved non-destructive excavation techniques to confirm their position.

For an unauthorised excavator operator, powered excavation shall not be carried out closer than 600mm to underground cables. This distance can be reduced to 300mm if it is known that only low voltage cables are in the area, such as underground service cables.

Powered excavation may be used to expose the hard cover or to 150mm above the cable if:

- the machine operator is authorised to excavate near the network; and
- they operate under the constant direction of a person authorised to observe excavation work.

The cable can be exposed for the length of the excavation by manually removing the hardcover and additional soil or sand. Once exposed, mechanical excavation may then be carried out to 75mm beside the cable by an authorised operator under the constant direction of an authorised observer.

If a cable is known or suspected to have been damaged during excavation, it shall be:

- regarded as live; and
- guarded from a safe approach distance of eight (8) metres by a responsible person once found; and
- remain guarded (unless extreme circumstances exist) until made safe or repaired in accordance with these Rules.

#### *6.4.6 Absolute limits of approach to live exposed conductors*

An authorised switching officer or high voltage test technician using an insulating stick, approved high voltage test equipment, or approved earthing equipment, may reduce the safe approach distance to the absolute limits of approach in table C below.

Under no circumstances may a worker come closer to live exposed conductors than the distances in Table C unless approved high voltage live work techniques are used.



**Table C – Absolute Limits of Approach to Live Exposed Conductors**

<b>Nominal Voltage (a.c volts)</b>	<b>Absolute Limit of Approach (mm)</b>
Above 1,000 up to and including 22,000	300
Above 22,000 up to and including 33,000	400
Above 33,000 up to and including 66,000	700

**6.5 Deleted**

**6.6 Communication**

Persons communicating with a System Operator via a radio or telephone shall identify themselves and should state the place from where they are speaking. The person transmitting the message is responsible for ensuring it is received correctly. **Operating messages shall be repeated by the receiver to the sender for confirmation.**

Facilities for emergency communications shall be available at all work sites. All workers normally on site shall be aware of and be instructed in the correct use of these facilities.

**6.7 Emergency conditions**

During an emergency the System Operator may request any competent person to carry out work that may, in the opinion of the System Operator, be necessary to make the network safe.

**Under emergency conditions, to save life or protect property:**

- **switching may be carried out by any competent person; and**
- **the System Operator shall be notified as soon as possible after such emergency operations; and**
- **the switch shall not be operated again without the System Operator's approval.**

**Note: Where risk to human life exists high voltage electrical apparatus shall be isolated, earthed and short circuited as required by these Rules. Rescue may then be carried out without the issue of an Access Authority under the immediate supervision or direction of the isolating officer.**

**6.8 Fallen conductors**

All fallen conductors shall be:

- regarded as live; and
- guarded from a safe approach distance of eight (8) metres by a responsible person once found; and
- remain guarded (unless extreme circumstances exist) until made safe or repaired in accordance with these Rules.

**There may be high or low voltage conductors down or both and these may be intermixed. Precautions shall be taken to manage any risks from step and touch potentials.**

The fallen conductors shall be identified by an authorised person.

Further requirements for managing fallen conductors can be found in Division Procedure (Network) GNV 1058 - Fallen Conductors.

### 6.8.1 *Making safe fallen low voltage conductors*

Fallen **low voltage** conductors shall be made safe by being isolated and danger tagged at all points of network supply, or being made disconnected apparatus. Alternatively, where the integrity of the insulation has been assessed and it has been confirmed that it is safe to do so, insulated or covered service mains may be rolled up and secured at least 3.5m high so as to be out of reach of the public in accordance with GNV 1058 – Fallen Conductors. If there is any doubt about the insulation integrity, the fallen low voltage conductors shall be isolated or disconnected.

Live working techniques shall be used when work is not being carried out under LVAA conditions in accordance with 7.1.2 of these rules.

A Warning Tag shall be applied to the adjacent structures advising of the actions taken.

The dispatcher shall be advised of all action taken.

**When proving low voltage fallen conductors de-energised using a contact tester, a temporary earth stake shall be used, driven into the ground at least 1.5 m away from any fallen conductors.**

### 6.8.2 *Making safe fallen high voltage conductors*

Fallen **high voltage** conductors shall be managed as follows:

- treat the fallen conductors as live; and
- under instructions from the System Operator, isolate and Danger Tag the points of isolation; and
- prove de-energised by approved means; and
- earth and short circuit in accordance with approved procedures.

Alternatively, following proving de-energised, the fallen conductors may be made safe using live line cutters by an authorised person in accordance with approved procedures.

An Access Authority shall be issued before any work is carried out on the fallen conductors, including relocation, in accordance with these rules.

The System Operator shall be advised of all action taken.

## **6.9 Safety equipment**

### 6.9.1 *Duty of personnel regarding safety equipment*

It is the duty of every person working on or near electrical apparatus:

- to use only safety equipment approved by the employer; and
- to use in a proper manner the safety equipment provided for its intended purpose; and
- to satisfy themselves that safety equipment is in good condition and working order prior to use; and
- to maintain and care for safety equipment.

Before use, all safety equipment shall be examined by the worker. If found to be defective, damaged or beyond the required test dates:

- it shall not be used; and
- it shall be identified as defective with a Warning Tag; and
- the worker's supervisor shall be informed, as soon as practicable, so that a replacement for such equipment can be arranged.

### 6.9.2 Protective Clothing

This clause is specific to protective clothing requirements for work covered under these rules and is exclusive of any additional general safety PPE requirements.

All workers shall wear protective clothing when undertaking any activity on or near the network within the scope of these rules. Specifically, protective clothing is required to be worn by a worker when:

- Carrying out electrical operating work, unless operating remotely;
- Working or testing on or near live electrical apparatus;
- Working on or testing earthing conductors;
- Operating or observing plant on or near live electrical apparatus;
- Carrying out the role of a nominated rescuer for work on or near the network;
- Signed on to an Access Authority or **Low Voltage Access Authority**; or
- Identified on the Worksite Hazard and Risk Assessment or Site Safety Management Plan.

The minimum protective clothing worn within the scope of these rules shall:

- cover the body from neck to wrist to ankle. Shirt, coat or jacket, and/or overalls shall be fastened at both wrist and neck area;
- be arc rated and flame retardant, with a minimum arc rating of 4 cal/cm<sup>2</sup>;
- be worn such that shirts must be tucked into trousers and sleeves must be rolled down and fastened to protect against entanglement and arc flash injury;
- have non-metallic fasteners or have fasteners protected by a layer of the same material as that of the garment on both the top and undersides; and
- be maintained in accordance with the manufacturer's instruction.

When applied to arc rated flame retardant clothing, retroreflective material shall be flame retardant.

Wet weather clothing and cold weather clothing worn when working on or near the network should comply with the requirements above. Where it does not comply, it shall be worn over at least one layer of protective clothing described above.

Additionally, approved safety footwear shall be in good condition and worn for all work on or near electrical apparatus.

People visiting site performing administrative or observation-type activities where there is no reasonable possibility of coming on or near live electrical apparatus are excluded from this requirement however are required to wear long sleeved shirt, long trousers and flat, enclosed footwear.

All clothing and materials are to be regarded as conductive unless there is definite knowledge to the contrary.

The wearing or carrying of personal metal effects such as keys, metal banded watches, bracelets, metal belts, clothing with metal thread woven into it, metal zips, cigarette cases, small pocket tools, ear rings, body piercing, necklaces, rings, mobile phones, etc., constitute a danger when working on or near live electrical apparatus. Such effects shall be removed from the person to minimise the risk of injury. A particular danger is metal objects falling from pockets.

Long hair must be secured against becoming caught in machinery or equipment.

Clothing and safety footwear shall be in good order and repair. Clothing shall have no holes, missing or broken buttons, fasteners or zips.

### 6.9.3 *Helmets*

Only approved helmets shall be used.

Before use, helmets shall be inspected for any signs of deterioration. Helmets shall not be modified in any way. Approved stickers or labels designed for the purpose are acceptable.

Damaged helmets shall be discarded and replaced.

Under no circumstances should a hard hat be worn over any headwear such as a sun hat, cap, or beanie, unless specifically approved for this purpose. These items present a fire risk, and reduce the effectiveness of the helmet's internal webbing and protective structure that is designed so that the helmet is a snug fit around the wearer's head.

Helmets shall only be cleaned with soap and water or mild household detergent.

Helmets are required to be worn in the following situations:

- In outdoor areas of electrical stations, and within cable basements;
- When working or testing on or near any live electrical apparatus (excluding tunnel boards, control panels or meter boards where the helmet would unduly restrict vision or reduce the wearer's ability to move within a small space);
- When carrying out electrical operating work (unless operating remotely or where the helmet would reduce the wearer's ability to move within a small space);
- When working in an area where cranes or plant, including elevating work platforms are operating;
- When mechanical lifting/cable pulling is taking place within operating reach of the crane or plant; or
- Where there is a risk of being struck by falling objects.

### 6.9.4 *Harnesses*

Only approved harnesses shall be used.

- Any person working in an elevated position where a fall is possible, including all work in elevating work platforms shall use an approved harness and lanyard.
- Before trusting their weight to the harness and lanyard, persons shall ensure that all fastenings are properly engaged.
- Before use, harnesses and lanyards shall be inspected for any visible failure, malfunction or deterioration.

### 6.9.5 *Low voltage insulating gloves*

Only approved low voltage insulating gloves and approved leather outer gloves shall be used.

- When working or testing on or near live low voltage electrical apparatus that is not adequately screened or insulated, approved low voltage insulating gloves and approved leather outer gloves shall be worn on each hand.
- This requirement extends to working on or testing distribution substation earthing systems.

- Where there is a risk of exposure to transferred or step and touch potential, approved low voltage insulating gloves and approved leather outer gloves shall be worn on each hand.
- Approved low voltage insulating gloves and approved leather outer gloves shall be worn on each hand when operating Air Break Switches and metal clad switchgear on the Distribution Network except where suitably rated operating equipment is used.
- Approved low voltage insulating gloves and approved leather outer gloves shall be worn on each hand when operating low voltage switchgear and fuses (including on customer's installations).
- Other types of gloves shall not be used for these purposes.

An exemption from these requirements may only be granted for work being undertaken in accordance with a procedure including a risk assessment, as approved by the **Electricity Network Safety Management System Committee**.

Before use, the insulating gloves shall be inspected for any damage, discolouration or perishing, and air leak tested for a period of not less than 20 seconds. Any glove that is not in optimum condition, eg, cracking, stickiness, discolouration, contact with chemicals or any other form of deterioration or damage shall be discarded.

Rings, watches and other jewellery shall not be worn on hands and wrists when wearing low voltage insulating gloves as they can cause mechanical damage and pose an electrical hazard.

Avoid mechanical damage to insulating gloves caused by abrasion and sharp edges. Replace approved outer gloves if there is any concern they may compromise the insulating properties when working live.

Insulating gloves shall be stored:

- in their natural shape, removed from outer protective gloves, in a cool, dark and dry place, inside a canvas or leather bag, or a box specifically designed for that purpose; and
- away from chemicals, direct heat, and out of direct sunlight.

Tools and equipment must not be stored in the same bag as insulating gloves.

If insulating gloves are to be cleaned, they are to be washed with mild soap and water, and allowed to dry before storing.

#### 6.9.6 *Eye protection*

Only approved eye protection shall be used. Eye protection is required to be worn in the following situations:

- In all situations posing a risk of injury to sight;
- When carrying out electrical operating work (unless operating remotely);
- When working or testing on or near live electrical apparatus, including inside tunnel boards and control panels, and during all Live Line Work.

#### 6.9.7 *Low voltage detectors*

Only approved low voltage detectors shall be used.

- Before every use, each detector must be proved for correct operation using either a source of low voltage supply (another in service conductor) or an approved checking device supplied by the employer.
- The detector must be proved both immediately before and after any no indication result.

- Detectors should also be inspected for any signs of damage, cracks in insulation or other defects before every use.
- Detectors shall not be modified in any way

#### 6.9.8 *Low voltage indicating devices (volt sticks)*

Only approved low voltage indicating devices shall be used.

- Low voltage indicating devices shall not be used for proving de-energised. They provide an indication only.
- It is the worker's responsibility to carry out suitable tests and checks prior to working on any low voltage electrical apparatus.

#### 6.9.9 *Ladders*

Only approved ladders such as timber or fibreglass shall be used for work on or near electrical apparatus.

- Persons shall satisfy themselves that the ladder is in a safe condition before trusting their weight to it.
- The ladder shall always be erected so that the head fitting or metal bucket is properly engaged and the ladder shall be so placed that the distance between the foot of the ladder and the pole or structure measured horizontally is approximately one quarter of the extended length of the ladder.

In addition, the following precautions must be complied with:

- the ladder shall, where ever possible, be lashed top and bottom, (the bottom lashing shall have a red or orange flag attached to make it easily seen); or
- if it is not practicable to lash the ladder at the top or bottom it shall be supported by another worker, or alternative safety measures taken such as the use of an EWP or the installation of scaffolding.

When using ladders near exposed live electrical apparatus extra precautions may need to be taken. Ladders shall not be brought within the minimum safe working distances to exposed high voltage electrical apparatus.

#### 6.9.10 *Portable pole platforms*

Only approved pole platforms shall be used.

- Before a platform is used it shall be examined for any visible damage, distortion or deterioration.
- Defective or damaged pole platforms shall not be used, shall be fitted with a Warning Tag and returned for replacement.
- The platform must be marked with the designed load limits (which shall not be exceeded).

#### 6.9.11 *Tool Bags*

Only approved tool bags shall be used.

- A person working in an elevated position shall take care to avoid dropping tools and material.

- They shall keep all small tools and small material not in use in the tool bag provided or in an approved pouch. (Small tools and small material shall not be thrown to or from the person elevated, but shall be raised or lowered by means of the tool bag attached to a hand-line or by approved hook attached to a hand line.)
- Each time before use, tool bags shall be inspected to ensure they are in good order and repair and the handle(s) are firmly attached to the bag.

#### 6.9.12 *Temporary low voltage covers and insulating material*

Authorised persons shall use approved covers, tubes, or mats made of insulating material when working near exposed low voltage conductors which are live or could become live.

Covers and/or tubes used for this purpose shall only be used to prevent inadvertent personal contact with electrical apparatus at a different potential.

When covers and/or tubes are used to cover conductors, they shall be securely fixed to prevent displacement.

**For the purpose of this Clause the neutral, street light conductor and Broad Band Communication Cable (BBCC) and catenaries, if involved shall be regarded as a conductor and shall be covered.**

Covers, tubes, and mats used to prevent inadvertent personal contact with low voltage apparatus shall be electrically tested on acceptance, routinely inspected every six months and visually inspected prior to every use.

Covers, tubes, and mats that are relied upon for low voltage insulation shall be electrically tested in accordance with the relevant Australian Standard every six months and inspected for damage prior to every use.

Covers and/or tubes shall be intact and shall not be modified in any way. Damaged or defective covers and/or tubes shall be removed from service and discarded or Warning tagged until repaired.

**When used in general public environment such as crane or plant operation or construction work, covers or tubes shall only be used for visual indication of the location of the electrical apparatus and the external groups shall be advised to maintain minimum safe approach distances for the voltage concerned.**

#### 6.9.13 *Screens/barriers*

Only approved screens/barriers shall be used.

- Temporary insulating screens for use near live high voltage electrical apparatus shall be tested every 6 months, and be inspected, clean, dry and in good condition at time of use.
- Screens and barriers shall only be installed using an approved method.

#### 6.9.14 *Rescue kits*

Only approved rescue kits shall be used.

An approved rescue kit shall always be available at the worksite. The kit shall be deployed and ready for immediate use when workers are attended by a nominated rescuer. Rescue kits (see Table D) shall also be available when workers enter confined spaces. Table D shows the appropriate rescue kits to be used.

**Table D – Rescue Kit Requirements**

WORK ON	TYPE OF RESCUE KIT
A pole using a ladder or platform	Pole rescue kit
Elevated work platform	Controlled descent device (A Ground Operator shall also be present)
Low voltage apparatus	Low voltage/Substation rescue kit
Towers	Tower rescue kit
Power transformer and scaffolding	Power Transformer rescue kit
Confined spaces	Confined space rescue kit - A vertical rescue - B horizontal rescue

Where a person is working on or near overhead electrical apparatus from a ladder or pole platform, the rescue kit shall be located near the foot of the ladder.

The contents of rescue kits shall be examined prior to each days use.

After a kit has been used for a rescue all of its items shall be inspected to ensure it is in good condition. The natural fibre rope life line shall be discarded and replaced by a new one.

**The requirement for a new rope does not apply to simulated or practice rescues.  
A practice rope shall not be used for an in service kit.**

Rescue kits should be stored in a dry place, preferably out of direct sunlight.

A rescue kit shall not be used for any other purpose.

*6.9.15 First aid kits*

Only approved first aid kits shall be used.

- First aid kits shall be readily available for the treatment of minor injuries.
- Any items used out of a first aid kit shall be replaced as soon as possible.
- Every kit shall contain a Contents List, allowing the contents to be checked against the list.
- Kits shall be carried in vehicles and shall be stowed in places where they can be easily reached. First aid kits shall be regularly inspected.



### **6.10 Controlled descent device**

Only approved controlled descent devices shall be fitted to elevating work platforms.

- Elevating work platforms used for work shall be fitted with a controlled-descent device for every occupant of the basket or bucket.
- Controlled descent devices (anchor point, lanyard, descender link and rope) shall be inspected prior to each days use. Any defective or suspect controlled descent device must be replaced before the EWP is used.
- Controlled descent devices, ropes and snap hooks for controlled descent systems shall be kept in clean and dry conditions and ready for immediate use.

### **6.11 Operating equipment and live line working equipment**

Only approved operating equipment and live line working equipment shall be used.

- Operating equipment and live line working equipment and indicating devices shall be kept in a dry clean place and stored on the supports where provided.
- Care shall be taken in handling operating equipment and live line working equipment so the surface will not be damaged.
- Any operating equipment and live line working equipment which is cracked or damaged in any way shall be replaced.
- Before use, operating equipment and live line working equipment should be cleaned and wiped thoroughly with a silicon cleaning cloth.
- Operating equipment and live line working equipment and live line indicating devices shall be marked with the voltage for which they are suitable and shall not be used for higher voltages.
- Operating equipment and live line working equipment and live line indicating devices shall be marked with a current test date and due test date.
- Operating equipment and live line working equipment and live line indicating devices shall only be used for their designed purpose.

### **6.12 Height measuring rods**

Only approved height measuring rods shall be used.

- Height measuring rods shall not be used above their rated voltage as indicated on their test sticker.
- Height measuring rods shall be marked with a current test date and due test date.
- Workers shall be trained in approved procedures prior to use of height measuring rods.
- Before use, height measuring rods should be cleaned and wiped thoroughly with a silicon cleaning cloth.

Note: Height measuring rods shall only be used for their designed purpose.

### **6.13 Water spray equipment**

Only approved water spray equipment shall be used.

- Work utilising specially designed water spray equipment shall not be regarded as work on or near exposed high voltage conductors provided that approved work methods are applied by trained and authorised workers.

- The System Operator shall be advised prior to commencing any such live insulator washing.

#### **6.14 Insulated low voltage tools**

Only approved insulated tools shall be used for work on live low voltage electrical apparatus.

- All insulated tools shall be:
  - checked for any signs of damage to or deterioration of the insulation before each use; and
  - tested and marked with a current test date, due test date and maximum voltage application.
- Low voltage insulated tools are intended for use on live low voltage equipment without additional precautions such as the wearing of insulating gloves. However, insulating gloves shall be worn where there is a possibility of any contact with live conductors/terminals.
- In damp conditions the level of the insulation may be reduced and insulating gloves should be worn. Tools which are covered or which are not clearly marked with an insulation voltage level shall not be used for live work unless approved insulating gloves are worn.
- Insulated tools shall be stored and handled carefully so that the insulation is protected from damage.

#### **6.15 Portable electrical equipment**

- Portable electrical equipment or tools which have suffered physical damage or which they consider to be unsafe shall not be used. They shall be Warning Tagged and repaired or replaced.
- All portable electrical equipment and tools shall be regularly examined and maintained to ensure that the equipment is in good order and labelled as required by AS/NZS 3012: Electrical installations – construction and demolition sites.

#### **6.16 Warning signs**

Only approved warning signs, barriers, guards, plates, warning lights, etc. shall be used as required where hazards exist to workers or the public.

#### **6.17 Conductive materials**

All materials, (not tested and rated with an insulation value for the voltage concerned) including liquids and gases shall be regarded as conducting unless there is definite knowledge to the contrary. In particular, it should be noted that:

- earth, concrete, branches and wet or damp timber are conducting materials;
- flame conducts electricity and care shall be exercised when using flame producing equipment;
- equipment such as metal ladders, wire reinforced ladders, steel tapes, metal reinforced tapes or rulers, shall not be used on or near live exposed conductors. Metal objects, such as radio telephone units with telescopic aerials, torches and the like shall be handled with care when working in the vicinity of live exposed conductors;
- the medium of certain fire extinguishers is conductive. Only fire extinguishers conforming to Class (E), as specified in AS 2444 - Portable Fire Extinguishers Selection and Location, may be used for fire fighting on energised low voltage electrical apparatus.

When using a fire extinguisher near high voltage equipment care shall be taken to maintain the minimum safe working distances, until the equipment has been isolated and earthed; and

- vehicle tyres, although made of rubber, contain a high percentage of carbon and other conducting materials, and therefore shall not be regarded as insulators of electricity.

### 6.18 Working on or accessing poles or structures

Before coming into contact with a pole or structure, every person shall make their own inspection including a test for the presence of a hazardous voltage in accordance with approved procedures. No person shall climb a pole or structure which:

- has visible deterioration due to decay, is visibly cracked or split to a degree which may cause such a pole or structure to collapse; or
- has been identified as a suspect pole by a Pole Inspector, unless it has been effectively secured.

Additionally:

- a pole or structure which has been confirmed to have a voltage difference to the general mass of earth above extra low voltage shall be treated as energised apparatus;
- where poles are fitted with pole steps, workers shall make sure of the firmness of each step before trusting their weight upon it;
- particular care shall be taken with poles or structures where loading conditions are to be significantly changed, e.g. made free-standing, or the tension in one direction decreased or increased, such as where conductors are cut away or newly erected;
- no person shall join two ladders together to climb a pole or structure; and
- except for an emergency involving danger to human life, no person shall remove a ladder from a pole while a person is aloft. Any ladder which is removed shall be replaced as soon as possible.

### 6.19 Identification of electrical apparatus

Electrical apparatus shall be identified by an approved means.

- No electrical apparatus shall be commissioned unless appropriate labelling for identification is permanently affixed.
- All labels shall be clear and permanent and shall be updated should the identity of the electrical apparatus be changed.
- All records of electrical apparatus shall be amended in accordance with any network change.

### 6.20 Tags

Only approved Tags shall be used.

#### 6.20.1 Danger tags

##### 6.20.1.1 Use of danger tags

A Danger Tag is a label on which the words **DANGER - DO NOT OPERATE** is boldly marked. It provides a warning against inadvertent or unauthorised operation of electrical apparatus. Danger Tags installed for long periods of time shall be checked at least every 7 days and be replaced if deteriorated or faded.

A Danger Tag shall:

- be associated with an Access Authority or an LVAA on isolated electrical apparatus;

- be applied or removed at the direction of the System Operator where associated with the high voltage network (which includes low voltage isolations for the issue of an Access Authority);
- be applied to all isolation points by a person authorised to operate the isolation point prior to the issue of an Access Authority or LVAA;
- be affixed to all points of isolation (including their remote controls), using yellow tape or other approved method, to which the Access Authority or LVAA applies;
- be attached to any electrical apparatus, which by operational work, provides continuity between electrical apparatus and the associated earthing equipment;
- be installed so as to be visible to a person attempting to operate the electrical apparatus; and
- in public places, be installed either out of the reach of the public or to ensure they cannot be inadvertently removed in accordance with approved procedures.

**No person shall operate a device to which a Danger Tag is attached for Access Authority purposes, unless directed by the System Operator.**

**Danger Tags shall be used at all isolation points for high voltage, low voltage, mechanical or pneumatic apparatus.**

#### 6.20.1.2 Danger tags for high voltage application:

When applied under the direction of the System Operator the Danger Tag will be noted with:

- the Disconnection and Reconnection Instruction number or the name of the System Operator requesting the attachment of the tag;
- the 'Work/Test' tick box ticked;
- the identification number or description of the isolation point;
- the name of the person attaching the tag;
- their associated depot; and
- the date of application of the tag.

#### 6.20.1.3 Removal of danger tags attached for high voltage applications

A Danger Tag, installed under a Disconnection and Reconnection Instruction or at the direction of the System Operator, shall only be removed by an authorised person, at the direction of the System Operator.

#### 6.20.1.4 Danger tags for low voltage application

A Danger Tag attached for low voltage applications will be noted with:

- the work order, project number or the name of the person requesting the attachment of the tag;
- the 'LV/LVAA' tick box ticked;
- the identification number or description of the isolation point;
- the name of the person attaching the tag;
- their associated depot; and

- the date of application of the tag.

Note: where high voltage apparatus is required to be isolated for work (eg the opening of HV DOFs on a pole sub for work on low voltage apparatus), an Access Authority shall be issued in accordance with the requirements of these Rules;

#### 6.20.1.5 Removal of danger tags attached for low voltage applications

A Danger Tag attached to an isolation point associated with a Low Voltage Access Authority or Operating Agreement shall only be removed by an authorised switching officer once the need for the application of the tag no longer exists (ie the LVAA or OA has been cancelled).

**There may be multiple Danger Tags at an isolation point. Care must be exercised to remove the correct tag.**

#### 6.20.2 Warning tags

##### 6.20.2.1 Use of warning tags

A Warning Tag provides a warning that:

- the operation or use of plant, equipment or apparatus would be hazardous to persons; or
- the normal functioning or operation of the plant, equipment, device or electrical apparatus to which it is attached has been changed or is not normal. (Operation of the plant, equipment, device or apparatus may still be possible, but caution or restrictions may apply.)

Warning Tags should be used on any item of equipment or plant, which is defective, unserviceable or should not be operated.

Warning Tags must have all information provided on the tag to advise the user of the hazards. The details must be clear and obvious to anyone reading the tag.

Warning Tags should be attached to the operating devices, securing locks or access doors of apparatus in such a manner that is obvious to any person approaching that there are hazards or changes to the apparatus.

A Warning Tag shall be applied to auto-reclosing facilities made non-auto for the purpose of Live Line Work.

##### 6.20.2.2 Removal of warning tags

A Warning Tag may be removed by any person only when:

- the hazardous or unusual condition has been repaired; or
- the reason for its attachment no longer exists; or
- the item to which the tag was attached has been completely disconnected.

A Warning Tag shall not be removed from apparatus while the hazardous condition still exists.

#### 6.21 Area marking tapes

Only approved area marking tapes shall be used.

Yellow tape shall be used to define areas, as required, for work under Access Authority or LVAA.

Area marking tapes shall be installed in accordance with Division Procedure (Network) GNV 1068 - Application of yellow taped areas in zone and transmission substations.

#### 6.21.1 *Yellow Tape Barriers*

##### 6.21.1.1 Use of yellow tape barriers

Yellow tape barriers shall be used to define an area for work in association with the issue of an Access Authority or LVAA. Yellow tape barriers are used to indicate the dividing line between live electrical apparatus and the electrical apparatus which is under an Access Authority or under a LVAA.

Yellow tape barriers shall only:

- be used in conjunction with an Access Authority; or
- be used in conjunction with a LVAA; and
- be erected or altered by an authorised switching officer.

If covers allowing access to exposed conductors are to be removed, the taping is to be carried out in conjunction with the Access Authority Holder.

##### 6.21.1.2 Entrance to yellow tape area

Where yellow tape barriers are erected, an opening in the yellow tape shall form an entrance to the yellow tape area. The Switching Folder shall be placed at the yellow tape barrier entrance.

##### 6.21.1.3 Crossing or interfering with yellow tape barriers

**Persons working or testing in a yellow tape area shall not pass over, under or interfere with such tape.\***

\*This does not prevent temporarily disturbing the yellow tape barrier to permit the passage of plant or materials under the control of the Access Authority Holder. Precautions shall be taken to ensure that risks are controlled to prevent harm to personnel and or damage to plant or material. Such tape shall be replaced in its original position as soon as the necessary passage of plant or materials has been completed. Extreme care shall be taken to ensure that safe approach distances are maintained at all times during the period that the yellow tape has been disturbed.

##### 6.21.1.4 Removal of yellow tape barriers

Yellow tape barriers shall be removed by an authorised switching officer immediately after the associated Access Authority or LVAA have been cancelled. Yellow tape barriers shall not be left erected following the cancellation of an Access Authority or LVAA.

This does not include work continuing from day to day where Access Authorities are cancelled and reissued on a daily basis. Tape barriers shall be checked prior to the reissue of an Access Authority or LVAA.

## **6.22 Isolation of low voltage apparatus**

A LVAA shall be issued in accordance with clause 7.1.2 to allow work on low voltage network apparatus not subject to Access Authority conditions. A LVAA shall also be issued when carrying out isolation for contractors and ASPs in situations such as low voltage isolation of services for contractors and ASPs to perform work.

Specifically, a LVAA:

- gives clearance to access specific electrical apparatus to carry out work;
- records the isolation points operated to isolate the electrical apparatus;
- records the number and location of each set of LV Protective Bonds installed and removed (if applicable);
- is issued by an authorised low voltage switching officer;
- is received by an authorised LVAA holder on behalf of the work party;
- is signed on to by the work party before commencing work; and
- is surrendered by the LVAA holder prior to the restoration of supply to the isolated apparatus.

LV Protective Bonds shall not be removed until the LVAA has been surrendered or the apparatus to which they are connected has been disconnected from all Customer Installations.

The application of LVAA is described in detail in Company Procedure (Health & Safety) GSY 0091 – Low Voltage Access Authority and Company Form (Health & Safety) FSY 0215 – Low Voltage Access Authority.

The isolation of Non-network systems including non-network low voltage apparatus, low voltage apparatus contained within the boundary of an electrical station, and non-electrical sources of energy, may be managed in accordance with Company Procedure (Health & Safety) GSY 0093 – Non-network Systems.

## **6.23 General working procedures in electrical stations**

### *6.23.1 Entry into electrical stations*

A person shall not enter areas within an electrical station where there are live exposed conductors unless the person:

- is authorised to enter that area, and has normal duties which require entry to the area; or
- has been specifically instructed by a person authorised to enter the area and is supervised by a person authorised to enter the area; and
- has been clearly instructed, on the site, as to the limits of the areas that may be entered; the dangers existing; and the precautions that shall be observed.

In addition, the person shall:

- comply with any instructions concerning safety given by the accompanying authorised person; and
- be made aware of the dangers existing.

### *6.23.2 Securing of entrances*

Access ways giving entrance into electrical stations shall always be locked when not in use.

At all times precautions shall be taken to ensure that unauthorised persons are not able to gain access.

#### 6.23.3 *Checking of entrances and exits*

Appropriate entrances and exits shall be checked to ensure that they:

- allow free and unobstructed movement;
- can be opened and closed easily; and
- can provide safe exit for persons should the need arise.

#### 6.23.4 *Additional requirements for indoor, basement and underground electrical stations*

Inspections should be carried out to ensure that emergency exits are free of obstructions to provide the safe emergency exit intended.

Exit doors, intended for emergency use only, shall have suitable signs affixed on or adjacent such as Emergency Exit or Alarmed Emergency Exit to indicate their usage. The signs shall be fitted to both the inside and outside of the emergency exit.

#### 6.23.5 *Duties of persons on entry into electrical stations*

Persons entering electrical stations shall:

- (a) Advise of their entry directly in the substation entry database, or by telephone on the notify line (1300 133 780), and provide:
  - the name, service number and contact number (mobile phone) of the work site coordinator;
  - the number of persons entering;
  - the nature, and likely duration, of the work to be carried out;or if performing operating work, or work that may affect network integrity, notify the relevant System Operator of their access.
- (b) Read and understand any warning signs, labels or tags posted at the entrance to the station, as well as warning signs appropriate to the area being entered.
- (c) Note the locations of the following items:
  - warning signs instructions appropriate to the area being entered
  - telephone, if installed, (the operation of the telephone should be checked to ensure it is working correctly);
  - the medical emergency button (where fitted);
  - portable and fixed fire fighting appliances, (portable fire fighting appliances should not be used for any other purposes, such as holding doors open, etc.);
  - any rescue kits, fire blankets and deluge showers, if provided;
  - live exposed conductors, and any screening;
  - Access Authority taped areas; and
  - hazard barriers (e.g. trench barriers, pit fences).



#### 6.23.6 *Operating work in electrical stations*

When entering an electrical station for operating work, in addition to the requirements in Clause 6.23.5 (except for 6.23.5 (a)), the authorised person shall:

- notify the relevant area System Operator of their access;
- advise the area System Operator of any unusual conditions or other anomalies found in the substation;
- provide the area System Operator with the switching instruction number and step/s to be attended to at the electrical station;
- wait on permission from the area System Operator to proceed;
- advise the area System Operator on completion of the switching steps indicated;
- advise the area System Operator when leaving the electrical station; and
- secure all access doors and gates.

Operating work within electrical stations shall only be carried out by authorised persons using approved operating procedures and equipment with the permission of the System Operator.

Particular care is necessary when operating electrical apparatus which is power operated and has remote or automatic control, to ensure that the operating work can be carried out without risk to persons or plant. Circuit breakers, isolators, tap changers and air compressors are examples of such apparatus.

#### 6.23.7 *Accidentally tripped circuit breaker*

**Do Not Reclose the circuit breaker unless instructed by the System Operator.**

If a circuit breaker is accidentally tripped for any reason, notify the System Operator immediately.

#### 6.23.8 *Hazardous low voltage and mechanical apparatus isolations*

Equipment covered by an Access Authority which is capable of storing some form of energy, such as circuit breaker operating mechanisms, shall be fully discharged or otherwise rendered inoperative in an approved manner by the Holder. Alternatively, the Access Authority shall be endorsed in Section 4 Special Conditions noting the presence of hazardous energies and the responsibilities of the Access Authority Holder.

**In all cases it is the Access Authority Holders responsibility to manage any hazardous energy within the worksite.**

#### 6.23.9 *Earthing of electrical apparatus in electrical stations*

When working on apparatus in electrical stations, earthing shall be so arranged that a minimum of one set of earths is connected at all times to the apparatus on which work is being carried out. Where practicable, earthing and short circuiting shall be applied between all sources of supply and the worksite.

When applying earths within substations, care shall be taken to avoid earth loops through protection current transformers as this may cause unintended tripping. If earths must be placed

in such a way as to cause earth loops around current transformers, protection isolation must take place.

When working on CVTs (Capacitive Voltage Transformers) the secondary terminals (four of) are to be short circuited and earthed.

In the case of frequency injection cells, capacitors or inductors, the star point earth is to be applied first.

When using circuit breakers for indirect earthing the tripping mechanism shall be secured by a danger tag and electrical controls shall be checked to ensure that electrical tripping circuits are inoperative.

In the case of HV switchgear maintenance with all remote points earthed and short circuited, permanent earths need not be applied at the work site. The equipment however shall be proved de-energised and momentarily earthed in view of the Access Authority holder.

#### 6.23.10 *Work in electrical stations*

When working within electrical stations, sound workshop practices shall be adopted. In particular, the following aspects should be noted:

- doors, panels or covers enclosing live equipment shall be kept closed except when work is being performed inside that enclosure;
- protective devices or interlocks shall not be interfered with, bypassed or made inoperative. However, with the approval of the System Operator secondary protective devices may be made inoperative where alternative protective schemes allow.
- electrical stations shall not be used for the storage of material or equipment or parking of vehicles, except as approved by the General Manager **Operations** or **their** delegate;
- materials shall not be allowed to obstruct doorways, or passageways, hinder normal operations, work, or access to fire extinguishers, deluge showers, first aid kits where fitted, telephones, control switches or any operating equipment;
- long objects such as ladders, conduits and the like, shall be handled with great care near live exposed electrical apparatus. Whenever possible, long objects should be carried by two people, holding the objects below shoulder height in a horizontal position and as close as practical to the ends of the object, so as to maintain maximum control;
- extreme care shall be taken when using portable radio and telephone apparatus with protruding whip aerials in areas containing exposed live electrical apparatus. At all times, persons shall ensure that no parts of this apparatus come closer than the safe approach distances to live exposed electrical apparatus.

#### 6.23.11 *Operation of plant in electrical stations*

When operating plant or vehicles capable of exceeding 1.9 metres in height within electrical stations, the following requirements shall be applied:

- for vehicles that are driven off the defined station driveway, an observer is required to ensure that the vehicle does not approach within 3m of live electrical equipment;
- whenever mobile plant is driven within an electrical station, care shall be taken that all crane jibs, stabilisers etc are stowed in the travel position before driving; and
- when mobile plant is in use and is capable of coming within 6m of electrical apparatus in the confines of an electrical station, the mobile plant shall be fitted with an approved 70mm<sup>2</sup> copper or equivalent trailing earth cable connected to the earth grid of the

electrical station. The trailing earth cable must be capable of carrying the maximum prospective earth fault current in that station. For transmission substations or other locations where the fault level warrants it, 2 x 70mm<sup>2</sup> copper or equivalent conductors are required.

Additionally, an observer shall be appointed to observe the movement of the mobile plant and to give warning to the operator where the mobile plant may encroach within 6 metres of electrical apparatus.

When mobile plant is in use and the use involves the plant moving continuously between locations in the station (for example a Bobcat) an observer shall be appointed to observe the movement of the mobile plant and a means of active communications established between the observer and the operator to give warning to the operator where the mobile plant may encroach within 6 metres of electrical apparatus.

In this situation the requirement to use a trailing earth cable may be waived.

Excavation work within an electrical station shall not be commenced until the location of all underground cables, earthing conductors, ducts, etc in the vicinity of the proposed excavation have been positively identified.

#### *6.23.12 Rescue and resuscitation notices and emergency response information*

Within every electrical station, except for padmount and kiosk substations, instructions shall be displayed conspicuously for the:

- release of persons from live (low voltage) electrical apparatus;
- treatment of persons who have received injury from electric shock. These instructions shall include cardio-pulmonary resuscitation (CPR); and
- appropriate emergency response information.

#### *6.23.13 Fire protection systems*

When carrying out work within electrical stations equipped with fire protection systems, suitable safety precautions shall be taken to ensure the safety of personnel and equipment. Precautions may include isolation and tagging and/or making non-auto fire detection and extinguishing systems.

A check for the existence of remote fire control gas injection systems, such as bulk injection or self contained carbon dioxide systems shall be made. To ensure that operation cannot occur during occupancy, Danger Tags should be attached at the bulk gas injection point and/or initiation panel controls.

When leaving electrical stations, fire detection and extinguishing systems made non-auto prior to work commencing, shall be reset for auto operation. See approved procedures for specific locations.

#### *6.23.14 Access to high voltage cages or rooms*

An Access Authority is required for entry to a high voltage cage or room. Entry for operating work is permitted provided that safe approach distances can be maintained.

All doors, gates or readily removable panels for ease of access shall be fitted with an approved label identifying the area as a cage or room and a warning against unauthorised entry.

#### 6.23.15 *Work in battery rooms*

Persons working in battery rooms shall ensure that the rooms are adequately ventilated by means of the natural or forced ventilation.

Because of the risk of explosion, the use of naked flames is prohibited in battery rooms and battery repair depots. Where it is necessary to use naked flames or attached jumper leads in a battery room, the room shall first be thoroughly ventilated and the batteries shall not be on charge. Similarly, caution shall be exercised to ensure that arcing caused by connecting jumper leads, or sparking caused by power tools or steel objects such as tools, watchbands, etc does not occur.

**SMOKING IS STRICTLY PROHIBITED IN ALL BATTERY ROOMS.**

The spray above gassing cells is strongly corrosive. Persons should take precautions to avoid getting this spray on the skin or clothes. Affected areas should be washed thoroughly with water or other approved washing solutions.

#### 6.23.16 *Duties of persons prior to leaving the station*

When cleaning up after work and before leaving an electrical station:

- all tools and materials shall be accounted for. (This is especially important in stations where frame leakage busbar protection is installed. The frame leakage earthing path could inadvertently be short-circuited by tools or other equipment left in contact with the switchgear panels.);
- all chequer plates, covers, barriers and the like removed during the course of work shall be replaced to their correct locations. Otherwise, suitable barriers or warning signs shall be erected to guard against injury to persons;
- normal and emergency lighting shall be checked as turned off;
- entrances and exits shall be checked as secured; and
- advise that they are leaving the station directly in the substation entry database, or by telephone on the notify line (1300 133 780).

### 6.24 **Earthing systems**

Earthing systems shall remain intact while ever the associated electrical apparatus is energised.

If part of an earthing system is damaged or disconnected, dangerous voltages may appear. Making or breaking a connection to an earthing system or between earthing systems shall be carried out in accordance with 6.35.4 of these rules.

Apparatus which can produce dangerous voltages if an earthing system connection is disconnected include power and voltage transformers, potential taps fitted to high voltage bushings and high voltage current transformers, insulated sheaths of high voltage cables, and surge diverters.

#### 6.24.1 Temporary connections between earthing systems

All connections between earthing systems, including from cable screens and overhead earth wires, should be made using a suitable permanent or bolted connection. Where this is not practicable, a clamped connection may be used as a temporary bond provided the mechanism is locked with a network HV switch or earthing padlock. If a temporary bond is to be left in place, a warning tag shall also be applied to the bond indicating the purpose of the bond and what works are required to enable removal of the bond.

**Note that operational and working earths, and temporary equipotential bonds used by workers to address earthing hazards during work are exempt from this requirement.**

#### 6.25 Neutral systems

All parts of neutral systems shall be regarded as live while ever associated phase conductors are energised, and the procedures contained in these Rules adopted for work on this equipment.

Neutral systems shall remain intact while ever the associated electrical apparatus is energised.

Dangerous voltages may appear, during earth fault conditions, on neutral systems including neutral busbars, neutral resistors, neutral reactors and the connections between the neutrals of transformers or generators and the earthing systems.

#### 6.26 Work on new (yet-to-be connected) or disconnected apparatus

An Access Authority or LVAA is not required for work on apparatus which is confirmed to be disconnected apparatus.

A risk assessment shall be completed and suitable measures shall be put in place to enable the work to be carried out safely, such as issuing an Access Authority on adjacent apparatus.

Before work is carried out on, or near, disconnected apparatus, a formal declaration of Disconnected Apparatus shall be made, unless working in accordance with approved live working techniques. A declaration of Disconnected Apparatus must:

- be issued by an authorised Access Authority Holder; and
- be available at the worksite; and
- record the disconnection points for the disconnected apparatus; and
- advise the work party of the disconnected status of the apparatus; and
- be cancelled prior to the issue of an Access Authority or LVAA enabling connection of apparatus to the network.

When cancelling a declaration of Disconnected Apparatus, all relevant work parties must be advised and acknowledge that the apparatus shall no longer be considered to be disconnected.

A Warning Tag shall be attached to all points of disconnection. The condition of Warning tags on disconnection points shall be checked at least weekly while work on disconnected apparatus is being carried out, and replaced where necessary.

The requirements of 6.35 of these rules must be adhered to with regard to the hazards of:

- induced voltages;

- transferred earth potentials;
- earth fault currents; and
- lightning.

Testing and commissioning activities may be carried out on disconnected apparatus, including the temporary removing of earth and short circuit connections if:

- the person responsible for the test takes all necessary precautions and actions to ensure the safety of workers, contractors, the public and the electrical apparatus under test; and
- at the conclusion of the testing or commissioning, the disconnected apparatus is fully discharged and left in a safe condition, including the reinstatement of any earth and short circuit connections.

### **6.27 Work on de-energised lines above in-service lines**

Work above in-service lines can only proceed with the strict application of approved work procedures. These procedures shall include provisions for:

- suitable temporary insulation; and
- approved escape and rescue provisions.

### **6.28 Cable penetrations including in cable ducts**

Positive cable identification must be undertaken before cutting existing cable ducts or conduits, or making a penetration in a wall, floor, or other barrier, where live cables may be contacted. All conduits must be considered to contain a live cable until the contents have been proven and identified.

Valid Dial Before You Dig (DBYD) plans or project drawings should be on site to assist in positively identifying the location of all underground assets.

Where the end of a conduit is not exposed and unable to be continuously traced to the work site, an inspection window needs to be made to determine whether the conduit contains any cable. The inspection window must be made in a controlled manner in accordance with an approved procedure to avoid impacting or penetrating live cables in the work area.

Once the conduit has been windowed and proved empty or the identity of all cables has been confirmed, the conduit may be cut.

When cutting a cable, conduit, or making a penetration, a minimum of 300mm clearance must be maintained between the cutting tool and all assets adjacent to the work location. Where this is not possible, suitable mechanical protection must be used to prevent damage to adjacent assets.

### **6.29 Testing**

Only approved test equipment shall be used by trained and authorised persons.

The person in charge of the test is responsible for ensuring that all required precautions are taken and ensuring the safety of all members of the work party.

### **6.30 Responsibility for authorisation to energise**

The responsibility and authorisation to energise electrical apparatus being placed into service for the first time, or following major maintenance work is detailed in Division Procedure (Network) GNV 1044 – Commissioning Network Electrical Assets.

### **6.31 Phasing**

All new electrical apparatus capable of being paralleled with existing electrical apparatus shall be phased prior to commissioning or recommissioning.

All electrical apparatus, the connections of which have been broken other than by switches provided for the purpose, should be phased before being returned to service, except when there is no possibility of crossing phases.

Phasing shall be checked from all possible sources of supply using approved indicating devices or voltmeters following any installation of new electrical apparatus or re-arrangement of construction involving more than one phase.

### **6.32 Indirect phasing**

Where a high voltage source produces a low voltage potential via a permanently connected transformer, or capacitive coupling, and the low voltage potential derived from each high voltage source consistently phases with an existing reference source of supply, the high voltage sources can be considered to phase.

### **6.33 Current transformer circuits**

The secondary circuits of a current transformer shall not be open circuited while the primary circuit is energised.

### **6.34 Working on poles carrying live electrical apparatus**

Extreme care shall be exercised when it is necessary to work on electrical apparatus on poles in joint use with other electrical apparatus which is live. Special attention is to be paid to the possibilities of uplift occurring on the conductors being replaced or erected.

Where this possibility exists, care shall be taken to prevent the conductors being worked on coming within the Safe Approach Distance of live electrical apparatus as required by 6.4.1 of these rules.

The installation or removal of multiple continuous spans of open wire (uninsulated) conductors under or adjacent to energised circuits is not permitted (where adjacent is defined as being within 3 metres of bare conductors of an energised circuit).

### **6.35 Hazards from induced voltages and transferred earth potentials**

There are several potentially hazardous conditions routinely found on equipment connected to the electrical network including earthing conductors and interconnected apparatus. While these conditions are more likely to be found during a fault on the network or during storm conditions, they can also occur during normal working conditions. These hazards exist even though the fault can be at an entirely different (even remote) location.

Hazards from induced voltages and transferred earth potentials shall be considered in the worksite hazard and risk assessment process.

#### 6.35.1 *Lightning*

Workers working outdoors or on or near any part of the network (overhead, underground and indoor assets) may be at risk of injury from lightning strike if working during thunder storm activity

A lightning strike on an overhead line results in a very short duration pulse or pulses of very high voltage which travels along the line overhead earth wire or conductor until it is diverted to earth via earth electrodes at a structure or surge diverters on the phase conductors.

Workers working outdoors or on the network must remain alert to changing weather conditions. Work outdoors or on the network during lightning activity shall cease when the time between lightning and corresponding thunder is 30 seconds or less, until 30 minutes after the last thunder is heard (known as the 30/30 rule) unless working on long transmission lines, in which case work should cease whenever lightning activity is identified in the area that may affect the line.

During this period workers are to remain inside a building or vehicle cabin until the lightning threat has safely passed. Work may resume within this period if the work party believes the lightning threat to have safely passed, however the work party must continue to monitor the storm movement.

#### 6.35.2 *Induced voltages*

Wherever a line is adjacent to or connected to lines or cables which run near energised apparatus, induced voltages can develop. Induced voltages most often occur between an energised line and a non-energised line, but can occur where conductors are parallel anywhere along their length. Electrical induction transfers energy by using either of the following:

- magnetic field (where there is current in a live line it may induce a current or voltage on other nearby lines or earth conductors even if they are earthed)
- electric field or capacitance (nearby energised lines can induce charges on equipment, out of service lines, or even people).

The hazard of induced voltages can be managed by:

- Bonding together and earthing all conductors including the overhead earth wire, pilot cables and metallic catenary cables, as well as conductive poles or structures, as close as possible to the worksite;
- When making or breaking bonds; using temporary bridging conductors to create an equipotential bond before making or breaking the main circuit;
- Using temporary bridging conductors to bond between plant, the structure, equipment and conductors if working close by;
- Earthing metallic fencing that is under overhead lines, and is isolated from the ground; and
- Using bonded earth mats for all ground work and ensuring that all approach and departure paths are via these mats.

Any non-insulated plant being operated for work on or near the network within 15 metres of the centre line of an overhead transmission line and raised off the ground on outriggers must have the chassis connected to earth, either at:



- The earth down lead on the structure carrying the circuit being worked on or near; or
- The structure carrying the circuit being worked on or near if the structure is conductive; or
- A temporary driven earth stake; or
- Following a risk assessment, alternate metallic objects in the work area that provide connection to the general mass of earth.

### 6.35.3 *Voltage gradients*

Voltage gradients arise from currents passing through conducting materials such as structures, earthing connections, or fallen conductors, to the natural ground. Two particular gradient situations which can be hazardous to people are referred to as touch voltage and step voltage.

Hazardous step or touch voltages may rise at a structure where earthing has been applied, as a result of line energising, lightning strike, transferred voltages or high levels of induction.

The step voltage reduces substantially at short distances from the base of the structure or the earth stake.

The touch voltage can arise when workers stand near the structure or the portable earth stake where working earths are in place and touch the structure earthing system or the down lead to the portable earth stake.

For this reason, when a portable earth stake is used, it should be installed away from the immediate work area where practical, and workers should generally avoid this location.

### 6.35.4 *Transferred voltages on neutral and earthing systems*

During fault conditions, the earth potential rise can be transferred along any conductor to a remote location. A person may receive a shock by touching the conductor and the local soil. Conversely a conductor may transfer a remote low potential into a high soil potential area also creating a touch voltage hazard.

Some sources of transferred earth potential rise include:

- copper or other metallic conductors, such as cable screens or armouring;
- metal pipes (water or gas pipes) especially if the pipes are earthed;
- fencing, especially if a neighbouring fence connects to a substation fence;
- underground cables; and
- concrete (such as a steel reinforced concrete driveway next to a substation).

The hazard of transferred voltages can be managed by:

- using temporary bridging conductors to create an equipotential bond before making or breaking neutral or earth connections;
- using bonded earth mats for all ground work, bonding equipment to the earth mats, and ensure that all approach and departure paths are via these mats; or
- applying suitably designed and constructed earthing and insulation arrangements.

## 6.36 **Work on or near pilot cables**

When working on pilot cables, the requirements of 6.35 of these rules must be adhered to with regard to the hazards of:

- induced voltages;
- transferred earth potentials;

- earth fault currents; and
- lightning.

No additional action is required when working on terminal ends of pilot cables within stations where the work area is provided with isolation from the local earth.

For work on pilot cables where the conductors are to remain unbroken and the cable will not be placed under mechanical stress, then the work may be carried out using live low voltage working procedures without the need to isolate the feeder or individual services within the cable.

Where the conductor is required to be broken or mechanical stress placed on the cable then all services carried by the pilot cable shall be isolated. The associated feeder must also be de-energised where there is a risk of the pilot cable coming within the Safe Approach Distance of live electrical apparatus as required by 6.4.1 of these rules.

Protection work at the terminal ends of the pilot cable may be carried out with the high voltage equipment in service provided satisfactory equipment isolation is taken to ensure system security.

In all cases work shall proceed on pilot cables treating them as 'live' low voltage until all cores being worked on are proved de-energised at the work site.

**Where duplicate protection is available and where the System Operator determines that the network will not be placed at unreasonable risk, pilots may be worked on with the feeder live once adequate precautions have been taken.**

**Precautions shall be taken in accordance with approved procedures to avoid dangers from optic fibre cables where these are used as protection/communication pilots.**

Workers within 1.0m of exposed metallic catenary of an overhead pilot cable could be exposed to induced voltage and transferred earth potential hazards, and these shall be managed in accordance with Clause 6.35. Use of temporary insulating material shall be in accordance with Clause 6.9.12.

### **6.37 Work on live high voltage overhead lines**

Work on live high voltage lines shall be carried out in accordance with the requirements of Section 9 of these Rules using approved techniques, procedures and equipment.

Certain work which is not regarded as live high voltage line work may be done in accordance with approved procedures on live high voltage lines as listed below. This work may include:

- operating work;
- washing or cleaning insulators, or applying compounds to insulators or conductors, using equipment specially designed for the purpose; and
- attaching or removing testing equipment which is specially designed for the purpose.

Only appropriately tested and rated equipment shall be used for these purposes.

### **6.38 Distractions when working on live electrical apparatus or in high risk situations**

Mobile phones and other possible distractions shall not be taken into high risk situations. High risk situations include any live electrical work, work at height, work in or near confined spaces, and work with machinery or for operation of plant or crane near live electrical apparatus. Hazard and risk assessments shall record these situations and the control measures taken.

When working as designated observer for live work, the observer may carry a mobile phone (or other communication device) for emergency communication purposes. If the designated observer is required to use a mobile phone, or is in any other way distracted from the role of observer, all work requiring the observers presence shall cease and the work crew shall move away from the hazardous situation.

### **6.39 Communications antenna on towers, poles or columns**

Communications facilities such as BBCC cables, telephone cables and telecommunications antennas and radio facilities are the responsibility of the communications organisation owning the communications system.

Isolation processes are provided (where necessary) at the installation sites for the isolation of the energy supplying these installations. It is essential to identify such installations during the worksite hazard and risk assessment and to note the control measures adopted to manage the site if persons are to be working within the hazardous field of the antenna (this will be shown in the instructions provided at each site). These control measures will include the isolation procedure for the energy source to the antenna/transmitter.

**Radio emissions pose a potential danger. Care must be taken to avoid approach to these installations until isolated in accordance with approved procedures.**

## 7.0 WORK ON LOW VOLTAGE ELECTRICAL APPARATUS

This section applies to all electrical apparatus operating at low voltage.

### 7.1 Low voltage safety principles

#### 7.1.1 Basic safety principle

**ALL LOW VOLTAGE EXPOSED CONDUCTORS AND ELECTRICAL APPARATUS SHALL BE REGARDED AS LIVE UNTIL ISOLATED AND PROVED DE-ENERGISED BY APPROVED MEANS.**

**Contact with live electrical apparatus will cause severe injury or death.**

**In all cases of electric shock or suspected electric shock the victim shall immediately be transported to hospital or medical centre for treatment.**  
**All cases of electric shock or suspected electric shock shall be reported as required by Company Procedure (Health & Safety) GSY 0051 – Health, Safety and Environment Incident Management.**

**Hazard and risk assessments shall be carried out for all types of work performed under these Rules.**

#### 7.1.2 Work on or near de-energised low voltage electrical apparatus

When work is to be carried out on or near de-energised low voltage electrical apparatus (except for disconnected apparatus, or where approved live low voltage working techniques are applied), an authorised person shall, in accordance with approved procedures and in the following sequence:

- **ISOLATE** the associated electrical apparatus from all possible sources of supply, with the exception of those equipped with LV Auto Isolation;
- **SECURE THE ISOLATION** by tying back bonds, withdrawing fuses or links, applying **DANGER TAGS** and where possible approved **LOCKING DEVICES** to all points of isolation;
- **PROVE DE-ENERGISED** by approved procedures;
- **APPLY LV PROTECTIVE BONDS** immediately after proving de-energised, to each isolated low voltage circuit whose active conductors are in electrical contact with a customer installation. If the isolated apparatus is not in electrical contact with any customer installations then LV Protective Bonds are not mandatory.
- **CLEARLY IDENTIFY THE ELECTRICAL SAFE AREA FOR WORK;**
- **ISSUE A LVAA or ACCESS AUTHORITY** in accordance with these Rules.

The LVAA **HOLDER** SHALL:

- **SATISFY THEMSELVES** that the LVAA will allow the work to be carried out safely;
- **SIGN ON** to the LVAA as the LVAA Holder; and
- **ENSURE** all members of the work party understand and sign onto the LVAA prior to commencing work.

**Where the work party considers that hazardous induced or transferred voltages are likely to occur, either live working procedures shall be adopted or the conductors shall be earthed and short-circuited by approved means.**

### *7.1.3 Proving low voltage electrical apparatus de-energised*

Low voltage electrical apparatus shall be proved de-energised by means of approved testing devices. This test equipment shall be proved to be in good working order immediately before and after use, otherwise two independent means of proving de-energised shall be used. Care shall be taken to ensure correct identification of all individual LV isolation points and circuits. Proof of isolation shall be confirmed by a second qualified worker (if available).

### *7.1.4 Energising and de-energising low voltage electrical apparatus*

When connecting de-energised electrical apparatus, including connection to customers services, to a live low voltage source of supply, the final connections to be made shall be to the source of supply. When disconnections are being made, the connections at the source of supply shall be disconnected first. The neutral conductor shall be connected first and disconnected last.

### *7.1.5 Street lighting conductors and control circuits*

Working on or near street lighting conductors poses a unique hazard due to the risk of inadvertent energisation and difficulties in identifying all sources of supply.

Street lighting conductors and other control circuits shall be treated as live unless they have been:

- a) Isolated at all sources of supply, danger tagged, and LV Protective Bonds applied from the isolated Street Light mains to the neutral of the isolated Low Voltage mains; or
- b) Isolated from all sources of supply via a physical break in the street light conductor on both sides of the work site, and danger tagged.

Street lighting conductors are effectively earthed via connected lamp fittings, even if isolated, and therefore present a hazard. They shall be temporarily insulated when approaching within 500mm. Metal street light brackets and support fittings shall be regarded as earthed.

## **7.2 Work on live low voltage electrical apparatus**

Work on or near live low voltage electrical apparatus shall be in accordance with approved procedures. Work on or near live low voltage electrical apparatus shall only be carried out when:

- the worker has been trained in the safe performance of such work;
- the electrical apparatus has been identified as low voltage; and
- approved precautions have been taken by screening or other means to avoid danger from inadvertent contact with other live conductors or earth.

### *7.2.1 Working with a safety observer*

A person working on or within 500mm of an uninsulated live low voltage conductor shall wear a low voltage insulating glove and approved leather outer glove on each hand and be attended by a safety observer who:

- has had training in emergency procedures; and
- demonstrated competency to carry out those procedures during the last 12 months; and
- holds authorisation to carry out the work being undertaken; and
- been instructed in the hazards of the work and the necessary precautions.

**Emergency procedures include resuscitation and releasing a person from live apparatus, and, as appropriate to the work being done, rescuing a person from a pole, structure, or elevating work platform.**

The primary responsibility of the safety observer is to remain on the ground and observe LV live work activities across the full scope of the LV live work task.

The Safety Observer must alert the work team to any potentially unsafe actions that may inadvertently occur including infringement of safe working distances, movement of temporary insulating material, or any other lack of compliance with approved procedures.

The Safety Observer has the authority to temporarily stop the work at any time.

The Safety Observer must not perform any other task whilst LV live work is in progress and must maintain effective and immediate communication with the work team at all times. This may include the use of electronic communication due to noisy environments.

A defibrillator must be available at the worksite and deployed ready for immediate use by the safety observer.

#### 7.2.2 *Effectiveness of insulation on low voltage electrical apparatus*

Low voltage electrical apparatus covered with material such as tape, rubber, plastic or fabric including cables and service wires exposed to ultra violet (UV) deterioration shall not be regarded as insulated for handling when live, unless it is known that the insulation is suitable for the purpose and is in good condition.

#### 7.2.3 *Deleted (content moved to 7.1.5)*

#### 7.2.4 *Paralleling of low voltage distributors via bonding, switching or fuse insertion*

The authorised person in charge of the work shall keep the System Operator informed of the exact location of all switches and fuses available for the purpose of paralleling the low voltage network via a low voltage alteration sheet.

Correct phasing and compatible voltages from all possible sources of supply shall be confirmed at low voltage bond, switch and fuse points prior to making connection following any installation of new electrical apparatus or re-arrangement of construction.

#### 7.2.5 *Low voltage customers' service connection and identification of service neutral*

**Incorrect connections, reverse polarities and incorrect phase rotations can create life threatening situations and equipment damage. It is the connecting person's responsibility to ensure that all connections are correct prior to leaving the work site.**

All connections to the low voltage network must only be made after undertaking a documented testing process in accordance with AS4741 – Testing of connections to low voltage electricity networks, and the results must be recorded.

In particular, the identity of the neutral conductor(s) must be confirmed by electrical testing, and the polarity of connections must be confirmed as being correct.

**If there is any doubt about the identification of a service neutral, the service shall be left disconnected until the neutral has been identified.**

All connections and required testing must be complete before leaving site, including confirming that metal parts are not energised.

#### 7.2.6 *Work on low voltage control panels or switchboards*

Work on low voltage control panels or switchboards (including work in tunnel boards) shall be performed in accordance with approved procedures. Care shall be taken to ensure inadvertent contact is not made with live exposed conductors and precautions taken to prevent the worker from forming a part of a conductive circuit.

#### 7.2.7 *Live low voltage tasks not permitted*

The following tasks must only be carried out on LV network apparatus under isolated conditions:

- Work on the top circuit(s) of three-way or four-way, twin circuit, or triple circuit, open wire, multi-phase overhead constructions (other than the installation or removal of bonding conductors or service connections);
- Cable jointing involving straight-through or branch joints;
- Any work that disturbs CONSAC (concentric neutral solid aluminium conductor) cable, including making or breaking connections;
- Making or breaking connections of paper/lead cables;
- Replacement of columns or metal pillar covers where the incoming mains are larger than 50mm<sup>2</sup> in size;
- Making or breaking ground-mounted transformer connections, either at the bushing or line side of the main isolator;
- Working on maximum demand indicator (MDI) or metering current transformers on ground-mounted transformers, mounted between the transformer bushings or line side of the main isolator;
- Remove or replace Weber LV switchgear current transformers (other than with the transformer, LV fuse strips, and distributor connections all isolated).

The final decision whether to work live or not will be made by the work party on site after completion of the pre-task hazard and risk assessment.

### 7.3 **Work on low voltage overhead lines**

#### 7.3.1 *General principles*

The basic safety principle of regarding all conductors as live until proved de-energised always applies. Earthed apparatus is known to present a hazard, but the hazard is often not obvious. Protection from electric shock can be achieved by insulation or body separation or both. Where you can't achieve one, you shall have the other.

Insulation can be obtained by having:

- permanently insulated conductors; or
- temporarily insulating bare conductors; or
- by wearing low voltage insulating gloves and approved leather outer gloves on each hand.

Making a connection between a live conductor and any other conductor can also create a hazard.

The following precautions are required:

- ensure your body does not become the path between the conductors (suitable precautions include wearing low voltage insulating gloves and approved leather outer gloves on each hand and using temporary insulation); and
- always check between the conductors before making the connection, using an approved low voltage detector to ensure the connection will not be made between unlike phases.

**For the purpose of this Clause the neutral, street light conductor and Broad Band Communication Cable (BBCC) and catenaries, if involved shall be regarded as a conductor and shall be covered.**

#### *7.3.2 Work on or near live low voltage overhead conductors*

Where work is to be done within 500mm of any uninsulated live low voltage conductor every other uninsulated conductor within reach shall be covered with temporary insulating material in all directions, and an insulating glove and approved leather outer glove shall be worn on each hand.

**This means that work may be done on an uninsulated live conductor provided that an insulating glove and approved leather outer glove shall be worn on each hand, and every other conductor within reach is covered in accordance with these Rules.**

The temporary insulating material shall be applied from a position below the mains so that no part of the worker's body other than their forearms are at or above any exposed conductor.

Once all conductors are covered, the insulating material can be removed from the conductor on which work is to be carried out. On completion of the work, the temporary insulating material on the bare conductor shall be reinstated before progressing to the next conductor.

#### *7.3.3 Persons working together*

Where two or more persons are working together on a live low voltage line, in addition to Clause 7.3.6 below, special care shall be taken to ensure that they either:

- confine their work to the same phase; or
- maintain at least 500mm body separation from each other; and
- do not pass tools (or anything conductive) direct from one to the other.

#### *7.3.4 Deleted (content moved to 7.2.1)*



### 7.3.5 Working without a safety observer

A safety observer is not required for work on live low voltage overhead conductors where the work is limited to operating, testing, or disconnection / reconnection of conductors only.

A person working without a safety observer on or within 500mm of an uninsulated live low voltage conductor shall:

- keep below the level of every uninsulated conductor within 500mm of any part of their body except for the forearms; and
- wear an insulating glove and approved leather outer glove on each hand.

An example is connecting or disconnecting a service line at a point of attachment, working from below the service mains but with insulated services at or below head level, or with a bare service conductor below head level temporarily insulated wherever it is within reach.

### 7.3.6 Working in Earthed Situations

An earthed situation is a work location where an earthed conductor is within 500mm of any part of the person's body. An earthed conductor may include metal brackets, earthing down leads or cable sheaths **which may not be obvious hazards**. An earth situation presents a risk of electric shock from contact between the live conductor being worked on and earth.

**Earth situations include working on steel or concrete poles. De-energised street lighting conductors should also be treated as earthed.**

**An insulating glove and approved leather outer glove shall be worn on each hand** when working on or near live low voltage conductors in an earth situation.

### 7.3.7 Passing Between Live Low Voltage Conductors

When workers need to pass between live low voltage conductors within 500mm of any part of the worker's body, they shall wear a low voltage insulating glove and approved leather outer glove on each hand, and be attended by a safety observer in accordance with Clause 7.2.1. The conductors nearest their body shall be insulated (either temporarily or permanently) wherever they are within reach. Permanent insulation must be thoroughly visually inspected for integrity before passing through.

### 7.3.8 Deleted (content moved to 6.36)

## 7.4 Work on low voltage underground cables

### 7.4.1 Identification of low voltage underground cables

When low voltage cables exist in areas where high voltage cables could exist, identification of the cable will be necessary as detailed in Section 8 of these Rules. When working on underground pilot cables they shall be identified in the same way as low voltage cables. However, at all times work shall proceed on the cable as if it is live and all necessary precautions taken until the cable is proved de-energised at the work site.

### 7.4.2 Work on de-energised low voltage cables

A person shall not work on or near de-energised low voltage cables unless they are identified, isolated, danger tagged and proved de-energised in accordance with approved procedures.

#### 7.4.3 *Work on energised low voltage cables*

All work on energised low voltage cables shall be performed in accordance with approved procedures. Consideration shall be given to the option of isolation in every case.

When working on pillars and columns containing energised apparatus, a worker shall:

- wear an insulating glove and approved leather outer glove on each hand; and
- apply temporary low voltage insulating material to all live parts not being worked on and earthed metal within reach; and
- work from an insulating mat to minimise the hazard of their body being at earth potential.

#### 7.4.4 *Persons working together*

Where two or more persons are working together on live low voltage apparatus, special care shall be taken to ensure that they either:

- confine their work to the same phase; or
- maintain at least 500mm body separation from each other; and
- do not pass tools (or anything conductive) direct from one to the other, including to a person not positioned on an insulating mat.

#### 7.4.5 *Working without a safety observer*

A safety observer is not required for work on live low voltage cables and apparatus where the work is limited to operating, testing, or disconnection / reconnection of conductors only.

An example is connecting or disconnecting a customer's service at a point of attachment above ground level, working from an insulating mat, with all bare conductors and apparatus temporarily insulated, other than the phase being worked on.

## 8.0 WORK ON OR NEAR HIGH VOLTAGE ELECTRICAL APPARATUS

This section applies to electrical apparatus operating at high voltages.

### 8.1 High voltage safety principles

#### 8.1.1 Basic safety principle

**ALL HIGH VOLTAGE ELECTRICAL APPARATUS SHALL BE REGARDED AS LIVE UNTIL ISOLATED AND PROVED DE-ENERGISED, EARTHED AND SHORT CIRCUITED AND AN ACCESS AUTHORITY IS ISSUED IN ACCORDANCE WITH THESE RULES. Contact with live electrical apparatus will cause severe injury or death.**

**In all cases of electric shock or suspected electric shock the victim shall immediately be transported to hospital or medical centre for treatment. All cases of electric shock or suspected electric shock shall be reported as required by Company Procedure (Health & Safety) GSY 0051 – Health and Safety Incident Management.**

**Hazard and risk assessments shall be carried out for all types of work performed under these Rules.**

#### 8.1.2 Work on, or near, de-energised high voltage electrical apparatus

Before carrying out work on or near exposed high voltage electrical apparatus (except for disconnected apparatus, or where approved live line working techniques are applied), an authorised person shall, in accordance with approved procedures:

- **ISOLATE** the associated electrical apparatus from all possible sources of electrical supply; and
- **SECURE THE ISOLATION** to prevent unauthorised operation of the isolation point by applying **DANGER TAGS** to all points of isolation; and
- apply approved **LOCKING DEVICES** or **CONTROL SYSTEMS** as applicable; and
- **PROVE DE-ENERGISED** the associated electrical apparatus; and
- **EARTH AND SHORT CIRCUIT** the associated electrical apparatus, immediately after proving de-energised by connecting operational earths; and
- as required, **CLEARLY IDENTIFY THE SAFE AREA FOR WORK**; and
- **ISSUE AN ACCESS AUTHORITY** in accordance with these Rules.

Also THE ACCESS AUTHORITY HOLDER shall:

- **SATISFY THEMSELVES** that the Access Authority will allow the work to be carried out safely;
- **SIGN ON** to the Access Authority as Access Authority Holder;
- **ENSURE** all members of the working party understand and sign onto the Access Authority prior to commencing work; and
- **ENSURE** all unwanted mechanical energies or secondary supplies are isolated prior to commencing work.

### *8.1.3 Isolation of high voltage electrical apparatus for work or test*

Isolation of electrical apparatus shall be carried out by an authorised switching officer for the apparatus being operated, and in accordance with the requirements of Company Procedure (Health & Safety) GSY 1004 – Isolation and Danger Tagging. Due regard shall be given to the capability of the isolating devices to break any suspected load. Isolation shall provide sufficient break in the circuit to prevent a flashover or bridging of the isolation gap and precautions shall be taken to ensure the safety of the operator of the device.

High voltage electrical apparatus shall be isolated by making a break in the electrical circuit appropriate to the voltage and type of insulation being used, by:

- operating an identified switching device or isolator; or
- removed or separated connections; or
- mid span isolation points (installed using approved live line working techniques).

The effectiveness of the isolation shall be demonstrated by a visible break. Where it is not practicable to demonstrate a visible break approved testing or earthing procedures shall be used.

The integrity of an isolation point shall not be compromised.

Work shall only proceed on the connections or operating mechanism of a switching device or isolator if there is no risk of altering the required state of the apparatus.

When operating overhead switchgear on the transmission network, the authorised switching officer shall stand on an equipotential mat electrically connected directly to the handle of the switch, except where suitably rated operating equipment is used.

When operating non-metal clad high voltage switch gear (eg MD4), the authorised switching officer shall wear the following additional PPE for protection against arc flash injury:

- (i) approved arc rated clothing; and
- (ii) an approved arc rated face shield; and
- (iii) approved arc rated gloves.

### *8.1.4 Securing of isolations*

Precautions shall be taken to prevent unauthorised operation of every isolation device that has been operated to create the isolation.

Securing of isolation points shall be by the application of Danger Tags, in accordance with the requirements of Company Procedure (Health & Safety) GSY 1004 - Isolation and Danger Tagging.

### *8.1.5 Proving high voltage electrical apparatus de-energised*

HV conductors must be proved de-energised prior to the application of earthing equipment.

Testing for de-energised mains shall only be completed by an authorised person using approved equipment.

To prove HV electrical apparatus de-energised the following actions shall be carried out:

- the HV detector shall be inspected for a compliant test date and for signs of any visual damage;
- ensure that the HV detector is set to the correct voltage range;
- test the HV detector against a known live HV source or approved proving unit;
- apply the HV detector to the apparatus on all phases at the proposed isolation point where earths and short circuits are to be applied and observe for any voltage indication;
- retest the HV detector against a known live HV source or approved proving unit without any alteration to the selection switch; and
- repeat procedure at each and every proposed isolation point where earths and short circuits are to be applied.

When direct contact testing is utilised, testing shall be carried out with appropriately insulated testing equipment. The equipment shall be within a valid test date.

Direct contact testing should be completed on bare sections of HV apparatus. Testing should not be conducted on covered conductors or bus bars.

Testing instruments should be tested/proved in the same plane relative to conductors where possible. The authorised switcher should be aware of stray fields/induction in HV switchyards in relation to the plane (angle) of the detecting device.

Where induction is suspected due to adjacent live apparatus, alternate switching arrangements may alleviate the presence of induction, eg, bleeding induction through the HV winding of a transformer within the isolation.

Note: Any indication on a detector shall be regarded as indicating potential. No assumption shall be made as to the possibility of induction being the cause.

Where it is not practicable to prove conductors de-energised at the point of application of operational earths, approved procedures shall be used to ensure the conductors are de-energised prior to the application of operational earths (eg via neon indicators or transformer secondary potentials).

Visual detectors such as neons or lights may be used provided that there is a facility to test the visual detectors once the HV apparatus is de-energised via approved testing procedures.

Test points and approved test devices for use with test points shall be verified with another source or approved testing unit after testing.

Where no testing facility is available, switching may be arranged to include an accessible section of apparatus to carry out the test, ie, low voltage on a transformer within the isolation, or proving the oil switch open on an external apparatus, eg, overhead mains.

When testing is completed through fuse elements, a method of test must be followed that ensures that the fuse has not blown during the test. The use of fuse test dummies is recommended. The location of fuse dummies that have been installed must be recorded on the switching folder.

Proving de-energised aerial covered high voltage cables shall be carried out at termination or transition points on high voltage covered cable where exposed conductors are available. The covered cable shall then be traced visually to the work site.

Note: The visual trace shall be independently verified by a second person.

The application of an interlocked, fault rated earthing switch may be used to prove apparatus de-energised where the electrical apparatus is fully enclosed and non-withdrawable. Interlocks shall only allow the earthing switch to be closed if bus bar and feeder disconnectors have been opened.

#### 8.1.6 *Earthing and short-circuiting*

Earthing is an integral step in providing safe access to de-energised HV apparatus under an Access Authority. Operational earths shall be applied between all points of the isolation and the work site. Care should be taken to ensure that earths are between the work site and all possible sources of supply including low voltage (LV) backfeeds.

Earthing and short-circuiting equipment shall be applied by an authorised person immediately after the conductors have been proved de-energised. Earths shall be connected to the general mass of the earth or to a substation earth grid before application to HV apparatus. All three phases or all available phases shall be earthed.

Working earths and equipotential bonds may need to be connected to the electrical apparatus in addition to operational earths prior to work commencing.

Earths shall not be connected through a fuse element and therefore fuse dummies must replace fuses when fuses form part of the earthing circuit to ensure earthing connectivity during a fault. The location of fuse dummies that have been installed must be recorded on the Switching Folder.

##### 8.1.6.1 Earthing and short-circuiting of an overhead line

Earthing and short-circuiting of a high voltage line shall be carried out as follows:

- where a number of transformers are tee-connected to a spur line (a line with only one possible source of network supply), the high voltage transformer terminals need not be isolated and earthed individually, provided that the line is earthed between the nearest transformer(s) and the work site;
- at least one set of earths shall be visible to the work site except for earthing high voltage covered conductor (Note: a working earth may be applied to satisfy this requirement);
- where the conductors are to be broken, wherever possible, an earth shall be connected within sight of the work, on both sides of the proposed break or approved temporary bonds connected across the break until the conductors have been reconnected;
- working earths may be placed on the line under Access Authority conditions as needed, provided that the line is proved de-energised before installing the extra earths;
- where possible, excess earthing lead must be secured to the structure for safety;
- where permanent earthing facilities such as substation earth electrodes, down leads, transmission towers, or pole butt-plates exist, they shall be used for earthing overhead lines;
- earthing equipment used for earthing and short-circuiting a line, whenever connected at a substation, shall be connected to the high voltage earthing system; and
- where no permanent earthing facilities exist, an approved earth stake shall be used, driven at least 600 mm into the ground.

Note: where a temporary driven earth is used for an operational earth on a **high voltage distribution network** feeder without Sensitive Earth Fault (SEF) protection enabled, the

associated high voltage isolation points shall be a three-phase switch or ganged switch (ie cannot be operated one phase at a time). This does not prevent SEF protection being temporarily disabled for network operation if required.

#### 8.1.6.2 Earthing of transmission earth wire and overhead pilot cables

Where operational or working earths are applied to transmission feeders having overhead earth wire/s and/or pilot cable/s with uninsulated earthed screens, each earth will be bonded to the aerial earth wire or pilot cable to maintain the same potential at the worksite.

#### 8.1.6.3 Earthing of single wire earth return (SWER) lines

When earthing a SWER line, the first earth connected shall be to a known permanent (solid) earth on the supply side of the work site. If two (or more) possible sources of supply exist then the first two (or more) earths connected shall be to a known permanent earth, one on each supply side of the work site.

A permanent earth point can be found at distribution substations, isolating transformers, reclosing facilities and at some established points as noted on system diagrams. In addition to the solid earth bond connection/s the SWER line shall be earthed on each side of the proposed work. This includes below DOF where the work involves work on a distribution transformer pole.

#### 8.1.6.4 High voltage overhead covered conductors

High voltage overhead covered conductors including:

- metallic screened aerial bundled cable (ABC);
- Non-Metallic Screened Aerial Bundled Cable (NMSABC); and
- unscreened insulated conductor (Covered Conductor Thick - CCT);

shall be earthed and short-circuited in accordance with approved procedures. High voltage aerial cable systems need not be earthed and short-circuited at the work site, provided that the conductors are earthed and short-circuited between all isolation points and the work site. Earthing and short-circuiting at the points of isolation satisfies this requirement.

High voltage overhead covered conductors shall be traced visually from an earth location to the work site, with the trace independently verified by a second person prior to the commencement of work.

Alternatively, insulated unscreened conductors may be earthed and short-circuited where required, using earthing tags or connectors specially installed for the purpose.

#### 8.1.6.5 Earthing equipment

Only approved equipment shall be used to earth and short-circuit high voltage conductors. Earthing equipment shall have an appropriate rating for the maximum prospective fault current and backup clearing time so that earths are capable of operating the protection. Earthing equipment must be within current test date and in good condition.

**Improvised earthing and short circuiting equipment shall not be used.**

#### 8.1.6.6 Work on unearthed electrical apparatus

The only exemptions to the requirement for earthing and short-circuiting of high voltage electrical apparatus are:

- draw-out type equipment which has been withdrawn clear of live conductors and has shutters closed, locked and danger tagged preventing access to high voltage spouts or terminations; or
- apparatus which is separated from all possible sources of high voltage supply by apparatus which is earthed and short-circuited such as screens or barriers; or
- dismantled high voltage equipment on which it is impracticable to use fixed earths and which cannot be energised by operational work; or
- where approved live line working techniques are applied; or
- involved with the application of test voltages; or
- for work on secondary systems in accordance with GSY 1088 – Access authority for high voltage work and/or test; or
- special circumstances as approved by the Manager System Operations.

### 8.2 Access Authorities

Before work is carried out on, or near, high voltage electrical apparatus, an Access Authority shall have been issued and the safe area of work defined as required by these Rules, unless working in accordance with approved live line working techniques. An Access Authority:

- is issued by an authorised person; and
- is received by an authorised Access Authority Holder; and
- gives clearance to carry out specified work or test on specific electrical apparatus on the high voltage network; and
- records the isolation points operated to isolate the electrical apparatus; and
- records the number and location of operational earths, working earths, equipotential bonds, and LV Protective Bonds installed.

#### 8.2.1 Switching folder

A switching folder (Company Form (Health & Safety) FSY 0054 – Switching Folder), is an envelope, attached by an authorised person at the location specified by the person requesting an electrical isolation, where Access Authorities shall be found. (refer to Division Procedure (Network) GNV 1086 – Switching Folder) The switching folder shall also be used for retention of other paperwork associated with LVAAAs, live line work, and operating agreements. Every switching folder shall be returned and stored for auditing purposes.

#### 8.2.2 Access authority for work

##### 8.2.2.1 Description

An Access Authority for Work is shown in Company Procedure (Health & Safety) GSY 1088 – Access Authority for Work or Test and Company form (Health & Safety) FSY 0051 – Access Authority for Work.

It is an authority issued for work to be carried out on, or near, de-energised and isolated high voltage electrical apparatus.



#### 8.2.2.2 Requirements before commencing work

With the exception of live line work, persons may not commence work on or near isolated high voltage electrical apparatus until:

- an **Access Authority has been issued** by an authorised person; and
- it has been received by the authorised person delegated to be the Access Authority Holder, on behalf of the single or multiple crews; and the Access Authority Holder has ensured that all persons at the worksite:
  - are aware of the existence and conditions of the Access Authority; and
  - sign onto the Access Authority before commencing work.

#### 8.2.2.3 Approval for additional work after disconnection

Where it is found that additional work needs to be carried out on electrical apparatus that has already been isolated, such work may only be carried out if the System Operator has approved the additional work and details of the additional work has been specified in one of the following ways:

- the additional work has been included on the original Access Authority prior to its acceptance; or
- a new Access Authority has been issued to cover all work; or
- an additional Access Authority has been issued for the additional work.

#### 8.2.2.4 Responsibilities of Access Authority issuer

The authorised person issuing an Access Authority shall:

- ensure that all necessary safety precautions have been taken in accordance with these Rules;
- ensure the Access Authority is completed in ink in a clear and legible manner;
- not issue an Access Authority when there is concern that the isolation is incorrect for the work to be carried out;
- not issue an Access Authority to a Holder who is not authorised, considered incompetent, insufficiently interested or inattentive when the authorised switching person is issuing the warnings;
- not issue a personal issue Access Authority until the Holder has been given personal instruction on the conditions of the Access Authority;
- advise the Holder and all persons present who are to sign on the Access Authority of the hazards involved and the precautions taken for the issue of the Access Authority (Note: this shall be carried out by the Holder where the authorised switching person is not on site); and
- draw a line under the names of persons signed on to the Access Authority and advised of the hazards and initial the line (Note: this shall be carried out by the Holder where the authorised switching person is not on site).

An authorised person may cancel an Access Authority already issued if it is considered that the requirements of these Rules are not being met. The System Operator and appropriate field supervisor shall be notified of the cancellation.

#### 8.2.2.5 Persons authorised to be Access Authority holders

Only persons authorised in accordance with Endeavour Energy policies and procedures shall hold an Access Authority.

#### 8.2.2.6 Responsibilities of Access Authority holders

The person receiving the Access Authority shall:

- ensure that the Access Authority clearly states:
  - the apparatus to be worked on; and
  - the work to be carried out; and
  - the location of the work; and
  - any special conditions; and
- ensure that they understand that adjacent electrical apparatus shall be regarded as live; and
- shall then ensure that all persons who are to work on the electrical apparatus covered by the Access Authority, understand the conditions of the Access Authority and any hazards involved; and
- ensure that all persons required to carry out work on the isolated electrical apparatus or enter the yellow tape area/worksite, including any visitor/s, sign onto the Access Authority under 'Sign on' column; and
- be responsible for safeguarding the Access Authority until its cancellation, and not leave the vicinity of the work (and where work is in a yellow tape area, the Access Authority shall be left in the switching folder); and
- ensure that where persons who were not present when the warnings were issued, the Holder repeats the warnings, underlines and initials their signatures as they sign on the Access Authority to signify the appropriate warnings were given; and
- have the right to refuse to work on or test electrical apparatus specified on the Access Authority when the requirements of these Rules have not been met; and
- ensure that, before the Access Authority is surrendered, all persons who have signed on the Access Authority under 'Sign on' column have signed off the Access Authority under 'Sign off' column; and
- as soon as work is completed, advise the System Operator that the Access Authority is surrendered and that the apparatus is available for service or alternatively the limitations and conditions which apply.

#### 8.2.2.7 Additional responsibilities of persons taking up an Access Authority (in the absence of an authorised switching person)

Where the Access Authority is left to be picked up, the Holder shall be authorised to take up an Access Authority. Also, the Holder shall receive clearance from the System Operator to take up the Access Authority, before he allows persons to sign on the Access Authority or commence work. The Holder shall verify that the electrical apparatus is isolated, danger tagged, earthed and short-circuited, and low voltage bonds applied, as defined on the Access Authority, and issue the warnings required.

#### 8.2.2.8 Responsibilities of persons signing on to an Access Authority

All persons at a work site governed by an Access Authority shall sign on the Access Authority in 'Sign on' column following acceptance by the Authorised Holder.

Persons signing on an Access Authority shall ensure that, relevant to their work:

- they understand the instructions given on the work to be undertaken;
- they understand the limits of the Access Authority and are aware of any relevant warnings;
- they sign on to the Access Authority to indicate their understanding of the requirements of above points;

- they follow any safety directions given by the authorised person in charge;
- when leaving or returning to the barrier area they do so, in accordance with approved procedures, via the barrier entrance;
- on completion of their work, sign off the Access Authority in 'Sign off' column; and
- there after consider the electrical apparatus they have been working on as live.

#### 8.2.2.9 Procedure on leaving or returning to a worksite controlled by an Access Authority

Persons leaving a worksite shall sign off the Access Authority in 'Sign off' column.

Persons returning to a worksite shall satisfy themselves of the Access Authority conditions and sign onto the Access Authority in the 'Sign on' column prior to recommencing work. The Holder shall give all current warnings, underline and initial the signature.

#### 8.2.2.10 Transfer of Access Authorities

Where, in unforeseen circumstances, the original Access Authority Holder is unable to continue work or must leave the worksite, the Access Authority may be transferred to a new Authorised Access Authority Holder or work shall cease and the Access Authority be surrendered.

The transfer may only be carried out if:

- BOTH PERSONS ARE PRESENT ON SITE;
- the new Access Authority Holder is authorised to accept an Access Authority; and
- the original Holder of the Access Authority ensures that the person to whom the Access Authority is to be transferred is fully aware of all safety aspects of the Access Authority or work prior to the transfer.

If the intended new Holder was already signed on the Access Authority under 'Sign on' column, that person shall sign under 'Sign off' column before becoming the new Access Authority Holder.

Access Authorities issued to non-electrically qualified persons as Personal Issue CANNOT BE TRANSFERRED. (Personal Issue - see Definitions)

Access Authorities issued 'in person' to electrically qualified authorised persons can be transferred.

#### 8.2.2.11 Work on electrical apparatus continuing from day to day

An Access Authority is generally limited to one day's duration. For major work and with the approval of the Manager, System Operations an extended Access Authority may be issued for a maximum of seven days in accordance with approved procedures.

On the completion of work each day (when work is ongoing from one day to the next);

- the Access Authority Holder shall ensure all members of the working party have signed off under 'Sign off' column daily; and
- the Access Authority on issue shall be returned to the switching folder and the switching folder left in a secure location.

8.2.2.12 Alterations to Access Authority conditions

If it becomes necessary to alter in any way the conditions of the Access Authority on issue, e.g. the isolation, earthing or special conditions, the Access Authority shall be surrendered and cancelled.

Before the work can recommence a new Access Authority shall be issued setting out the changed conditions which then apply.

8.2.2.13 Proxy cancellation of an Access Authority

Failure to surrender or sign off an Access Authority is a serious matter. Where persons leave the site without doing so all practical steps should be taken to obtain their signatures. Where this is not possible, the following procedure applies.

Where a person is unable to sign 'Sign off' column or surrender the Access Authority due to accident, sickness or any other legitimate reason, the System Operator may obtain authority from the appropriate Branch Manager for the surrender on behalf of the absent person.

If this authority is obtained the following endorsement shall be hand written across the back of the Access Authority by the Holder to complete the surrender prior to cancellation:

I hereby state that _____, whose signature appears under 'Sign on' column, (or as Access Authority Holder), is incapable of signing under 'Sign off' column, (or as Access Authority Holder), and has ceased work on the electrical apparatus referred to in this Access Authority.	
Advised by: _____	(Branch Manager)
Signed: _____	Time: _____ am/pm.
Witness: _____	Date: _____

The Branch Manager who authorised the endorsement of a person's signature shall be responsible for ensuring that the absent person is advised of the actions taken immediately on, or before, their return to duty.

If this clearance is received as verbal instruction from the System Operator, the authorised person on site will complete the abovementioned endorsement, and including the statement via System Operator (include Name).

8.2.2.14 Loss or destruction of an Access Authority

Where an original Access Authority has become lost or is destroyed work shall cease, the original Holder and the work group coordinator on being satisfied that such is the case, shall request the issue of a replacement Access Authority. All persons signed on the original Access Authority shall sign on the duplicate Access Authority. The new Access Authority shall be marked duplicate across the top and the System Operator shall note in their Disconnection and Reconnection Instruction the issue of the duplicate Access Authority. The precautions taken to make the work safe by isolation, earthing and tagging shall be confirmed before issue of the

duplicate Access Authority. The loss of an Access Authority is a serious matter; a duplicate may only be issued after exhaustive checks and enquires are made to locate the original.

#### 8.2.2.15 Returning of electrical apparatus to service following the cancellation of an Access Authority

Electrical apparatus under Access Authority shall not be re-energised until the following steps are done in the following order:

- all work on the electrical apparatus is completed;
- all equipment, plant, tools and materials (other than those referred to below) are removed;
- all persons (other than those who are to remove working earths and equipotential bonds) are clear of the electrical apparatus;
- all working earths, short-circuits and equipotential bonds are removed;
- all relevant Access Authorities have been surrendered;
- the Access Authority is cancelled by the authorised person;
- the System Operator gives permission to proceed;
- any means, such as yellow tapes, used to distinguish the electrical apparatus from in-service or live equipment has been removed;
- all LV Protective Bonds have been removed;
- all operational earthing and short-circuiting equipment associated with work carried out on the electrical apparatus has been removed;
- all remaining persons are clear of the electrical apparatus;
- all electrical apparatus associated with the work is ready for service; and
- the System Operator gives permission for reconnection to proceed.

The Authorised Switching Officer responsible for completing the network restoration must check that the Access Authority has been cancelled in accordance with Company Procedure (Health & Safety) GSY 1088 – Access Authority for Work and/or Test prior to commencing or continuing with network restoration, and verify switching status with the System Operator.

The switching folder, containing the surrendered or cancelled Access Authority, updated Disconnection and Reconnection instruction (D&R), and any removed danger tags, shall be handed to the Authorised Switching Officer responsible for completing network restoration, or left at a location designated by the System Operator (preferably the work site).

Where this is not practical (e.g. a Transmission line job), the restoring Authorised Switching Officer shall gain the following information from the System Operator prior to commencing or completing the network restoration:

- Confirm D&R number; and
- Access Authority number(s); and
- Access Authority cancellation date and time; and
- Name of the Authorised person who surrendered or cancelled the Access Authority.

### 8.2.3 Access Authority for Test

#### 8.2.3.1 Description

At the direction of the System Operator, an Access Authority for Test as shown in Company Procedure (Health & Safety) GSY 1088 – Access Authority for Work and Test and Company form (Health & Safety) FSY 0050 – Access Authority for Test is issued to authorised persons to

allow them to perform high voltage testing or the removal of operational earths for testing electrical apparatus.

An Access Authority for Test shall be issued in accordance with the following requirements:

- any Access Authority for Work, covering the electrical apparatus to be tested, has been cancelled;
- only one Access Authority for Test shall be issued on the apparatus to be tested at any one time;
- an Access Authority for Test shall not have any common isolation points with an Access Authority for Work;
- the issuer shall enter particulars of the testing, and details of the electrical apparatus on which test voltages are to be applied;
- particulars of any earths which may be removed during the currency of the Access Authority for Test shall be entered on the Access Authority;
- the Access Authority for Test Holder may remove and/or replace operational earths associated with the equipment being tested;
- testing work shall not commence until suitable precautions, including the erection of yellow tape barriers and/or warning signs have been taken; and
- when a single work party is testing a single piece of electrical apparatus at one location only, **limited** work directly associated with the test may be carried out to allow repetitive testing, including the disconnection and reconnection of conductors as required by the testing process.

#### 8.2.3.2 Situations requiring Access Authority for test

An Access Authority for Test shall be used when the electrical testing has the potential to produce currents hazardous to the human body. (Refer to Joint Australian/New Zealand Standard AS/NZS 60479 – Effects of current on human beings and livestock, for further information).

Electrical testing shall only be carried out in accordance with approved procedures including, but not limited to, the requirements that:

- an Access Authority for Work on or near the exposed conductors under test shall not be on issue; and
- an Access Authority for Test is not required when testing high voltage electrical apparatus that is not electrically connected, however, such testing shall be in accordance with approved procedures to ensure the safety of persons and adjacent electrical apparatus or equipment.

Access Authority for Test is required in the following situations:

- the application of tests which produce high voltages on electrical apparatus;
- the use of testing devices, rated at higher than 1,000 volts a.c or 1,500 volts d.c, on electrical apparatus;
- the use of electronic insulation testing devices on cables and capacitors which can create voltages greater than 1,000 volts a.c or 1,500 volts d.c, (except when used on switchgear to which there are no cables or capacitors connected and which can be considered as disconnected apparatus); and
- the removal of operational earths to carry out any electrical tests.

#### 8.2.3.3 High voltage test

High voltage testing is subject to the application of approved procedures and the following requirements:

- the points of isolation provide separation distances appropriate for the voltage and the insulating medium;
- control measures are taken to ensure persons are prevented from coming on or near the conductors while under test;
- control measures are taken to ensure adjacent electrical apparatus and equipment do not become unintentionally energised during the test;
- at the conclusion of the test, ensure any electrical apparatus under test that has become electrically charged during test is fully discharged and left in a safe condition;
- all operational earths that were temporarily removed to allow the electrical testing to be carried out are reapplied immediately; and
- where testing requires operational earths be temporarily removed, the electrical apparatus shall be regarded as being live, irrespective of whether or not the testing voltages have been applied.

#### 8.2.3.4 Persons assisting with testing

Any person assisting in the testing of electrical apparatus shall be competent and trained in rescue and resuscitation in accordance with Clause 6.1.2, and shall sign on to an Access Authority for Test prior to the commencement of the testing process. It is necessary that a person assisting in testing be competent in isolating the testing apparatus.

#### 8.2.3.5 Precautions prior to high voltage testing

Where any exposed part of the electrical apparatus being tested may become live, the worker in charge of the test shall take precautions to prevent persons from coming in contact with the live conductors.

These arrangements shall include:

- the installation of yellow tape barriers and the affixing of Danger - High Voltage Testing notices;
- arranging for workers to stand by at these exposed points during the tests; and may include:
  - where a high voltage injection test set is used as the voltage source a flashing amber light is also to be displayed at the test location; and
  - ensure that at the conclusion of the work any apparatus which has become electrically charged during the course of the work is fully discharged and left in a safe condition.

#### 8.2.3.6 Application of testing devices on high voltage electrical apparatus

Testing of high voltage electrical apparatus shall be in accordance with approved procedures. In all cases it shall be the responsibility of the person in charge of the test to take all necessary precautions and actions to ensure the safety of workers, contractors, the public and the electrical apparatus under test.

### **8.3 Work on control and protection equipment**

Persons working on control and protection equipment associated with in-service electrical apparatus, including its secondary wiring shall work in accordance with approved procedures; and

- shall take adequate precautions to ensure that inadvertent tripping of the in-service electrical apparatus does not occur;
- shall notify the System Operator prior to such work commencing, having regard to any operational limitations that the work may impose on the electrical apparatus for the duration of the work; and
- shall not interfere with, bypass or make inoperative protection devices or interlock systems unless they are authorised by the System Operator.

#### **8.4 Replacement of high voltage fuses in switchgear and operation of fuse switch units**

Where it is necessary to replace, access, or inspect high voltage fuses in switchgear, the fuse switch unit shall first be isolated from all possible sources of supply.

Oil insulated high voltage fuse switch units shall not be operated in an energised state.

**11kV and 22kV plugboard fuses shall be isolated and earthed prior to exposing and making contact with high voltage electrical apparatus in accordance with approved switchgear operating instructions. Special care shall be taken to prevent personal effects from falling into the switchgear.**

#### **8.5 Work on high voltage overhead lines**

Before any work is carried out on, or near, high voltage overhead lines, the provisions of these Rules shall apply, including the application of approved procedures for:

- live line work using approved live line working techniques;
- work on completely disconnected overhead lines; and
- operating work.

#### **8.6 Work on high voltage underground cables**

##### *8.6.1 Precautions for working on high voltage underground cables*

Before any work is carried out on, or near, high voltage underground cables or cable terminations they are to be isolated, proved de-energised, earthed and short circuited and an Access Authority issued in accordance with these Rules.

Note: The assistance of dial before you dig (phone 1100) and all other necessary searches shall be sought prior to commencing any excavation.

##### *8.6.2 Work which may be carried out with high voltage cables in service*

Work in gas or oil pressure supervision cubicles, including work on the gas or oil pipes within the cubicles may be carried out with high voltage cables in service. Other functions may only be carried out in accordance with approved procedures.

##### *8.6.3 Work which may not be carried out with high voltage cables in service*

A person shall not physically handle a high voltage cable while it is live unless it is completely surrounded by an earthed sheath or screen, or both, and precautions are taken, where necessary to avoid danger from induced voltages and transferred earth potentials.



A person shall not physically handle a high voltage cable, whether sheathed or screened or not, if its condition is suspect or doubtful unless:

- (a) the cable is proved to be de-energised and made safe for work in accordance with these Rules; or
- (b) working in accordance with approved cable identification procedures.

#### 8.6.4 *Isolation of high voltage underground cables*

Isolation of high voltage underground cables shall be carried out in accordance with Clause 8.1.3.

#### 8.6.5 *Earthing and short circuiting of high voltage underground cables*

##### 8.6.5.1 Basic earthing principle

Earthing and short-circuiting of a high voltage cable shall be carried out as close as practicable to the work site between all points of isolation and the work site.

Operational earths and working earths on cables shall be established by:

- (a) closing a fault rated earth switch;
- (b) applying approved portable earthing apparatus; or
- (c) connecting all phases to earth using conductor not less than 70mm<sup>2</sup> Copper or its equivalent.

##### 8.6.5.2 Earthing for a high voltage cable to be cut

When a high voltage cable is to be cut, where practicable, earthing and short-circuiting shall be carried out on each side of any proposed break in the cable.

##### 8.6.5.3 Precautions when continuity of high voltage cable sheath is broken

Where it is necessary to break the metallic sheath on high voltage cables (which are connected to the system) during jointing processes:

- a bond shall be used to ensure continuity of the cable sheath/s;
- an earth mat shall be installed to provide a work platform for the jointer to work on. This earthed mat shall be bonded to the sheath of the cable; and
- all short circuiting and earthing shall be carried out using conductor not less than 70mm<sup>2</sup> Copper or its equivalent.

##### 8.6.5.4 Temporary removal of earthing equipment

Earthing and short circuiting equipment may be temporarily removed only to:

- carry out testing of cables or equipment under an Access Authority for Test; or
- allow the rearrangement of equipotential bonding when working under induced voltage conditions or changing from bonded earth-mat conditions to fully insulated conditions in accordance with approved procedures; or
- allow equipment to be dismantled or replaced as permitted by Access Authority conditions.

#### 8.6.6 *Identification of high voltage underground cables*

Before working on high voltage cables remote from their exposed terminals it is essential that they be positively identified.

If a cable cannot be positively identified by tracing the cable visually throughout its entire length from one point of isolation where an earth can be applied, at least two approved cable identification methods shall be used. Methods for identification of cables may include:

- newly installed, unearthed cable that can be physically traced by means of the installation process and pulling eyes;
- using a signal generator and sensing device connected to the cable cores from point of isolation (Access Authority for Test is required);
- the use of a direct current tong ammeter to detect a pulse or ramp of direct current injected at the point of isolation (Access Authority for Test is required);
- detection of tracer gas injected at a point of isolation in the case of gas filled cables where the gas is leaking at the work site (use of this method alone is not an acceptable means of identification);
- where pressure loss from an oil filled cable is monitored at a point of isolation, and other cables in the vicinity are checked for pressure loss (use of this method alone is not an acceptable means of identification);
- using a low voltage impedance measurement device applied to an insulated sheath or screen of a cable at a point of isolation to detect an applied interrupted sheath fault connected at the point of work;
- with faulted cables, a surge generator (thumper) injection may be carried out and visual confirmation at the fault site of the resulting arcing effect (Access Authority for Test is required).

When the cable has been identified, it shall be suitably labelled by the identifying officer by attaching a metal tag with sealing wire and seal. The tag shall be inscribed with the voltage of the cable, substation and switch numbers or geographic location of other ends, date of identification and identity of the identifying officer.

Alternatively, unterminated cables left above ground in substations or other enclosures which provide protection from the elements may be clearly identified by information written on the cable serving with a permanent marker pen.

A cable that has been identified greater than four weeks previously or the label is missing or illegible must be identified again in accordance with these rules.

A cable which is terminated to labelled apparatus at both ends is identified in accordance with these rules.

Where a cable is connected at one end only, a Warning Tag shall be attached to the apparatus at the connection point to indicate the cable is not able to be energised, and identify the location of the remote end.

All unterminated cable ends shall be short-circuited (for example using 80A fuse wire) to assist cable identification and manage the risk of induction. The short circuiting wire shall be brought out from under any cable end caps to be accessible for testing, and be earthed where practical. Additionally, all unterminated cable ends shall be labelled in accordance with this clause to identify the location of the remote end.

#### *8.6.7 Other cables laid adjacent to power cables*

Where other cables and power cables are laid together additional precautions are necessary to identify the correct cable.

Except where it is possible to positively identify the cable in accordance with Clause 8.6.6, both the communications cable and power cable shall be identified as a double check (this may require both to be isolated).

#### *8.6.8 Proving high voltage cables de-energised by spiking*

Following identification of the cable at the work site, the cable shall be spiked (by approved means) at the work site to prove it is de-energised, except as provided for in Clause 8.6.9. The spiking equipment used shall be remotely operated.

Where for some reason it is impossible to identify a cable using electrical or physical methods, or to prove it de-energised by testing, it shall be spiked, and the spiking equipment used shall be remotely operated.

#### *8.6.9 Work on high voltage de-energised cables without spiking*

Work may proceed on a high voltage cable without spiking provided that at least one of the following conditions has been fulfilled:

- the identification process has involved tracing a clearly visible cable, where the view of the cable is not hidden by any form of coverage, throughout its entire length or from a point of isolation where an earth can be applied; or
- three (3) different methods of identification in accordance with Clause 8.6.6 above are used; or
- the cable concerned has a metallic sheath or screen, has been identified in accordance with Clause 8.6.6 and the work does not involve the penetration of the metallic sheath or screen, therefore not interfering with the primary cable insulation.

*8.6.10 Deleted (content moved to 6.36)*

### **8.7 Deleted (content moved to 6.23)**

### **8.8 Work on electrical apparatus not owned by Endeavour Energy**

All work on electrical apparatus not owned by Endeavour Energy is to be carried out in accordance with the electricity safety rules and procedures of that authority, unless they afford an inferior safety outcome to these Rules.

## 9.0 HIGH VOLTAGE LIVE WORK

### 9.1 Scope

This section of the Electrical Safety Rules relates to High Voltage Live Work (HVLW) on the Company's high voltage transmission and distributions system and includes work in live HV switchyards. It does not cover work on live low voltage systems which is covered in section 7 of these rules.

All HVLW work shall be conducted in accordance with Division Procedure (Network) GNV 1072.00 – High Voltage Live Work Safety and approved supporting procedures.

### 9.2 Safety – General

#### 9.2.1 Identification of the worksite

Before HVLW commences the worksite **shall** be clearly identified by all members of the work party.

#### 9.2.2 Communication

The Worksite coordinator **shall** ensure that there is at least one form of secure communication method to the System Operator. If communication with the System Operator is not possible work shall not proceed.

Effective communication must be established and maintained between all members of the work party and shall be limited to the work being performed.

#### 9.2.3 HVLW Permit

Before any live work commences, an authorised person **shall** receive clearance from the System Operator and shall issue a live work permit to the work party, which shall be read and understood by all members of the work party.

#### 9.2.4 Live Line Manual

A Live Line manual **shall** always be available at the worksite and shall be referenced when discussing the work procedures or techniques to be employed to perform the work method.

The manual **shall** be kept up to date with all amendments that have been issued.

#### 9.2.5 Training and Authorisation

All HVLW staff **shall** be appropriately trained and suitably authorised to perform the live work procedures or techniques associated with the work method to be performed.

#### 9.2.6 Minimum Approach Distances

Minimum Approach Distances to exposed HV live conductors in accordance with Table E below, **shall** be maintained at all times. Where these distances cannot be maintained the work shall not proceed until either the distance can be maintained via other arrangements or suitable HV insulation is established.

**Table E – Minimum Approach Distances for High Voltage Live Work**

<b>HV LIVE WORK MINIMUM APPROACH DISTANCE (MAD)</b>				
<b>Situation</b>	<b>Stick Method</b>			<b>Glove and Barrier Method</b>
	<b>11kV –22kV</b>	<b>33kV</b>	<b>66kV</b>	<b>11kV – 33kV</b>
H.V. Live worker working on energised conductors and apparatus	500mm	600mm	700mm	Contact wearing approved insulated gloves and sleeves
HV Live worker working on energised conductors and apparatus <b>in relation to the insulated phase behind</b>	500mm	600mm	700mm	11kV – 100mm 22kV – 200mm 33kV – 300mm
HV Live Work EWP <b>insulated section to uninsulated conductors and apparatus</b>	11kV-100mm 22kV-200mm <b>Refer Note 1</b>	300mm <b>Refer Note 1</b>	1000mm <b>Refer Note1</b>	300mm <b>Refer to Note 2</b>
HV Live work EWP <b>insulated section to insulated conductors and apparatus</b>	11kV-50mm 22kV-100mm	150mm	1000mm	Brush Contact
HV Live work EWP, mobile plant and borer <b>non-insulated section to (uninsulated conductors)</b>	700mm	1000mm	1000mm	11kV-700mm 22kV-700mm 33kV-1000mm
HV Live Work EWP, Mobile Plant and borer Erector, <b>non insulated section (to single insulated conductors)</b>	11kV-350mm 22kV-400mm	450mm	1000mm	11kV-350mm 22kV-400mm 33kV-450mm
Mobile Plant load (e.g. pole) <b>double insulated, where the load is insulated and the conductors are insulated</b>	Brush Contact	Brush Contact	1000mm	Brush Contact
Phase to phase distance <b>(the distance to be maintained between phases when moving the conductors)</b>	11kV-350mm 22kV-425mm	550mm	900mm	11kV-350mm 22kV-425mm 33kV-550mm

**Note 1:** In relation to insulated sections of the EWP Booms to uninsulated apparatus/conductors.

**Note 2:** In relation to the circuit below the EWP basket when work between circuits.

### 9.2.7 Suspension of work

Work may be suspended by the System Operator or the work crew due to network or work site contingencies.

Work **shall** be suspended if it is necessary for the System Operator to carry out any switching involving the circuit being worked on.

When it is necessary for the work crew to suspend work, the System Operator **shall** be notified.

When work is suspended the worksite and associated circuitry **shall** be left in a safe condition. Work **shall** not recommence until clearance has been obtained from the System Operator.

### 9.2.8 Safety Observers

A dedicated Safety Observer **shall** be appointed and shall not perform any other task whilst HVLW is in progress.

The Safety Observer **shall** maintain effective and immediate communication with other members of the work party at all times.

### 9.3 Live Work Permit

**Work on live high voltage electrical apparatus shall be carried out under a LIVE WORK PERMIT**, where an authorised person shall, in accordance with approved procedures:

- **IDENTIFY** the approved high voltage live work method to be used; and
- **CONFIRM** that the worksite is at the required electrical and geographical location; and
- **CONFIRM** that all necessary temporary protection alterations are made on circuits impacting the work site; and
- **IDENTIFY** all site risks and ensure that risk management controls are in place; and
- **SELECT** the correct temporary insulation to be used and comply with all Minimum Approach Distances; and
- **ADOPT** all Safe Working Principles for the work method selected; and
- **COMPLY** with all the requirements of the approved techniques and/or procedures selected for the work; and
- **ISSUE** the live work permit.

Also **THE LIVE WORK PERMIT HOLDER** shall:

- **SATISFY THEMSELVES** that the Live Work Permit will allow the work to be carried out safely; and
- **SIGN ON** to the Pre Job/Post Job Live Line Working Check Sheet;
- **CONFIRM** all members of the working party understand and initial the Pre Job/Post Job Live Line Working Check Sheet prior to commencing work.

### 9.4 Coordination of HV Live Work and Access Authority Work on the same worksite

Live work and work under an access authority shall only be conducted on the same work site providing that:

- (i) A single task coordinator is appointed for the work site, who is an authorised HV live worker, who remains on the ground, and whose sole responsibility is to directly supervise whenever any work is being carried out;
- (ii) In situations where HV live work and access authority work methods are to be used separately, clear transition points shall exist between the HV live work and the work undertaken under the access authority. The transition process must include the work party obtaining clearance from the task coordinator to transition from HV live work to work under AA conditions, or from work under AA conditions to HV live work before proceeding. Additionally, HV live work PPE shall be left on the ground when HV live work methods are not in use;
- (iii) In situations requiring HV live work and access authority work methods to be used simultaneously, HV live work personnel must be signed on to the HV live work permit and the access authority before ascending to perform the HV live work, and must wear HV live work PPE for all work aloft;
- (iv) All conductors that have been moved or repositioned are secured using the appropriate techniques and equipment; and

- (v) Safe approach distances as required by the Company's Electrical Safety Rules are established and maintained by either using HV live work methods or using appropriate equipment between the live circuit and access authority clearance area.

### 9.5 De-energised work

If a live line trained crew are to perform work on a feeder that is de-energised due to fault and emergency reasons (i.e. in response to an unplanned event, and not at the request of the live line staff), and approved live line procedures can be safely employed such that if the line were to become re-energised there would be no impact to the safety of the work, then this work may proceed under direction of the System Operator.

High voltage live line work is not able to proceed if the network is requested to be de-energised for any reason.

### 9.6 HVLW Equipment

HVLW equipment includes the following:

- **PPE** - hard hats, clothing, boots, eyewear, sleeves and gloves;
- **Tools** – sticks, rods, supports, clamps, etc used to perform HVLW;
- **Insulation** – rigid covers, mats; and
- **Scaffolding** – rated and approved HVLW scaffolding and platforms

All HVLW equipment **shall** be designed, tested and approved specifically for high voltage live work.

All HVLW equipment **shall** be inspected for damage, dust and dirt prior to work commencing. Equipment that has a test label shall be checked to ensure that the equipment is within test date.

Any defective HVLW equipment shall be tagged, returned for assessment and/or repair/tested or disposed immediately if required.

### 9.7 Temporary Insulation

Temporary insulation **shall** be used to ensure that the worksite is safe to prevent personal inadvertent contact with electrical apparatus a different potential.

It is not intended to use HVLW covers to provide long term insulation.

### 9.8 Switching and Protection Requirements

Prior to live work commencing the network and associated protection systems shall be configured to ensure the safety of the work crew and the integrity of the network.

### 9.9 Mobile Plant

For all work, all EWP's to be used for the work method **shall** be inspected and rated to ensure it is suitable for the work to be performed.

EWP's **shall** have an appropriate electrical test certificate and a stability test certificate.

The mobile plant **shall** be treated as alive and all persons at ground level shall keep clear and avoid contact when in use for HVLW.

The chassis of the plant **shall** be electrically connected to an effective earth point before any HVLW procedures are carried out.

#### **9.10 HVLW Mechanical Tension and Loading Calculations**

All tensions and loads to be contained **shall** be assessed to ensure that they can be safely controlled.

The assessment **shall** be checked by another authorised HVLW worker.