

Electrical infrastructure safety rules

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ACCOUNTABILITIES AND ROLES

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RELATED LEGISLATION & DOCUMENTS

These rules operate under the most current versions of the legislation and regulation listed below:

Name

Rail Safety Act (Local Operations) (Vic)

Rail Safety (Local Operations) (Safety & Accreditation) (Vic)

Victorian Traction Industry Electrical Safety Rules

Occupational Health and Safety Act (Vic)

Occupational Health and Safety Regulations (Vic)

Electricity Safety Regulations (Vic)

AS3000 Wiring Rules

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PURPOSE

The purpose of the Electrical Infrastructure Safety Rules is to keep workers safe when they are exposed to the hazards of working on, *Near*, or in the *Vicinity* of the Yarra Trams electrical infrastructure.

Safety is Yarra Trams' highest priority and these Safety Rules are an essential part of Yarra Trams Safety Management System.

Use of the word "*Shall*" indicates mandatory provisions. Defined terms are identified in the text by italics and are explained in the definitions on page 13.

SCOPE

This document sets out *Approved* rules for safe access to Yarra Trams electrical infrastructure.

APPLICATION

These Electrical Infrastructure Safety Rules apply to Yarra Trams electrical infrastructure located in or associated with:

- Substations;
- Tram Stops;
- Overhead infrastructure;
- Underground Infrastructure;
- Track Infrastructure; and
- Tram Depots.

Yarra Trams Safety Management System including the Electrical Safe Systems of *Work* apply to all *Work* undertaken within the Categories of these Safety Rules.

The Yarra Trams Electrical Infrastructure Safety Rules are fully compatible with the Victorian Traction Industry Electrical Safety Rules (2014) (the "Orange Book") produced by Energy Safe Victoria. It is therefore mandatory to be trained and operate only under these Yarra Trams Electrical Infrastructure Safety Rules. Any apparent discrepancies or ambiguities should be referred to the Safety Rules Committee.

RESPONSIBILITIES

All persons working under these Rules *Shall* comply with them fully. If it is unclear how these Rules are to be applied, it is the responsibility of the individual to seek clarification before proceeding.

Any person found not complying with these Rules will be subject to cancellation of their Authorisation. Yarra Trams staff will be subject to disciplinary action and wilful non-compliance will be treated as extremely serious and may result in dismissal of the employee or employees concerned.

Electrical Infrastructure Safety Rule amendments *Shall* be proposed by the Safety Rules Committee prior to approval by the CEO.

All persons required to *Work* under these Rules *Shall* have access to a current copy of the Electrical Infrastructure Safety Rules. The Electrical Infrastructure Safety Rules *Shall* be distributed using an *Approved* document control process.

STRUCTURE OF AUTHORISATIONS

CATEGORY 1		
Safe Access to <i>Substations</i> (Observation Only)		
CATEGORY 2		
<i>Work in Substations</i> (General)		
2.1 <i>Work</i> on General Facilities		
2.2 <i>Work</i> on Buildings / Building Services		
CATEGORY 3	CATEGORY 4	CATEGORY 5
<i>Work in Substations – ELV, LV & Mechanical</i>	<i>Work in Substations – Traction Voltage</i>	<i>Work in Substations – High Voltage</i>
3.1 <i>Work</i> on Extra Low Voltage Equipment	4.1 <i>Work</i> on Traction Voltage Equipment	5.1 <i>Work</i> on High Voltage Equipment
3.2 <i>Work</i> on Low Voltage / Mechanical Equipment Under the control of the Network Controller	4.2 Receipt of a Traction Voltage Access Authority	5.2 Receipt of High Voltage Access Authority
3.3 Receipt of a Low Voltage / Mechanical Authority	4.3 Traction Voltage Testing	5.3 High Voltage Testing
3.4 Issue a Low Voltage / Mechanical Authority	4.4 Issue a Traction Voltage Access Authority	5.4 Issue a High Voltage Access Authority
	4.5 Operate Traction Voltage Switchgear	5.5 Operate High Voltage Switchgear

CATEGORY 6	CATEGORY 7
<i>Work</i> on Electrical Infrastructure Outside <i>Substations</i>	Electrical Network Access and Operation
6.1 <i>Work</i> in Tram Corridors not Under the control of the Network Controller	7.1 Applications for Access
6.2 <i>Work</i> on LV Equipment Excluding Overhead Infrastructure	7.2 Assessing an Application for Access
6.3 <i>Work</i> on Electrical Infrastructure outside of <i>Substations</i> – General	7.3 Producing a Switching Program
6.4 Working under a Dead Line Access Authority	6.7 Working under a Live Line Overhead Electrical Working Authority
6.5 Receipt of a Dead Line Overhead Access Authority	6.8 Receipt of a Live Line Overhead Working Authority
6.6 Issue a Dead Line Overhead Access Authority	6.9 Issue a Live Line Overhead Working Authority
6.10 Operate Switchgear outside of <i>Substations</i>	7.4 Operating Switchgear via SCADA

ASSOCIATED DOCUMENTATION

Electrical Infrastructure Safety Rules

CATEGORY 1

SWMS PC 0014 01 – Substation Access PSU

CATEGORY 2

SWMS PC 0014 01 – Substation Access PSU

SWMS PC 0002 – Maintaining Substation SCADA Equipment

Provision of Electrical Permits

Provision of Standard Isolation Programs Work Instruction

CATEGORY 3

SWMS PC 0014 01 – Substation Access PSU

Lockout Tagout of Electrical Apparatus (non-HV)

Substation Technical Support FaultRepair & Reactive Maintenance

Managing Substations Planned Preventative Maintenance

Planning Power & Overhead Work

Managing Power & Overhead Corrective Work

Managing Power & Overhead Preventative Maintenance

Provision of Electrical Permits

Provision of Standard Isolation Programs Work Instruction

Preparation of Application to Work on or in the Vicinity of Electrical Apparatus

CATEGORY 4

SWMS PC 0014 01 – Substation Access PSU

Lockout Tagout of Electrical Apparatus (non-HV)

Substation Maintenance Support Section – PPM of High Speed Circuit Breakers

Managing Substations Planned Preventative Maintenance

SWMS PC 0012 – Switching and Short Circuiting

Application for Approval to Place Electrical Installation into Service

Coordination of Installation of Electrolysis Drainage Equipment

Planning Power & Overhead Work

Managing Power & Overhead Corrective Work

Managing Power & Overhead Preventative Maintenance

Provision of Electrical Permits

Provision of Standard Isolation Programs Work Instruction

Preparation of Application to Work on or in the Vicinity of Electrical Apparatus

SWMS OH 0014 – Underground Feeder Cable Installation

CATEGORY 5

SWMS PC 0014 01 – Substation Access PSU

Managing Substations Planned Preventative Maintenance

SWMS PC 0013 01 – Switching High Voltage Apparatus

Charting Electrolysis Voltages & Currents – Install of HV Isolation Installation Board

Planning Power & Overhead Work

Managing Power & Overhead Corrective Work

Managing Power & Overhead Preventative Maintenance

Provision of Electrical Permits

Provision of Standard Isolation Programs Work Instruction

Preparation of Application to Work on or in the Vicinity of Electrical Apparatus

CATEGORY 6

Lockout Tagout of Electrical Apparatus (non-HV)
Overhead Electrical Schedule Trolley Wire Examinations
SWMS OH 0007 – Working Dead Line
SWMS OH 0008 – Working Live Line
SWMS OH 0002 – Overhead Network Fittings Installation and Removal
SWMS OH 0009 – Battens, Bunting and Insulating Mats Installation
Overhead Electrical System – TMP Servicing Schedule
Drop Zone Management Task Card
Managing Power & Overhead Corrective Work
Managing Power & Overhead Preventative Maintenance
Provision of Electrical Permits
Provision of Isolation Programs
Overhead Electrical System Servicing Schedules
Preparation of Application to Work on or in the Vicinity of Electrical Apparatus
Standing Overhead Poles Live
SWMS TM 0020 Supply 600VDC to Automatic Points and Signals
SWMS OH 0016 600 VDC Supply Connection to Automatic Points Control Fuse Box
Tram Overhead Works Commissioning
SWMS OH 0005 Lifting the Wire – Escorting High Load Vehicles

CATEGORY 7

Tram Electrical System Diagram Issue
Control Room Endorsement System
Provision of Electrical Permits
Provision of Standard Isolation Programs Work Instruction
Power Centre Log Sheet Entries
Preparation of Application to Work on or in the Vicinity of Electrical Apparatus

TRAINING & COMPETENCY

Persons who require authorisation under these Rules *Shall* be trained and assessed as *Competent* in the relevant categories.

Authorised Persons *Shall* be reassessed at prescribed intervals in accordance with Yarra Trams Tram Electrical Network Authorisation Requirements. Failure to undertake reauthorisation will result in the withdrawal of the authorisation.

Provision for Young People / Persons in Training

Persons under the age of 18 years *Shall* not be authorised under these Electrical Infrastructure Safety Rules.

Apprentices *Shall* not be authorised to a level that would require them to supervise other persons.

Personal Protective Equipment

All personnel working on Yarra Trams equipment *Shall* wear the Approved *Personal Protective Equipment (PPE)* for the task being undertaken, in accordance with the *Personal Protective Equipment Policy (SS-001-PO-0005)* and *Personal Protective Process (SS-022-PR-0001)* as well as the relevant *Safe Work Method Statements* for the Work.

Work Involving Apparatus of Other Organisations

1. Distribution Business staff working on their own *Apparatus* in Yarra Trams *Substations*:
 - Distribution Business staff *Shall Work* under their own safety rules when working in Yarra Trams *Substations* and *Shall* be authorised under Category 1 to allow them unaccompanied access to *Substations*
2. Contractors working on Yarra Trams *Apparatus* in Yarra Trams *Substations*:
 - Contractors *Shall* be either be authorised under these Safety Rules to the category appropriate to the *Work* being undertaken, or *Shall Work* as *Instructed Persons*.
3. *Work* on *Rail Squares*:
 - *Work* on assets shared between railways and Yarra Trams *Shall* be conducted under the railway safety rules and relevant Safety Interface Agreements.
4. *Work* on shared assets (poles)
 - Working on shared assets between distribution companies and Yarra Trams *Shall* be conducted under the electrical safety rules of the organisation conducting the *Work*.

Work on Apparatus Not Electrically Connected

During the construction, installation and dismantling of *Electrical Apparatus*, it can be made *Not Electrically Connected* and therefore exempt from the requirements for working under An Access Authority. All other requirements of these Safety Rules *Shall* be complied with.

The requirements for making *Electrical Apparatus Not Electrically Connected* are explained under Categories 4, 5, & 6.

DEFINITIONS

Access Authority/ies (AA)

Any form of authorisation which allows access to work on or near, or testing, of apparatus.

Alternating Current (AC)

Alternating Current electricity supply.

Application for Access (AFA)

A formal request for work which shall be submitted in writing.

Apparatus

Electrical and mechanical Apparatus including SCADA and electrical control schemes.

Approved

Having appropriate organisational endorsement in writing for a specific function.

Assess/Assessment

Formal review of proposed work to determine whether safety of personnel is involved and hence whether an access authority will be required or operating procedures will apply.

Authorised Applicant

A person who has been assessed as Competent to an approved training standard to make application.

Authorised Recipient

A person who has signed on an access authority.

Authorised Person

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

Barriers

A physical device used to prevent access to, or contact with, electrical apparatus. Barriers must be approved for their intended application. Barriers can include approved insulating materials used to provide an insulating screen, of approved design, between persons and electrical apparatus.

Bonded

Connected together in such a manner as to ensure that all connected parts are maintained at the same potential.

Bonding Leads

An approved conductor which is used when seeking to create an equipotential work area.

Bridging Leads

An approved conductor which is used to maintain a current path when a conductor is to be broken or disconnected.

Circuit Breaker

A device capable of making, carrying and breaking currents under normal and abnormal circuit conditions, such as short circuit.

Cable

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

Competent

Having the skills, knowledge and attributes a person needs to complete a task. Persons assessed as competent also require the appropriate authorisation for work in relation to the tram electrical network.

Conductor

A wire or form of metal designed for carrying electrical current.

Connected

Joined together by a conductor capable of carrying electrical current for its required function or purpose. This could be by either physically clamping or bolting conductors together or closing a circuit breaker, switch or similar device.

Control Measures

Policies, standards, procedures or actions to eliminate, avoid or minimise risks.

Direct Current (DC)

Direct current electricity supply.

Dead Line Overhead Access Authority

An access authority which allows access to, and work on, overhead electrical apparatus under isolated conditions.

De-Energised

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

Description of Work

A description of the work to be carried out, sufficient to allow appropriate steps to be identified to make the apparatus safe for work.

Designated Work Area

A clearly defined work area associated with an access authority for work on apparatus.

Device

Any instrument or device designed for the use near or in direct contact with live high voltage conductors.

Discharged

Having been connected to the general mass of earth or short-circuited in such a manner as to remove any residual electrical energy in a conductor.

Do Not Operate Tags

An approved tag, used in accordance with approved procedures, warning of a particular hazard or hazardous condition that is likely to be life threatening. The tag is affixed to a device as an instruction against the operation of the device.

Earthed

Directly electrically connected to the general mass of earth so as to ensure and maintain the effective dissipation of electrical energy.

Electrical Apparatus

Any electrical apparatus, including overhead lines and underground cables, the conductors of which are live or can be made live.

Electrical Operating Work

Work involving the operation of switching devices, links, fuses or other connections intended for ready removal or replacement, proving electrical conductors de-energised, earthing and short circuiting, locking and/or tagging of electrical apparatus and erection of barriers and/or signs.

Energised

Connected to a source of electrical supply.

Equipotential Work Area

A work area (zone, site) where all apparatus is interconnected by hoppers, earths, earth rods, and / or earth grids that will provide acceptable potential differences between all parts of the work area under worst-case conditions of energisation.

Extra Low Voltage (ELV)

A nominal voltage not exceeding 50 volts *alternating current* or 120 volts ripple free DC.

Typical:

- 50V DC alarm supplies;
- 110V DC control supplies.

Enclosed Apparatus

Apparatus which is not accessible without operating interlocking mechanisms or isolations to access the apparatus.

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.

High Voltage (HV)

A nominal voltage exceeding 1000 volts AC, or exceeding 1500 volts DC.

HV Access Authority

An access authority issued for HV work within the boundary of a substation.

HV Testing Authority

A testing authority issued for HV testing within the boundary of a substation.

In Service

The status of electrical apparatus connected to the electrical traction system, or in a condition fit to be connected to the system by closing of installed isolators and / or circuit breakers.

Instructed Person

A person adequately advised, inducted or supervised by an authorised person to enable them to avoid the dangers that electricity may create.

Insulated

Separated from adjoining conducting material by a non-conducting substance. This provides resistance to the passage of current, to disruptive discharges through or over the surface of the substance at the operating voltage. It aims to mitigate the danger of shock or injurious leakage of current.

Insulated Mobile Plant

Mobile plant approved and tested for carrying out work on or near electrical apparatus.

Isolated

Not connected to any possible sources of electricity supply by means that will prevent unintentional re-energisation of the electrical apparatus. It is assessed as a suitable step in the process of making safe for access purposes.

Isolator

A non-load breaking device that when opened, provides the appropriate designed clearances from electrical conductors. It aims to prevent accidental or inadvertent energisation of some part of the circuit.

Live

Energised or subject to hazardous induced or capacitive voltages.

Live Work

All work performed on components of electrical apparatus not isolated, not proved de-energised and not earthed or short circuited.

Live Line Overhead Working Authority

A working authority issued for overhead work performed on overhead electrical apparatus not isolated under live conditions.

Low Voltage (LV)

Nominal voltage exceeding 50V AC or 120V DC, but not exceeding 1000V AC or 1500V DC.

LV/Mech Isolation Authority

An isolation authority issued for low voltage work performed on apparatus within a substation.

LV/Mech Testing Authority

A testing authority issued for LV testing within the boundary of a substation.

Mobile Plant

Cranes, elevating work platforms, tip trucks, any apparatus fitted with a jib or boom, and any device capable of raising or lowering a load. Mobile plant can only be considered as a vehicle when in the normal travelling mode, not in the working mode when determining safe approach distances.

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.

Negative

The electrical return path of a traction DC network.

Network Asset

Any asset that is owned or operated by a network operator for the purposes running the train/tram electrical traction system of the network operator.

Negative Conductor

Rail, negative bus connections or cabling, poles/structures bonded to the negative rail.

Network Controller

The approved owner, controller or operator of all or a designated part of the tramway system.

Not Electrically Connected

Disconnected from all sources of supply by the removal or absence of conductors, appropriate to the voltage and insulating medium. It is not able to be made live by normal operating means and identified in accordance with approved procedures.

Ordinary Person

A person without sufficient training or experience to enable them to avoid the dangers which electrical apparatus may create. Note: ordinary person refers to a person under the control of Yarra Trams.

Permit to Work

Work required to be undertaken in tram corridors by parties not under the control of Yarra Trams shall be carried out in accordance with No Go Zone guidelines and Yarra Trams approved procedures.

Personal Protective Equipment (PPE)

Approved clothing, apparatus and / or substances, which when worn or correctly used, protect parts or all of the body from foreseeable risk of injury or disease, at work or in the workplace.

Rail

Part of the return circuit of traction power supply system that is connected to the negative bus at the source of supply.

Recipient in Charge

An authorised recipient to whom an access authority has been issued, and who is in charge of all recipients signed on that access authority.

Safe Approach Distances (SAD)

The minimum distance in air from exposed conductors that shall be maintained by a person, vehicle or mobile plant when approaching electrical apparatus other than for work in accordance with an access authority. This includes its load, controlling ropes and any other accessories. It excludes rail in the DC work environment.

Safety Observer

A person with sufficient knowledge of the task being performed and competent for the duty of observing and warning against unsafe approach to electrical apparatus.

Statement of Condition of Apparatus and/or Plant (SCAP)

A statement issued by the network operators to other network operators to confirm the condition of specified apparatus and/or plant during the currency of the statement. A SCAP does not authorise access to or work upon the apparatus or plant.

Shall

To be interpreted as mandatory.

Short Circuiting

The connection by a low resistance path between two or more points in an electrical circuit. In the DC traction system, a connection by an approved device between the positive conductor of traction voltage apparatus to rail or rail-connected negative conductor of the apparatus.

Short Circuit Device

An approved device used for short-circuiting of DC electrical apparatus.

Substation

Any enclosed or fenced location in which high voltage supply is generated, converted, controlled or transformed.

Supply

Supply of electricity.

Switch

A device capable of making and breaking load currents. A switch may also serve as an isolator.

Switching Program

A written instruction, prepared in accordance with approved procedures setting out the safe sequence of steps required to:

- Prepare apparatus and make it safe for the Work and/or Test as described in the Request For Access; and/or
- Return the apparatus to service;
- Take apparatus out of service for plant security.

Each switching program shall have a unique number.

Testing / Test

Work where the modification of some or all safety isolations or access authority earths is necessary and as a result, additional safety precautions are required to be implemented to ensure the safety of personnel.

Traction Voltage (TV)

The traction voltage is that potential voltage that normally exists on the tram traction system and is nominally 600V DC.

A nominal voltage of 600V DC (for trams) and 1500V DC (for trains).

Tram Corridor

Any area where tram network apparatus exists.

TV Access Authority

An access authority issued for TV work within a substation and extending to the aerial switch.

TV Testing Authority

A testing authority issued for TV testing within a substation and extending to the aerial switch.

Under the control of the Network Controller

Any apparatus that can directly or indirectly affect the operation of the power system.

Vehicle/s

A truck, car, utility, or other general purpose conveyance used for the carriage of persons or goods. (See also *Mobile Plant*).

Vicinity

A situation where it is unlikely that a person will, either directly or through any conducting medium (e.g. via *Mobile Plant*), come within the relevant safe approach distances.

Visible break

The point at which conductors are visibly separated by a distance appropriate for the insulating medium and the nominal voltage.

Warning Tag

An approved tag, used in accordance with approved procedures affixed to a device as a warning that this device shall not be operated, except as indicated on the tag.

Work

When a person enters a substation for the purpose of effecting some degree of change, then work is being undertaken.

If the purpose of entry is to observe only (i.e. to look, measure or photograph without coming into contact with Substation apparatus), then work is not being undertaken.

SAFE APPROACH DISTANCES

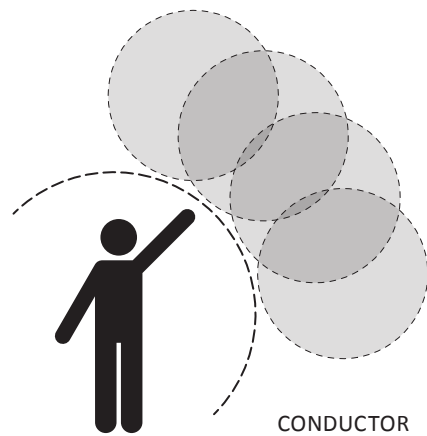
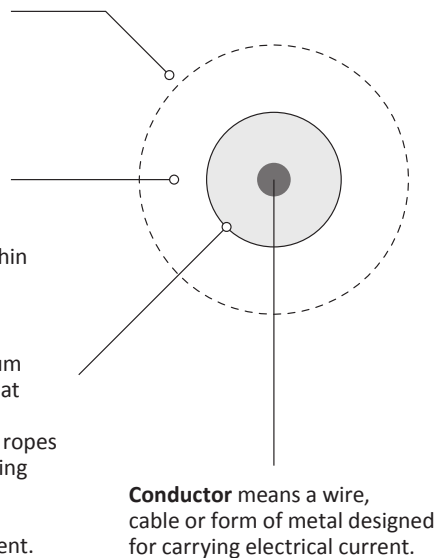


FIGURE 1 SADS

Vicinity means a situation where it is unlikely that a person will, either directly or through any conducting medium (e.g. via mobile plant), come within the relevant **safe approach distances**.

Near means a situation where there is a reasonable possibility of a person, either directly or through any conducting medium (e.g. via mobile plant), coming within the relevant **safe approach distances**.

Safe approach distance means the minimum distance in air from exposed conductors that shall be maintained by a person, *vehicle* or *mobile plant* (including its load, controlling ropes and any other accessories) when approaching *electrical apparatus* other than for work in accordance with an *access authority*. This excludes rail in the DC work environment.



Conductor means a wire, cable or form of metal designed for carrying electrical current.

FIGURE 2 APPROACH DESCRIPTIONS

Table 1: Safe approach distance for persons to Exposed Conductors

Nominal phase to phase AC voltage	Ordinary Persons	Instructed Persons 1 & 2	Authorised Persons 1, 2 & 3
LV Aerial Lines	1500mm	300mm	Insulated Contact Only
1.0kV to 2.2kV	2000mm	700mm	Insulated Contact Only
2.2kV to 6.6kV	2000mm	1000mm	1000mm
6.6kV	2000mm	1000mm	1000mm
11kV	2000mm	1000mm	1000mm
22kV	2000mm	2000mm	2000mm
33kV	2000mm	2000mm	2000mm
50kV	2000mm	2000mm	2000mm
66kV	2000mm	2000mm	2000mm
Nominal DC voltage			
LV DC Aerial Lines (less than 600V)	1500mm	300mm	Insulated Contact Only
DC (not less than 600V not greater than 1500V)	2000mm	300mm	Insulated Contact Only

Notes:

1. Deliberately avoid movements that could result in distances being infringed
2. These distances specified are based on *Work* from a stable surface. Appropriate allowance *Shall* be made for Conductor sag and sway
3. Requires Yarra Trams Approved SWMS

Table 2: Safe approach distance - special for *Authorised Persons* only to *Exposed Conductors* in *Enclosed Apparatus* (i.e. *Switchboard*)

Nominal phase to phase AC voltage	Authorised Persons 1, 2, 3 & 4
LV	<i>Insulated</i> contact only
Not less than 1.0kV Not greater than 2.2kV	450mm
6.6kV	2000mm
11kV	2000mm
22kV	2000mm
33kV	2000mm
50kV	2000mm
66kV	2000mm
Nominal DC voltage	
600V	<i>Insulated</i> contact only ⁵
1500V	<i>Insulated</i> contact only ⁵

Notes:

1. Deliberately avoid movements that could result in distances being infringed
2. These distances specified are based on *Work* from a stable surface.
Appropriate allowance *Shall* be made for *Conductor* sag and sway
4. Excludes *Testing* and commissioning
5. Excludes *Work* done in *Substations* by Authorised Persons who are not Authorised Electrical Operators

Table 3: *Safe Approach Distances* for *Vehicles* (does not include *Mobile Plant* in working mode)

Nominal Phase to Phase Voltage (AC)	Vehicles under the control of Ordinary Persons	Vehicles under the control of Instructed Persons or Authorized Persons
Low Voltage	600mm	600mm
HV up to and including 33kV	1000mm	700mm
50kV	1000mm	750mm
66kV	1000mm	1000mm
Nominal DC voltage		
600V	700mm	600mm
1500V	700mm	600mm

Table 4: Safe approach distance for *Mobile Plant* to exposed *Live* conductors in the working mode

Nominal phase to phase voltage (AC)	Mobile Plant under the control of Ordinary Persons ^{1 & 3}	Mobile Plant under the control of Instructed Persons or Authorized Persons ^{1 & 2}
Low Voltage	2000mm	1000mm
HV up to and including 33kV	2000mm	1200mm
50kV	2000mm	1300mm
66kV	2000mm	1400mm
Nominal DC voltage		
600V	2000mm	1200mm ⁴
1500V	2000mm	2000mm ⁴

Notes:

1. All distances specified are based on *Work* from a stable surface.
Appropriate allowance *Shall* be made for *Conductor* sag and sway and for uncontrolled movement of *Vehicle* or plant due to any reason.
2. A *Safety Observer* is required unless the *Mobile Plant* is incapable of infringing the safe approach distance.
3. Including *Insulated* elevating *Work* platforms.

Table 5: *Safe Approach Distances for Insulated Mobile Plant operated by Instructed Persons or Authorised Persons*

Nominal phase to phase AC voltage (kV)	Instructed Persons ^{1, 2 & 3}		Authorised Persons ^{1, 3 & 4}	
	Insulated portions	Uninsulated portions	Insulated portions	Uninsulated portions
Low Voltage	Contact allowable	1200mm	Contact allowable	1200mm
HV up to and including 33kV	700mm	2000mm	Contact allowable	2000mm
66kV	1000mm	2000mm	Contact allowable	2000mm
Nominal DC voltage kV				
600V	700mm	1200mm	Contact allowable	1200mm

Notes:

1. These distances specified are based on *Work* from a stable surface. Appropriate allowance *Shall* be made for *Conductor* sag and sway, and for uncontrolled movement of the *Mobile Plant* for any reason.
2. For *Ordinary Persons* refer to Table 4: Safe approach distance for *Mobile Plant* to exposed Live conductors in the working mode.
3. For safe approach distance where contact is allowed, care *Shall* be exercised to prevent unsafe movement of conductors.
4. For *Live Work* in accordance with Category 7 for Overhead *Live Line Work*.

1 Safe Access to *Substations* (Observation Only)

1.1 ENTERING A <i>SUBSTATION</i>	29
1.2 DEPARTING A <i>SUBSTATION</i>	30
1.3 ESCORTING PERSONS NOT AUTHORISED	30



This section of the Rules sets down the basic requirements for safe access to *Substations* for the purpose of observation only.

The following document supports this section of the Safety Rules:

Category 1

SWMS PC 001401 Substation Access PSU

Authorisation under Category 1 allows you to:

- Safely access a *Substations* and Switchyards without supervision; and
- Provide “Escorted Access” for others who are not authorised, who remain your responsibility for the duration of their time within the *Substation*.

You cannot:

- Perform *Work*;
- Supervise *Work*; or
- Give others access to perform *Work*.

Distribution business staff who require access to *Work* on their own *Apparatus* within a substation are the exception to this. These persons *Shall* be authorised under this category, however are not authorised to *Work* on Yarra Trams *Apparatus*.

1.1 Entering a *Substation*

Your responsibility before entering a *Substation*:

- Check if anyone requiring access has medical implants that may be affected by electric fields and, if so, refer them to their physician before allowing them access;
- Ensure that everyone in attendance at the *Substation* is fully compliant with the requirements for *Personal Protective Equipment*.

The following items may not be taken into a *Substation*:

- Metal ladders;
- Extendable metal rulers;
- Other long metal objects e.g. umbrella, crutch.

Your responsibilities when entering a *Substation*:

- Close and lock all doors and gates used (or found unlocked);
- Do not allow *Unauthorised Persons* whom you are not escorting to access to the *Substation*;
- Telephone the *Network Controller* immediately to advise your presence. They will advise of any adverse system conditions that could make your presence unsafe.
- Sign in to the *Substation* Log book

Once inside the *Substation*:

- Check the Workplace Risk *Assessment* and Hazard Board for current hazards;
- Observe the requirements of all signage and *Work* areas; and
- Remain at ground level.

1.2 Departing a *Substation*

When departing a *Substation*:

- Advise the Power Control Officer of your departure;
- Sign out in the *Substation* Log book
- Close and lock all doors and gates;

1.3 Escorting Persons Not Authorised

Persons not authorised remain the responsibility of the *Authorised Person* at all times and *Shall* not be left alone at any time. They *Shall* be briefed on the relevant hazards in accordance with the Safe *Work* Method Statements for *Substations*.

2 Work in Substations – General

2.1 WORK ON GENERAL FACILITIES	35
2.2 WORK ON BUILDINGS / BUILDING SERVICES	37



This section of the Safety Rules sets down the requirements for ensuring the safety of personnel when working in *Substations* or *Switchyards*. It covers *Work* that will not affect the operation of the network.

The following documents support this section of the Safety Rules:

Category 2

SWMS PC 0014 01 Substation Access PSU

SWMS PC 0002 Maintaining Substation SCADA Equipment

Provision of Electrical Permits

Provision of Standard Isolation Programs Work Instruction

Persons carrying out *Work* under *Category 2* *Shall* be trained in the specific hazards present in the *Substation* environment relevant to the *Work* and any plant, tools or *Apparatus* to be used. Persons authorised under *Category 2* are Approved to supervise *Instructed Persons* who have been specifically engaged to assist them in carrying out their *Work*, who must remain under their direct supervision at all times.

2.1 Work on General Facilities

Authorisation under category 2.1 is specifically intended for persons working within the *Substation* perimeter and *Substation* building.

Typical *Work* under this category includes:

- Cleaning
- Grass cutting
- Pest control
- Fire extinguisher inspection
- External building *Work* (e.g. painting, guttering) – non-electrical

Persons authorised under this category are not authorised to conduct any electrical *Work*.

2.1.1 Substation Hazards

Prior to undertaking *Work*, hazards *Shall* be identified and controlled. The following hazards *Shall* be considered:

Hazard 1 Use of electrical leads and appliances

- Electrocution or injury. Not all *Substation* power points are protected by Residual Current Devices.

Hazard 2 Battery rooms and associated systems

- Injury as a result of DC electrical contact
- Fumes in battery room
- Explosive battery failures.

Hazard 3 Enclosed spaces

- Injuries may result from close proximity to moving parts on *Switchgear*
- Possible engulfment due to the release of SF6 gas.

Hazard 4 Near Approach

Contact with, or *Near* approach to, a Live *Conductor* can cause severe injuries or death, which can occur by the following means:

- By touching the Live *Exposed Conductor* with any part of the body;
- By bringing any portion of the body so close that an arc occurs between the *Conductor* and the body; or
- By bringing close to, or touching, the Live *Exposed Conductor* with material or *Apparatus*, other than that specifically designed for such contact.

Personnel and plant clearance *Shall* be maintained as specified in “*Safe Approach Distances*” on page 20.

Hazard 5 Suitability of fire extinguishers

- Fire extinguishers marked “Suitable for use on Electrical Fires” are intended for use on *Low Voltage* fires only.

Hazard 6 Large Vehicles, vertically-mounted exhausts and long antennae

- Possibility of large *Vehicles* coming within minimum Safe Approach Distances while entering a *Substation* compound
- *Vehicles* with long antennae may create a similar hazard.

Hazard 7 Fire in the Vicinity of Live Exposed Conductors

- Flame is a good *Conductor* and care *Shall* be exercised when using flame producing *Apparatus* *Near* Live *Exposed Conductors*.
- LPG *Apparatus*, welding torches and similar equipment can, under certain circumstances, throw a long stream of flame.

Hazard 8 Use of metallic tapes and other conductive Apparatus

- Steel tapes, metal-reinforced linen tapes and steel rules *Shall* not be used in *Substations*. Fibre glass tapes *Shall* only be used
- Metal ladders, lengths of conduit or pipe and other similar long items can be a hazard if not handled correctly to keep them from coming *Near* to *Exposed Conductors*.

2.2 Work on Buildings / Building Services

Authorisation under category 2.2 applies to persons working within the *Substation* perimeter and *Substation* building required to carry out building services and other electrical *Work* (*Low Voltage*).

Typical *Work* under this category includes:

- External electrical facilities (e.g. Yard lighting, electrically-operated gates)
- Internal building services *Work* (plumbing, fire detection systems)
- Low-voltage power outlets (GPO)
- Air conditioning
- Lighting systems

2.2.1 Additional Substation Hazards when undertaking Building Services Work

In addition to Hazards 1-8 listed in Section 2.1.1, *Work* under category 2.2 *Shall* also consider the following hazards:

Hazard 9 Induced voltages

- Induced voltages when carrying out *Work* on *Isolated* Electrical *Apparatus* that is located *Near* to Live *Electrical Apparatus*.

Hazard 10 Removal of earth connections

- If an earth connection is removed from a rack or panel, a dangerous voltage may appear across the connection.

Hazard 11 Transferred earth potential

- If a fault occurs within, or adjacent to a *Substation*, there may be a dangerous rise in earth potential.

Hazard 12 Underground services

- Any excavation or digging within a *Substation* boundary may come into contact with underground services, including HV conductors, LV cables, gas, water and sewerage. Isolation and Access Authorities may be required.

2.2.2 Electrical Work

Electrical workers undertaking electrical *Work* *Shall* only be engaged for duties consistent with their authorisation and qualifications.

All electrical *Work* *Shall* be undertaken with a minimum of two persons who are qualified and authorised to perform LV rescue and release.

Note that plumbing is included in this category since pipework is Bonded to the earthing system and so is vulnerable to some of the hazards listed above.

Training under this category *Shall* include the use of appropriate Do Not Operate Tags.

The person authorised under this category *Shall*:

- (a) Participate in a Pre-Work Risk Assessment;
- (b) Confirm that the qualifications of persons performing the electrical *Work* are consistent with the duties required;
- (c) Affix *Do Not Operate Tags* to all devices that isolate the *Apparatus* being worked on, showing the *Authorised Person's* name, date and brief details of why the tag has been affixed;
- (d) Advise all persons working under their supervision of the details of the isolation;
- (e) Where possible, circuit isolating devices *Shall* be locked open and/or covers locked in addition to affixing the Do Not Operate Tag.
- (f) Where fuses or plug-in *Circuit Breakers* are used, these *Shall* be removed and *Do Not Operate Tags* affixed;
- (g) Ensure that all *Exposed Conductors* are *Isolated* from all points of *Supply*;
- (h) Prove that *Exposed Conductors* are *De-Energised* using an *Approved Testing Device*;
- (i) If the *Work* is suspended, then before recommencement of *Work* the integrity of the above isolations is confirmed;
- (j) Ensure that, once *Work* is completed, the *Apparatus* is in a safe condition for returning to service, that all members of the *Work* party have ceased *Work* and have been warned to stay clear;
- (k) Remove the isolation and the associated *Do Not Operate Tags* when safe to do so; and
- (l) Where *Testing* is required, the Person in Charge of the *Test* *Shall*:
 - Ensure that the *Apparatus* is in a safe condition for *Testing*; and
 - Ensure that all persons are kept clear whilst the *Testing* is in progress.

3 Work In Substations – Extra Low Voltage / Low Voltage / Mechanical

3.1 WORK ON EXTRA LOW VOLTAGE EQUIPMENT	43
3.2 WORK ON LOW VOLTAGE / MECHANICAL EQUIPMENT UNDER THE CONTROL OF THE NETWORK CONTROLLER	43
3.3 RECEIPT OF A LOW VOLTAGE / MECHANICAL ISOLATION AUTHORITY	46
3.4 ISSUE A LOW VOLTAGE / MECHANICAL ACCESS AUTHORITY	48



This section of the Safety Rules sets down the requirements for personnel working on *Apparatus* at voltages up to 415V AC and 120V DC within a *Substation* and which cannot be undertaken under category 2.2.

If the *Work* is on *Apparatus* under the control of a *Network Controller*, then a *Low Voltage / Mechanical Access Authority* is required.

The following documents support this section of the Safety Rules:

Category 3

SWMS PC 0014 01 Substation Access PSU
Lockout Tagout of Electrical Apparatus (non-HV)
Substation Technical Support FaultRepair & Reactive Maintenance
Managing Substations Planned Preventative Maintenance
Planning Power & Overhead Work
Managing Power & Overhead Corrective Work
Managing Power & Overhead Preventative Maintenance
Provision of Electrical Permits
Provision of Standard Isolation Programs Work Instruction
Preparation of Application to Work on or in the Vicinity of Electrical Apparatus

3.1 Work on Extra Low Voltage Apparatus

3.1.1 Responsibilities of persons working on Supervisory Control and Monitoring Apparatus (SCADA)

Any personnel carrying out this *Work* *Shall* be trained in the hazards present when working in a *Substation* environment on:

- SCADA *Apparatus*;
- Electrolysis mitigation units (maintenance and inspection not requiring isolations); and
- VicTrack communication box.

An *Access Authority* is not required for undertaking *Work* on the above *Apparatus*.

Persons undertaking this *Work* *Shall*:

- (a) Participate in a Pre-*Work* Risk Assessment;
- (b) Notify the *Network Controller* of the works to be undertaken and any impact to the network
- (c) Maintain *Safe Approach Distances*
- (d) Carry out all works to *Approved* processes
- (e) Ensure that the *Apparatus* is left in a safe condition.

3.2 Work on Low Voltage / Mechanical Apparatus Under the control of the Network Controller

A *Low Voltage / Mechanical Isolation Authority (LV/Mech IA)* is required when *Work* is to be performed on *Low Voltage* (greater than 50V AC / greater than 120V DC) or mechanical *Apparatus* in the charge of a *Network Controller*.

Work under this category *Shall* be performed either by an *Instructed Person* or a person authorised category 3.2.

A *LV/Mech IA* is issued to provide a safe working environment for personnel when working on, or *Near, Exposed Conductors*.

LV/Mech Apparatus in the charge of a *Network Controller* includes:

- Alarms and metering circuits and *Apparatus*;
- Auxiliary supplies;
- Signalling *Apparatus*;
- *LV* or mechanical *Apparatus* requiring *TV* or *HV* out of service for the *LV* or Mechanical *Work*;
- *LV* or mechanical *Apparatus* which, if withdrawn from service, would preclude the associated *TV* or *HV Apparatus* staying *In Service*;
- Protection relays and associated circuitry;

- *Apparatus* associated with the provision of sustained auxiliary supplies;
- Ancillary *Apparatus* for *TV* or *HV Apparatus* such as cooling fans and pumps;
- Batteries and battery chargers; and
- Electrolysis mitigation units (maintenance and inspection requiring isolations).

Persons authorised category 3.2 are *Approved* to:

- Supervise *Instructed Persons* under this category;
- Perform the duties of the *Recipient in Charge*;
- Receive a *LV/Mech Isolation Authority*; and
- Receive *LV/Mech Test Authority*

3.2.1 Low Voltage and Mechanical Hazards

Prior to undertaking *Work* on *Low Voltage* and mechanical *Apparatus*, hazards *Shall* be identified and controlled. The following hazards *Shall* be considered:

Hazard 1 Identification of Apparatus that is safe for Work

Apparatus on which *Work* is to be carried out must be readily identifiable. A means of identification *Shall* be affixed to the *Apparatus*, to remain effective for the duration of the *Work*.

Hazard 2 Dangerous voltages

Dangerous voltages can occur from:

- Open-circuit CT secondary circuits;
- Induction on Cable sheaths; and
- Undischarged capacitors.

Hazard 3 Exposed Live conductors

Exposed or *Live* adjacent to the *Apparatus* being worked on can be a source of danger due to:

- Bare or damaged conductors;
- Inadvertent energisation;
- Short circuit conditions (battery terminals and cables); or
- Inadequate precautions for *Live Work*.

Hazard 4 Pressure Systems and Stored Energy

Dangers can arise from the accidental release of stored energy from mechanical systems such as springs and other mechanisms, *SF₆ Circuit Breakers* and oil *Circuit Breakers*.

Hazard 5 Rotating or Moving Parts

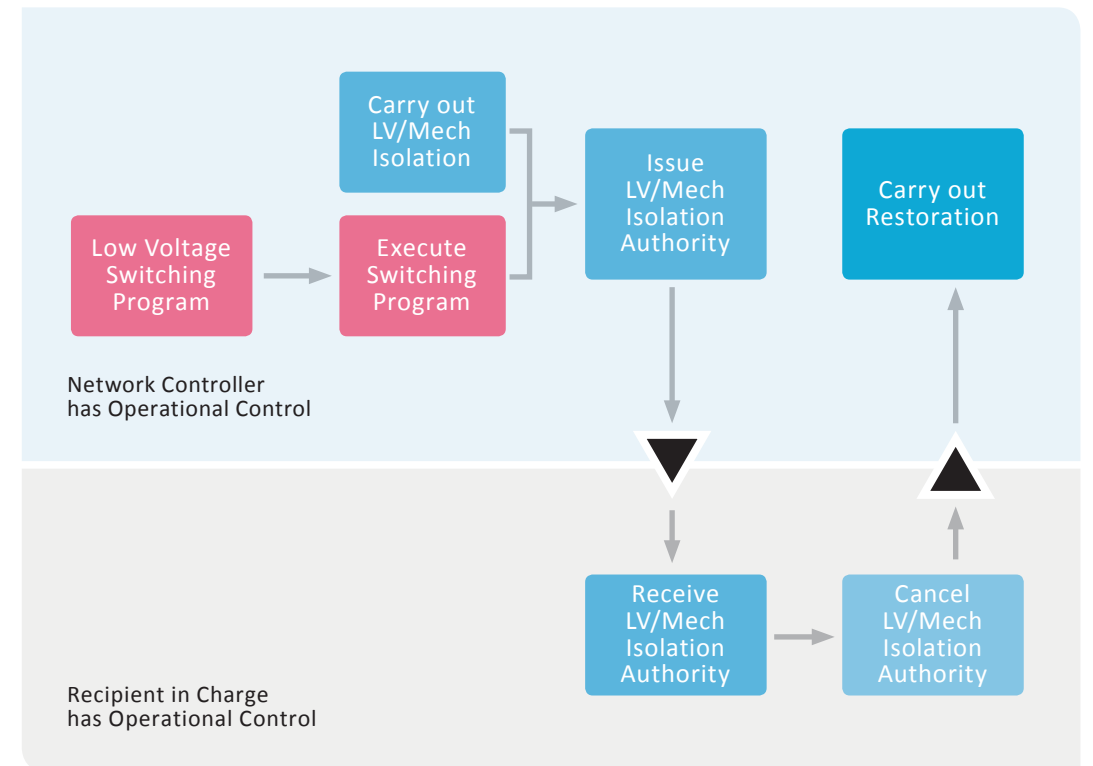
Some *Apparatus* can operate automatically without warning. Rotating and moving parts associated with pumps, fans and *Circuit Breakers* can cause serious injuries.

3.2.2 LV/Mech Isolation Authority Flow Chart

The following diagram illustrates the point at which operational control transfers from the *Network Controller* to the *Recipient in Charge*.

- For *LV/Mech Work* where *TV* or *HV Apparatus* is required to be out of service, a *Switching Program* is required (e.g. transformer oil sampling).

Operational Control when working under a LV/Mech Isolation authority



3.2.3 Responsibilities of persons working under a LV/Mech IA

All persons working under a LV/Mech IA Shall:

- (a) Participate in a Pre-Work Risk Assessment;
- (b) Sign on to the LV/Mech IA at the start of each shift or if returning to site to indicate that they understand the warnings, demonstrations given and their responsibilities under the LV/Mech IA;
- (c) Follow any safety directions from the Recipient in Charge;
- (d) Confirm with the Recipient in Charge; and
- (e) Sign off the LV/Mech IA at the end of the shift or when leaving site.

3.3 Receipt of a LV/Mech Isolation Authority

The Recipient in Charge Shall ensure:

- (a) The location, description of Apparatus, Description of Work and the type of authority required for Work as shown on the LV/Mech Isolation Authority or Testing Authority reflects that on the relevant part on the AFA;
- (b) Control Measures are identified and applied so that Work can be carried out safely under the LV/Mech Isolation Authority (such as the Approved Barriers or signage, or appointment of a Safety Observer);

- (c) That they understand the warnings given by the Issuer and their responsibilities under the LV/Mech Isolation Authority;
- (d) That the Apparatus to be worked on is positively identified and is as documented on the LV/Mech Isolation Authority;
- (e) Before Work commences, that all members of the Work party have signed on the LV/Mech Isolation Authority;
- (f) Work is restricted to the Description of Work on the LV/Mech Isolation Authority;
- (g) The LV/Mech Isolation Authority is kept safe until it is cancelled;
- (h) That all persons required to Work under the LV/Mech Isolation Authority are:
 - Either authorised category 3.2, or are given an appropriate briefing to enable them to Work as Instructed Persons;
 - Informed of the Apparatus to be worked on, its identification details, the Description of Work to be carried out and the extent of isolation performed work on the Apparatus;
 - Participants in a Pre-Work Risk Assessment Meeting;

- Given warnings and/or demonstrations appropriate to the Work being carried out;
- Conversant with the warnings and demonstrations given;
- Conversant in their responsibilities under the LV/Mech Isolation Authority; and
- Signed off the LV/Mech Isolation Authority at the completion of their Work for each shift, or when leaving site.

3.3.1 Cancellation of a LV/Mech Isolation Authority

On completion of Work, the Recipient in Charge Shall cancel the LV/Mech Isolation Authority by:

- (a) Confirming that all persons signed on the LV/Mech Isolation Authority have signed off;
- (b) Completing the cancellation section of the LV/Mech Isolation Authority; and
- (c) Communicating to the Network Controller whether the Apparatus/ plant/Apparatus is serviceable, or not serviceable.

The Network Controller Shall ensure the following details are recorded:

- Parameters for the use of the Apparatus or plant, including warnings or adjustments required prior to, or on return of the Apparatus or plant to service;

- Whether Apparatus, is or is not, serviceable; and
- Time and date of cancellation of the LV/Mech Isolation Authority.

Once cancelled, the LV/Mech Isolation Authority Shall be delivered to the Substation control point or directly to the person authorised category 3.4 responsible for the return Switching.

3.3.2 Testing of LV/Mech Apparatus

Testing of LV (415V AC / 120V DC) Apparatus in the control of a Network Controller Shall only be carried out following the issue of a LV/Mech Testing Authority. Testing Shall be controlled by a person authorised category 3.3 who has knowledge of the Work and Testing devices.

In addition to the requirements of receiving the LV/Mech Isolation Authority, the Recipient in Charge Shall:

- (a) Instruct those persons working under the LV/Mech Testing Authority of the Work that may proceed during the Testing;
- (b) Provide any additional warnings that may be applicable; and
- (c) Ensure that the Apparatus is left in a safe condition.

3.4 Issue a *Low Voltage / Mechanical Access Authority*

The issue of a *LV/Mech Isolation Authority* Shall be carried out by a person authorised category 3.4

3.4.1 *LV/Mech Isolation Authority* – General requirements

The general requirements for issuing a *LV/Mech Isolation Authority* are as follows:

- (a) Each *LV/Mech Isolation Authority* Shall have a unique number;
- (b) Each *LV/Mech Isolation Authority* Shall only be issued by a person authorised category 3.4; and
- (c) A *LV/Mech Isolation Authority* Shall not be issued where the *Work* would affect the safety of personnel working under another Access Authority.

3.4.2 Responsibilities of the person issuing a *LV/Mech Isolation Authority*

The person issuing the *LV/Mech Isolation Authority* Shall ensure that:

- (a) The person receiving the *LV/Mech Isolation Authority* is authorised category 3.3;
- (b) The location, description of *Apparatus*, *Description of Work* and nominated authority required set out on the *LV/Mech Isolation Authority* reflects those stated in the relevant parts on the *AFA*;

- (c) The steps of the *Switching Program* relevant to the *Description of Work* on the *LV/Mech Isolation Authority* to be issued, have been recorded as been carried out;
- (d) The *LV/Mech Isolation Authority* is not issued if it is not safe for the *Work* to proceed;
- (e) Normal procedure is that the *Apparatus* Shall be *Earthed*, where this cannot be achieved then the *Apparatus* Shall be *Isolated* in accordance with an *Approved* method
- (f) All required applicable warnings are entered on the *LV/Mech Isolation Authority*, are communicated to the *Recipient in Charge* and the *Work* party; and
- (g) The details of the issued *LV/Mech Isolation Authority* are communicated to the *Network Controller*.

3.4.3 Responsibilities of the *Authorised Person* issuing a *LV/Mech Testing Authority*

In addition to the requirements of issuing a *LV/Mech Isolation Authority*, the *Authorised Person* Shall ensure:

- (a) The *Network Controller* has given permission to issue the *LV/Mech Testing Authority*; and
- (b) A *Testing Authority* is not issued where the *Test* affects the safety of personnel working under another Access Authority.

3.4.4 Operate *LV/MECH Apparatus*

- (a) Operations Shall be carried out under the direction of the *Network Controller*;
- (b) All messages relating to the operation of *Low Voltage Apparatus* Shall be logged;
- (c) In describing *Apparatus*, the *Apparatus* Shall be given its full name and identification number;
- (d) The purpose of each message and the time of transmission Shall be recorded.

3.4.5 Making *LV/Mech Apparatus* Safe for Work

All *Exposed Conductors* and *Electrical Apparatus* Shall be regarded as *Live* until *Isolated* and proved *De-Energised*.

- (a) Before commencing operating, or fault finding, *Work* on or *Near Live Low Voltage Exposed Conductors* the *Authorised Person* Shall:
 - i. Identify the voltage of the *Exposed Conductors*;
 - ii. Ensure that *Approved* safe working methods will be used; and
 - iii. Take suitable precautions by *Approved Barrier*, or other means, to avoid inadvertent contact with *Live Low Voltage Exposed Conductors*.

- (b) Before *Work* commences on or *Near De-Energised Low Voltage Exposed Conductors* the *Authorised Person* Shall:
 - i. Ensure that *Exposed Conductors* are *Isolated* from all sources of *Supply*;
 - ii. Where possible, circuit isolating devices Shall be locked open and/or covers locked to prevent the circuits from being re-*Energised*, and *Do Not Operate Tags* affixed;
 - iii. Where power and/or control fuses are installed, the fuse carriers Shall be removed and *Do Not Operate Tags* affixed;
 - iv. Prove the *Exposed Conductors* *De-Energised* with an *Approved Testing Device*; and
 - v. Where hazardous induced or capacitive voltages are likely to be present ensure that the *Exposed Conductor* is *Discharged*, then *Earthed* in an *Approved* manner.
 - vi. Ensure that *Approved Insulated Work* methods or *Barriers* are used when a *Safe Approach Distance* cannot be maintained from other *Live Low Voltage Exposed Conductors*.

- (c) Before energising *Low Voltage Exposed Conductors*, the *Authorised Person* Shall take precautions to ensure that all persons maintain the relevant Safe Approach Distance from the *Exposed Conductors* and that any plant, tools, materials and earthing *Apparatus* (if any) have been removed.
- (d) Before *Work* commences on Mechanical *Apparatus* the *Authorised Person* Shall ensure *Apparatus* is Isolated and all sources of energy within the limits of the isolation are *Discharged*.

3.4.6 Restoration of Apparatus

The *Authorised Person* restoring the *Apparatus* after *Work* Shall:

- (a) Establish that the *Low Voltage Access Authority* has been cancelled;
- (b) Arrange for required adjustments to the *Apparatus* to be carried out prior to or on return to service of the *Apparatus*.

3.4.7 Responsibilities of the Network Controller

The *Network Controller* Shall ensure that the following details are recorded:

- (a) *LV/Mech Isolation Authority* number;
- (b) Time and date of issue and cancellation of the *LV/Mech Isolation Authority*; and
- (c) *Authorised Person* to whom the *LV/Mech Isolation Authority* is issued.

4 *Work In Substations – Traction Voltage*

4.1	<i>WORK ON TRACTION VOLTAGE EQUIPMENT</i>	55
4.2	<i>RECEIPT OF A TRACTION VOLTAGE ACCESS AUTHORITY</i>	56
4.3	<i>TRACTION VOLTAGE TESTING</i>	60
4.4	<i>ISSUE A TRACTION VOLTAGE ACCESS AUTHORITY</i>	62
4.5	<i>OPERATE TRACTION VOLTAGE SWITCHGEAR</i>	64



This section of the Safety Rules sets down the requirements for the safety of personnel with working on or *Near Apparatus at Traction Voltage (600V DC) within a Substation.*

Work on such Apparatus within a Substation Shall be undertaken as:

- Work under An Access Authority; or
- Work on Apparatus Not Electrically Connected.

Both of these methods require a clearly marked area in which it is safe to Work.

The following documents support this section of the Safety Rules:

Category 4

SWMS PC 0014 01 Substation Access PSU
 Lockout Tagout of Electrical Apparatus (non-HV)
 Substation Maintenance Support Section – PPM of High Speed Circuit Breakers
 Managing Substations Planned Preventative Maintenance
 SWMS PC 0012 Switching and Short Circuiting
 Application for Approval to Place Electrical Installation into Service
 Coordination of Installation of Electrolysis Drainage Equipment
 Planning Power & Overhead Work
 Managing Power & Overhead Corrective Work
 Managing Power & Overhead Preventative Maintenance
 Provision of Electrical Permits
 Provision of Standard Isolation Programs Work Instruction
 Preparation of Application to Work on or in the Vicinity of Electrical Apparatus
 SWMS OH 0014 Underground Feeder Cable Installation

4.1 Work on Traction Voltage Apparatus

An Access Authority is required when Work is to be performed on or *Near Traction Voltage Apparatus* that is in the charge of a Network Controller.

Work under this category Shall be carried out by persons authorised category 4.1 or *Instructed Persons*.

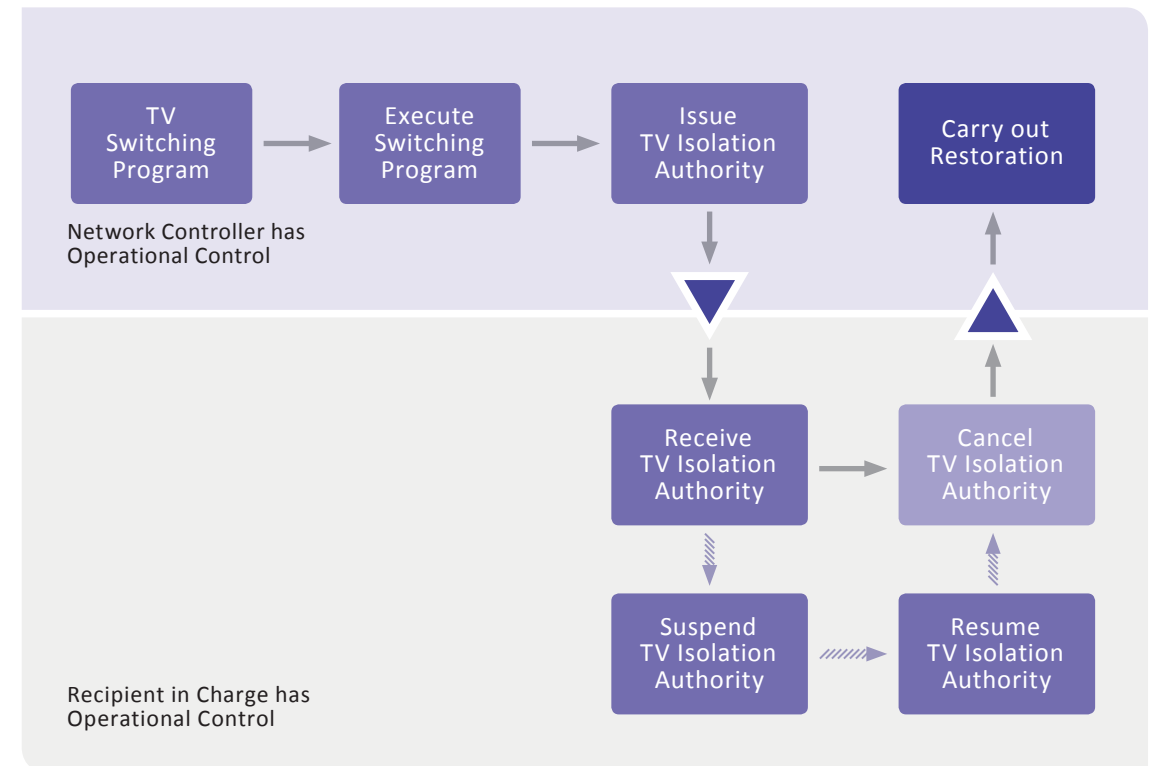
Traction Voltage Access Authorities normally apply just within a Substation,

but can include underground infrastructure outside a *Switchyard* up to the aerial *Switch* or connection point.

4.1.1 Traction Voltage Access Authority Flow Chart

The following diagram illustrates the point at which operational control transfers from the *Network Controller* to the *Recipient in Charge* (i.e. the holder of the TV Access Authority).

Operational Control working under a Traction voltage access authority



4.1.2 Responsibilities of persons working under a **Traction Voltage Access Authority**

All persons working under a *TV Access Authority* Shall:

- (a) Participate in the Pre-Work Risk Assessment meeting;
- (b) Sign on the *TV Access Authority* to indicate that they understand the warnings/demonstrations given and their responsibilities under the *TV Access Authority* at the start of each shift or upon returning to site;
- (c) Follow any safety directions given by the *Recipient in Charge*;
- (d) Check with the *Recipient in Charge* (or in their absence another person signed on the *TV Access Authority*) that they are in the correct *Designated Work Area* before recommencing *Work* upon return to the worksite;
- (e) Sign off the *TV Access Authority* at the completion of their *Work* for each shift or when leaving site; and
- (f) Before recommencing *Work* on any subsequent shift, verify that the conditions of the *TV Access Authority* covering the *Apparatus* are still valid.

4.1.3 Entry to **Designated Work Areas**

Persons *Shall* only enter a *Designated Work Area*:

- (a) When signed on to the *TV Access Authority*; and
- (b) With the permission of the *Recipient in Charge*.

Persons *Shall* only enter or leave the *Designated Work Area* using the *Approved* entrance.

4.2 Receipt of a **Traction Voltage Access Authority**

A *TV Access Authority* *Shall* be received by a person authorised category 4.2.

Persons authorised under category 4.2 are *Approved* to supervise *Instructed Persons* required to enter *Substations* and *Shall* ensure that all *Instructed Persons* under their supervision are:

- (a) Given an appropriate entry briefing;
- (b) Given warnings and/or demonstrations appropriate to the *Work* being carried out; and
- (c) Adequately supervised to enable them to avoid the hazards which may be present.

In addition, persons authorised under category 4.2 are *Approved* to perform the duties of the *Recipient in Charge* and can receive, suspend, resume and cancel *TV Access Authorities*.

The *Recipient in Charge* *Shall* ensure:

- (a) The location, description of *Apparatus*, *Description of Work* and the access required for *Work* as shown on the *TV Access Authority* reflects those on the relevant part on the *AFA*;
- (b) *Control Measures* are identified and applied so that *Work* can be carried out safely under the *TV Access Authority* (such as *Approved Barriers* or signage and appointment of a *Safety Observer*);
- (c) That they understand the warnings given by the Issuer and their responsibilities under the *TV Access Authority*;
- (d) That the *Apparatus* to be worked on is identified and reflects that shown on the *TV Access Authority*;
- (e) Before *Work* commences, that all members of the *Work* party have signed on the *TV Access Authority*;
- (f) *Work* is restricted to the *Description of Work* on the *TV Access Authority*;
- (g) The *TV Access Authority* is displayed at the entrance to the *Designated Work Area*;
- (h) The *TV Access Authority* is kept safe until it is cancelled;
- (i) There is a minimum of one additional person authorised category 4.1, signed on the *TV Access Authority* at all times;

- (j) That all persons required to enter the *Designated Work Area* are:
 - Either authorised category 4.1 or are given an appropriate briefing to enable them to *Work* as *Instructed Persons*;
 - Informed as to the *Apparatus* to be worked on, its identification details and the *Description of Work* to be carried out and the extent of access to the *Apparatus*;
 - Participants in a Pre-Work Risk Assessment;
 - Given warnings appropriate to the *Work* being carried out;
 - Conversant with the warnings given and their responsibilities under the *TV Access Authority*;
 - Enter or leave the *Designated Work Area* using the *Approved* entrance; and
 - Signed off the *TV Access Authority* at the completion of their *Work* for each shift or when leaving site.
- (k) That if the whole *Work* party temporarily leave the *Designated Work Area* the *Access Authority* remains displayed at the entrance to the *Designated Work Area* and the entrance is closed off. On returning to the *Designated Work Area*, confirm that the *Apparatus* is in the same condition as when it was left.

- (l) That working short circuits are applied to ensure equipotential conditions are maintained during the course of the *Work*; and
- (m) That working bridges are applied, where necessary, to maintain a current path when a *Conductor* is to be broken.

4.2.1 Alterations to conditions of Work under a TV Access Authority

Where the description of *Apparatus* and/or the *Description of Work* shown on a *TV Access Authority* is to be altered:

- (a) A new *AFA* Shall be submitted by a person authorised category 7.1;
- (b) The new *AFA* Shall be assessed and the *Switching Program* rewritten;
- (c) The *TV Access Authority* requiring the alteration(s) Shall be cancelled;
- (d) Any other affected *Access Authorities* Shall be cancelled;
- (e) The altered steps of the *Switching Program* Shall be carried out by a person authorised category 4.5; and
- (f) A new *TV Access Authority* Shall be issued by a person authorised category 4.4.

Note that any *Work* that requires changes to the *Switching Program* will be at the discretion of the *Network Controller*.

4.2.2 Suspension of a TV Access Authority

Suspension of a *TV Access Authority* is required when *Work* is to cease for a period and may remain suspended for a period not exceeding 48 hours except at the discretion of the *Controller*.

When a *TV Access Authority* is to be suspended, the *Recipient in Charge* Shall ensure that:

- (a) All persons working under the *TV Access Authority* have signed off, to indicate that permission to *Work* is suspended;
- (b) The *TV Access Authority* is endorsed to indicate that the *Apparatus* is serviceable /is not serviceable;
- (c) The entrance to the *Designated Work Area* is closed off;
- (d) The *Network Controller* is notified of the suspension of the *Work* and whether the *Traction Voltage Apparatus* is/is not serviceable so far as this *Work* is concerned; and
- (e) The *TV Access Authority*, together with attachments, is delivered to the *Substation* designated control point.

4.2.3 Resumption of Work Following Suspension of a TV Access Authority

A *TV Access Authority* can only be resumed by the person who suspended it. When resuming *Work* following suspension of a *TV Access Authority*:

The *Recipient in Charge* Shall:

- (a) Obtain permission from the *Network Controller*;
- (b) Sign on the *TV Access Authority* as the *Recipient in Charge*;
- (c) Allow all persons signed onto the *TV Access Authority* prior to its suspension to sign back on; and
- (d) Ensure any persons not signed on to the *TV Access Authority* prior to its suspension receive appropriate warnings.

4.2.4 Cancellation of a TV Access Authority

On completion of *Work*, the *Recipient in Charge* Shall:

- (a) Prior to cancellation, carry out necessary checks to:
 - i. Confirm all working short circuits and *Bridging Leads* and tools are removed;
 - ii. Confirm that all persons signed on the *TV Access Authority* have signed off;
 - iii. Confirm whether any warnings or adjustments are required prior to or on return to service; and

- iv. Confirm whether *Apparatus* is serviceable or not.
- (b) Cancel the *TV Access Authority* by:
 - i. Closing off the entrance to the *Designated Work Area*;
 - ii. Completing the cancellation section of the *TV Access Authority*;
 - iii. Communicating to the *Network Controller* who will record them on the log sheet;
 - iv. Entering the time and date of cancellation of the *TV Access Authority*; and
 - v. Delivering the cancelled *TV Access Authority* to the *Substation* control point or directly to the person authorised category 4.5 responsible for the return *Switching*.
- (c) The *Network Controller* Shall ensure the following details are recorded:
 - i. Parameters of the use of the *Apparatus* or plant, including warnings, or adjustments required prior to, or on return of the *Apparatus* or plant to service;
 - ii. Whether the *Apparatus* is, or is not, serviceable; and
 - iii. Time and date of cancellation of the *TV Access Authority*

4.3 Traction Voltage Testing

When *Testing TV Apparatus* requiring a *TV Testing Authority*, the *Test* Shall be supervised by a person authorised category 4.3.

Persons authorised category 4.3 are *Approved* to perform the duties of the *Authorised Person* in charge, supervise *Instructed Persons* and can receive / cancel *TV Testing Access Authorities*.

4.3.1 Testing Not Electrically Connected TV Apparatus

A *Testing Authority* is not required when *Testing Not Electrically Connected TV Apparatus* which meets the requirements of 'Making *Not Electrically Connected TV Apparatus* Safe for *Work*' Rule 4.5.3. The following measures *Shall* be applied;

The person in charge of the *Test* *Shall*:

- (a) Direct the control of the *Switching* of the *Test* source energising the conductors;
- (b) Ensure adequate communications are maintained with all persons involved in the *Testing*;
- (c) Warn any persons:
 - i. In the *Vicinity* of the conductors under *Test* that voltage is to be applied and receive an assurance that such persons will remain clear of such conductors during the *Test*; and

- ii. Involved in the *Testing*, that they may only *Work* on or *Near* the conductors under *Test* when the person in charge of the *Test* indicates to such persons which conductors are safe to approach.

- (d) Ensure that safe working methods are used where induced or *Test* voltages could be present;
- (e) Ensure that for the duration of electrical *Testing*, a defined *Test* area is established using appropriate *Barriers* and *Approved* notices warning persons of the dangers.
- (f) Ensure that any *Apparatus* which may have become electrically charged during the course of the *Test* is fully *Discharged* and left in a safe condition at the conclusion of the *Test*.

4.3.2 Testing under a TV Testing Authority

- (a) *Testing* of *Apparatus* in the charge of a *Network Controller* *Shall* only be carried out following the issue of a *TV Testing Authority*;
- (b) A *TV Testing Authority* cannot be issued on *Apparatus* which is already under a *TV Access Authority*. The *TV Access Authority* must either first be cancelled or suspended.
- (c) A *TV Testing Authority* *Shall* be used where the *Work* includes:
 - The removal and/or replacement of *Access Authority* short circuits;

- The use of a *Test* source, which is capable of producing currents hazardous to the human body, on the conductors of *Traction Voltage Electrical Apparatus*; and
 - The application of *Extra Low Voltages* or voltages produced by an insulation *Testing Device* operating at 1,000 volts or below, *Connected to Electrical Apparatus* with a capacitance greater than 4,000pF.
- (d) The Person in charge of the *Test* *Shall* have knowledge of the *Work*, verify the status of the *Test* devices and control the *Testing*;
 - (e) If it is necessary to change the *Authorised Recipient*, the new *Authorised Recipient* *Shall*:
 - Verify the status of the *Test* devices and all other *Apparatus* associated with the *Testing*; and
 - Understand the warnings, instructions regarding the devices and *Apparatus* that may be operated in conjunction with the *Test*.
 - (f) The *Apparatus* under *Test* *Shall* be adequately *Isolated* from any other *Apparatus* under *Test* or any other *Work* party by opening isolators and/or removing conductors as required.

4.3.3 Responsibilities of the Authorised Person in charge of a TV Testing Authority

In addition to the requirements of receiving a *TV Testing Authority* the *Authorised Person* in charge *Shall*:

- (a) Instruct those persons working under the *TV Testing Authority* regarding *Work* that may proceed safely during the *Testing* and provide any additional warnings that may be applicable;
- (b) Direct the control of the *Switching* of the *Test* source energising the conductors covered by the *TV Testing Authority*;
- (c) Ensure adequate communication is maintained with all persons involved in the *Testing*;
- (d) Warn any person in the *Vicinity* of the conductors under *Test* that voltage is to be applied;
- (e) Receive an assurance that such person will remain clear of such conductors during the *Test*;
- (f) Where induced or *Test* voltages could be present, ensure that safe working methods are used that restrict persons coming within the *Safe Approach Distance* of *Live* conductors and any *Testing Apparatus*;

- (g) Ensure that for the duration of electrical *Testing*, the entrance to the *Designated Work Area* is closed and an *Approved* notice warning that electrical *Testing* is in progress is erected at this closed entrance;
- (h) If *Test* voltages are to be applied to any *Exposed Conductors* that are out of sight of the person *Switching* the *Test* source, ensure that *Approved* notices are placed to warn against approach to the *Exposed Conductors* at such points and either:
 - Post a person to warn others not to approach the *Exposed Conductors* during the *Test*; or
 - Erect fences or equivalent *Barriers*, or close shutters to prevent any person gaining inadvertent access to the *Exposed Conductors*.
- (i) Ensure that, at the conclusion of the *Work*, any *Apparatus* under *Test* that may have become electrically charged during the course of the *Test* is fully *Discharged* and left in a safe condition.

4.4 Issue a Traction Voltage Access Authority

The issue of a *TV Access Authority* Shall be carried out by a person authorised category 4.4.

4.4.1 TV Access Authority – General requirements

The general requirements for issuing a *TV Access Authority* are as follows:

- (a) Each *TV Access Authority* has a unique number;
- (b) Each *TV Access Authority* Shall only be issued by a person authorised category 4.4;
- (c) More than one *TV Access Authority* may be issued using the same *Switching Program*, provided that the *Switching Program* covers all the descriptions of *Apparatus* and descriptions of *Work*; and
- (d) A *TV Access Authority* Shall not be issued where the *Work* would affect the safety of personnel working under another *Access Authority*.

4.4.2 Responsibilities of the Authorised Person issuing a TV Access Authority

The *Authorised Person* issuing the *TV Access Authority* Shall ensure that:

- (a) The person receiving the *TV Access Authority* is a person authorised category 4.2;
- (b) The location, description of *Apparatus*, *Description of Work* and the nominated access required for *Work* set out on the *TV Access Authority* reflects that stated in the relevant parts on the *AFA*;
- (c) The steps of the *Switching Program* relevant to the *Description of Work* on the *TV Access Authority* to be issued,

have been recorded as carried out;

- (d) The *TV Access Authority* number is provided to the *Network Controller*;
- (e) The *TV Access Authority* is not issued if it is not safe for the *Work* to proceed;
- (f) Prior to issuing the *TV Access Authority*:
 - The *Designated Work Area* is established using an *Approved* process;
 - All required warnings are entered on the *TV Access Authority*, and are communicated to the *Recipient in Charge* and *Work* party;
 - The *Work* party is assembled at the *Designated Work Area*;
 - The conductors that are safe to *Work* on are identified and precautions taken to make the conductors safe for *Work* are demonstrated, including local points of isolation, *Do Not Operate Tags* and *Access Authority* short circuits;
 - A demonstration is given to the satisfaction of the *Work* party that any conductors that are not short circuited or are remotely short circuited are safe to *Work* on or *Near*;
 - The *Work* party are warned that after leaving *Designated Work Area*, upon return check with the *Recipient in Charge* (or in their absence another person signed on the *TV Access Authority*) they are in the correct *Designated Work Area* before recommencing *Work*;

- The *Work* party are warned of the dangers of:
 - *Near* approach to *Live Traction Voltage Apparatus*; and
 - *Low Voltage* or mechanical *Apparatus*.
- The *Work* party are warned to confine their *Work* to the *Designated Work Area*;
- The *Work* as described on the *TV Access Authority*; and
- Their responsibilities under *Working* under a *TV Access Authority* Rule 4.1;
- (g) The details of the issued *TV Access Authority* are communicated to the *Network Controller*.

4.4.3 Responsibilities of the Authorised Person issuing a TV Testing Authority

In addition to the requirements of issuing a *TV Access Authority*, the *Authorised Person* Shall ensure that:

- (a) The person receiving the *TV Testing Authority* is a person authorised category 4.3;
- (b) Any *TV Access Authorities* covering the *Apparatus* under *Test* are either cancelled or suspended;
- (c) A *TV Testing Authority* is not issued where the *Test* may affect the safety of personnel working under another *Access Authority*;

- (d) *Warning Tags* are affixed to all control points that can operate the *Apparatus* during the *Test*, in accordance with the *Switching Program*;
- (e) Warnings and instructions are given to the person in charge of the *Test*; and
- (f) Confirmation has been received from the *Network Controller* that all current *Access Authorities*, for *Work* on or *Near* the conductors required to be electrically tested, are cancelled or suspended.

4.4.4 Responsibilities of the Network Controller

The *Network Controller* shall ensure that the following details are recorded:

- (a) *TV Access Authority* number;
- (b) Time and date of issue and cancellation of the *TV Access Authority*; and
- (c) *Authorised Person* to whom the *TV Access Authority* is issued.

4.5 Operate Traction Voltage Switchgear

Operation of *Traction Voltage Apparatus* shall be carried out by a person authorised category 4.5.

4.5.1 Operate TV Switchgear – General

- (a) Operations shall be carried out under the direction of the *Network Controller*;
- (b) All messages relating to the operation of *Traction Voltage Apparatus* shall be logged.
- (c) In describing *Apparatus*, the *Apparatus* shall be referred to by its full name and number.
- (d) The purpose of each message and the time of transmission shall be recorded.
- (e) *Switching* operations associated with a *Switching Program* shall not be regarded as *Work* on or *Near Traction Voltage Exposed Conductors* provided that:
 - *Safe Approach Distances* are maintained; or
 - When carrying out *Electrical Operating Work* in accordance with an *Approved* process.

4.5.2 Making TV Apparatus Safe for Work

Before *Work* is performed on or *Near Traction Voltage Exposed Conductors* the following shall be carried out in the order specified:

(a) Isolation

Conductors shall be *Isolated* from each point of *Supply*. Normally the points of isolation shall be locked and *Do Not Operate Tags* affixed. If this is not physically possible, then isolation shall be achieved using an *Approved Work* method.

The effectiveness of the points of isolation shall be demonstrated by either a *Visible break*, indication or operation of the *Apparatus*. These points of isolation shall include *Low Voltage* sources, that can cause the conductors to become *Live*.

During the *Work* if it becomes necessary to transfer a point of isolation to an alternative position, any affected *Access Authorities* shall be cancelled prior to the transfer taking place.

(b) Short Circuiting

TV Access Authority short circuits shall be applied to the *Traction Voltage* conductors, once it has been proved safe to do so, using an *Approved* method. Their placement shall not be affected by the *Work* to be undertaken and *Do Not Operate Tags* shall be affixed.

TV Access Authority short circuits shall be applied as follows:

- i. As close as practicable to the point of *Work*;
- ii. Where there is a *Conductor* that is not short circuited at the point of *Work*, *TV Access Authority* short circuits shall be applied between the point of *Work* and all points of *Supply*;

- iii. Where *Work* is to be performed on or *Near* the *Traction Voltage Exposed Conductors* of totally *Enclosed Apparatus*, supplied from a single source via *Cable(s)*, the *TV Access Authority* short circuits shall be applied at the nearest practical point to the *Work* area, and shall be on the same *Negative* potential connection;
- iv. Where the continuous electrical connection between the *Conductor* required to be short circuited and the *Access Authority* short circuit is provided by an *Isolator*, a set of links or similar *Device*, this shall be closed, locked closed if practicable, and a *Do Not Operate Tag* affixed;
- v. *Conductors* may be short-circuited by means of a closed *Switch* or *Circuit Breaker*, provided that it is rendered inoperative in the closed position and a *Do Not Operate tag* affixed.

4.5.3 Making Not Electrically Connected TV Apparatus Safe for Work

TV Substation Apparatus Not Electrically Connected or not yet commissioned for service may be *Approved* safe for *Work* and excluded from the *Access Authority* requirements of the *Safety Rules* if the conditions below are met. All persons working within the *Not Electrically Connected Apparatus* area shall be either *Instructed Persons* or *Authorised Persons* under category 2.2.

TV Substation Apparatus Shall be Approved as Not Electrically Connected Apparatus by a person authorised category 4.5. subject to the following conditions:

- (a) The *TV Apparatus* is *Not Electrically Connected* to any sources of *TV* electrical energy, achieved by the removal or absence of conductors and cannot be *Energised* by *Electrical Operating Work*;
- (b) Any risks associated with induced voltages or transferred potentials are appropriately controlled;
- (c) There is no possibility of coming on or *Near* the *TV Exposed Conductors* of other *TV Electrical Apparatus*;
- (d) Appropriate *Low Voltage* or mechanical isolations have been carried out in accordance with section 3.3;
- (e) Exposed terminal connections of any *Cable* within the *Vicinity* of the *Not Electrically Connected Apparatus* *Shall* be identified;
- (f) *Not Electrically Connected TV Substation Apparatus* – safe for *Work* *Shall* be identified within a *Substation* by enclosing the *Apparatus* by a fence appropriate to the planned *Work* and have signs “*Not Electrically Connected Apparatus*” affixed at regular intervals around the outside of the fence.
- (g) Prior to the start of *Work* on *Not Electrically Connected TV Apparatus*, a risk *Assessment* *Shall* be performed and documented.

4.5.4 Connection of *TV Apparatus*

Prior to any *Not Electrically Connected TV Apparatus* being *Connected* to the power network, a *TV Access Authority* is required and a person authorised category 4.5 *Shall* confirm that:

- (a) All measures taken to identify the *TV Apparatus* as *Not Electrically Connected Apparatus* are removed;
- (b) All necessary *Apparatus* identification, warning signs, locks, fences, gates, are in place;
- (c) The *Work* party is advised that the *Apparatus* is *Live*;
- (d) The *Apparatus* is in a fit state to be *Energised*; and
- (e) The precautions already taken for the issue of any associated *Access Authority* are appropriate.

4.5.5 Entry to *Enclosed Apparatus*

A person *Shall* only enter *Enclosed Apparatus* if they are signed on to the *TV Access Authority* for the *Enclosed Apparatus*, or are a person authorised category 4.5, who is carrying out *Traction Voltage Switching* and:

- (a) The *Traction Voltage* conductors within the *Enclosed Apparatus* have been *Isolated*; or
- (b) They will not come on or *Near Traction Voltage Exposed Conductors*; or
- (c) When carrying out *Electrical Operating Work* in accordance with an *Approved* process.

4.5.6 Restoration of *Apparatus*

The *Authorised Person* restoring the *Apparatus* after *Work* *Shall*:

- (a) Establish that the *Traction Voltage Access Authority* has been cancelled;
- (b) Dismantle the *Designated Work Area*:
 - When the *Traction Voltage Apparatus* covered by the *TV Access Authority* is to be made ready for service, before removing *Do Not Operate Tags*, the *Designated Work Area* and associated warning signs *Shall* be dismantled; or
 - When the *Traction Voltage Apparatus* is to remain out of service pending the issue of a new *TV Access Authority* for further *Work* then, provided all *Switching Program* requirements remain unaltered, the *Designated Work Area* and associated warning signs may be left in place in readiness.
- (c) Restore the *Apparatus* as per the *Switching Program*;
- (d) Arrange for required adjustments to the *Apparatus* to be carried out prior to or on return to service of the *Apparatus*.

4.5.7 Emergency Requirements

Where there is immediate risk to human life, or property, that requires action regarded as *Work* on or *Near Traction Voltage Exposed Conductors*, *Work* may proceed under the following conditions:

- (a) The conductors *Shall* be *Isolated*, proved *De-Energised* and short circuited;
- (b) The requirements to apply locks and *Do Not Operate Tags*, erect a *Designated Work Area* and issue An *Access Authority* are not mandatory;
- (c) Persons working, who are not authorised to category 4.5 *Shall* be under the continuous close and personal supervision of a person authorised to category 4.5; and
- (d) As soon as possible after the immediate emergency, normal safety precautions *Shall* be applied.

5 *Work In Substations – High Voltage*

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This section of the Safety Rules sets down the requirements for the safety of personnel working on or *Near High Voltage Apparatus* within a *Substation*.

Work on such Apparatus within a Substation Shall be undertaken as:

- Work under An Access Authority; or
- Work on Apparatus Not Electrically Connected.

Both of these methods require a clearly marked area in which it is safe to Work.

The following documents support this section of the Safety Rules:

Category 5

- SWMS PC 0014 01 Substation Access PSU
- Managing Substations Planned Preventative Maintenance
- SWMS PC 0013 01 Switching High Voltage Apparatus
- Charting Electrolysis Voltages & Currents – Install of HV Isolation Installation Board
- Planning Power & Overhead Work
- Managing Power & Overhead Corrective Work
- Managing Power & Overhead Preventative Maintenance
- Provision of Electrical Permits
- Provision of Standard Isolation Programs Work Instruction
- Preparation of Application to Work on or in the Vicinity of Electrical Apparatus

5.1 Work on High Voltage Apparatus

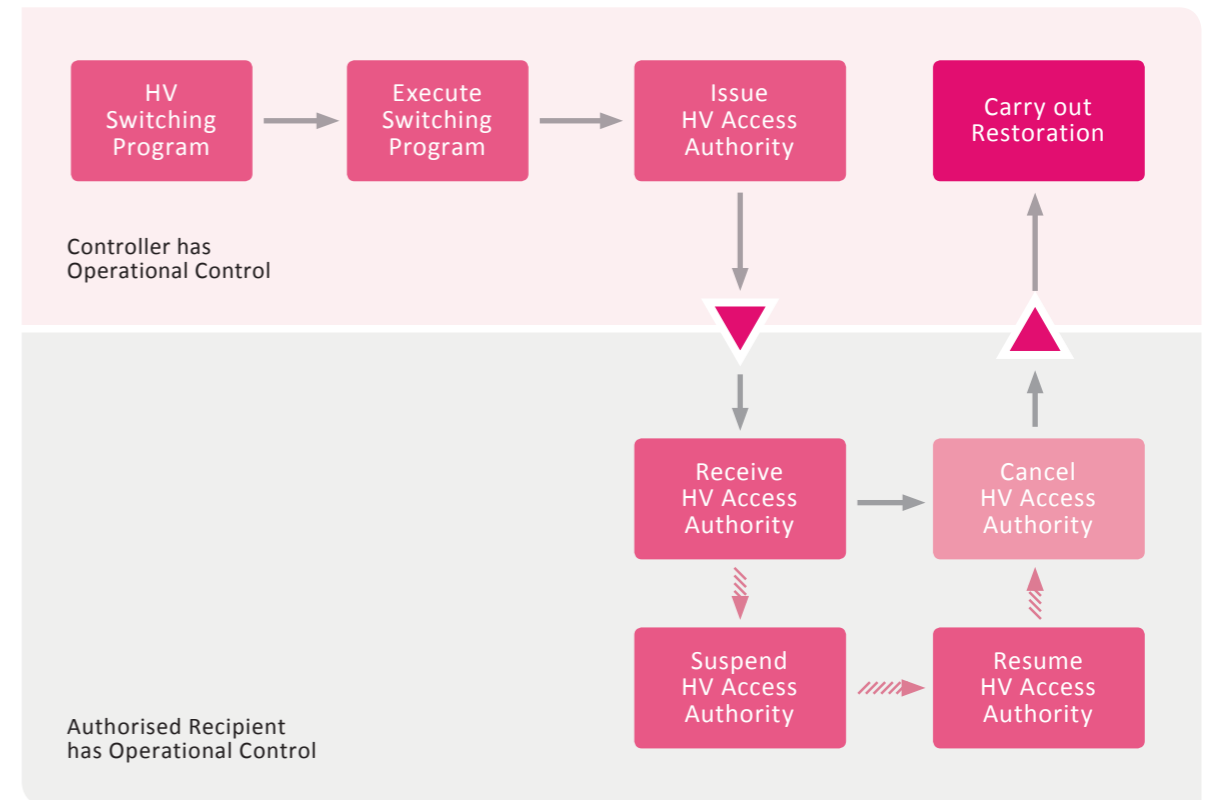
An Access Authority is required when Work is to be performed on or *Near High Voltage Apparatus* that is in the charge of a *Network Controller*.

Work under this category Shall be carried out by persons authorised category 5.1 or *Instructed Persons*.

5.1.1 High Voltage Access Authority Flow Chart

The following diagram illustrates the point at which operational control transfers from the *Network Controller* to the *Recipient in Charge* (i.e. the holder of the HV Access Authority).

Operational Control working under a high voltage access authority



5.1.2 Responsibilities of persons working under a High Voltage Access Authority

All persons *Working* under a *HV Access Authority* Shall:

- (a) Participate in a Pre-Work Risk Assessment;
- (b) Sign on the *HV Access Authority* at the start of each shift or when returning to site, to indicate that they understand the warnings/demonstrations given and their responsibilities under the *HV Access Authority*;
- (c) Follow any safety directions given by the *Recipient in Charge*;
- (d) Confirm with the *Recipient in Charge* that they are in the correct *Designated Work Area* upon returning to site;
- (e) Sign off the *HV Access Authority* at the completion of their *Work* for each day/shift or when leaving site; and
- (f) Verify that the conditions of the *HV Access Authority* covering the *Apparatus* are still valid before recommencing *Work* on any subsequent shift.

5.1.3 Entry to Designated Work Areas

Persons *Shall* only enter a *Designated Work Area*:

- (a) When signed on to the *HV Access Authority*; and
- (b) With the permission of the *Recipient in Charge*.

Persons *Shall* only enter or leave the *Designated Work Area* using the *Approved* entrance.

5.2 Receipt of a High Voltage Access Authority

A *HV Access Authority* *Shall* be received by a person authorised category 5.2.

Persons authorised under category 5.2 are *Approved* to supervise *Instructed Persons* required to enter *Substations* and *Shall* ensure that all *Instructed Persons* under their supervision are:

- (a) Given an appropriate entry briefing;
- (b) Given warnings and/or demonstrations appropriate to the *Work* being carried out;
- (c) Adequately supervised to enable them to avoid the hazards which may be present.

In addition, persons authorised under category 5.2 are *Approved* to perform the duties of the *Recipient in Charge* and can receive, suspend, resume and cancel *HV Access Authorities*.

The *Recipient in Charge* *Shall* ensure:

- (a) The location, description of *Apparatus*, *Description of Work* and the access required for *Work* as shown on the *HV Access Authority* reflects that on the relevant part on the *AFA*;
- (b) Control Measures are identified and applied, so that *Work* can be carried out safely under the *HV Access Authority* (such as the installation of any Barriers or signage, or appointment of a *Safety Observer*);
- (c) All persons understand the warnings given by the issuer and their responsibilities under the *HV Access Authority*;

- (d) That the *Apparatus* to be worked on is positively identified and is as documented on the *HV Access Authority*;
- (e) Before *Work* commences, that all members of the *Work* party have signed on the *HV Access Authority*;
- (f) *Work* is restricted to the *Description of Work* on the *HV Access Authority*;
- (g) The *HV Access Authority* is displayed at the entrance to the *Designated Work Area*;
- (h) The *HV Access Authority* is kept safe until it is cancelled;
- (i) There is a minimum of one additional person authorised category 5.1, signed on the *HV Access Authority* at all times;
- (j) That all persons required to enter the *Designated Work Area* are:
 - Either authorised category 5.1, or are given an appropriate briefing to enable them to *Work* as *Instructed Persons*;
 - Informed of the *Apparatus* to be worked on, its identification details, the *Description of Work* to be carried out and the extent of access to the *Apparatus*;
 - Participants in a Pre-Work Risk Assessment;
 - Given warnings appropriate to the *Work* being carried out;
 - Conversant with the warnings given and their responsibilities under the *HV Access Authority*;
 - To enter or leave the *Designated Work Area* using the *Approved* entrance; and

- Signed off the *HV Access Authority* at the completion of their *Work* for each shift or when leaving site.
- (k) That working earths are applied to ensure equipotential conditions are maintained during the course of the *Work*; and
 - (l) That working bridges are applied, where necessary, to maintain a current path when a *Conductor* is to be broken.

5.2.1 Alterations to conditions of Work under a HV Access Authority

Where the description of *Apparatus* and/or the *Description of Work* shown on a *HV Access Authority* is to be altered:

- (a) A new *AFA* *Shall* be submitted by a person authorised category 7.1;
- (b) The new *AFA* *Shall* be assessed and the *Switching Program* rewritten;
- (c) The *HV Access Authority* requiring the alteration(s) *Shall* be cancelled;
- (d) Any other affected *Access Authorities* *Shall* be cancelled;
- (e) The altered steps of the *Switching Program* *Shall* be carried out by a person authorised category 5.5; and
- (f) A new *HV Access Authority* *Shall* be issued by a person authorised category 5.4.

Note that any *Work* that requires changes to the *Switching Program* will be at the discretion of the *Network Controller*.

5.2.2 Suspension of a HV Access Authority

Suspension of a *HV Access Authority* is required when *Work* is to cease for a period and may remain suspended for a period not exceeding 48 hours except at the discretion of the Controller.

When a *HV Access Authority* is to be suspended, the *Recipient in Charge* shall ensure that:

- (a) All persons working under the *HV Access Authority* have signed off, to indicate that permission to *Work* is suspended;
- (b) The *HV Access Authority* is endorsed to indicate that the *Apparatus* is serviceable / is not serviceable;
- (c) The entrance to the *Designated Work Area* is closed off;
- (d) The *Network Controller* is notified of the suspension of the *Work* and whether the *High Voltage Apparatus* is/is not serviceable so far as this *Work* is concerned; and
- (e) The *HV Access Authority*, together with attachments, is delivered to the *Substation* designated control point.

5.2.3 Resumption of Work Following Suspension of a HV Access Authority

A *HV Access Authority* can only be resumed by the person who suspended it. When resuming *Work* following suspension of a *HV Access Authority*, the *Recipient in Charge* shall:

- (a) Obtain permission from the *Network Controller*;
- (b) Sign on the *HV Access Authority* as the *Recipient in Charge*;

- (c) Allow all persons signed onto the *HV Access Authority* prior to its suspension to sign back on; and
- (d) Ensure any persons not signed on to the *HV Access Authority* prior to its suspension receive appropriate warnings.

5.2.4 Cancellation of a HV Access Authority

On completion of *Work*, the *Recipient in Charge* shall:

- (a) Prior to cancellation, carry out necessary checks to:
 - i. Confirm all earthing and Bridging Leads and tools are removed;
 - ii. Confirm that all persons signed on the *HV Access Authority* have signed off;
 - iii. Confirm whether any warnings or adjustments are required prior to or on return to service; and
 - iv. Confirm whether *Apparatus* is serviceable or not.
- (b) Cancel the *HV Access Authority* by:
 - i. Closing off the entrance to the *Designated Work Area*;
 - ii. Completing the cancellation section of the *HV Access Authority*;
 - iii. Ensuring that the necessary details are communicated to the *Network Controller* who will record them on the log sheet;
 - iv. Entering the time and date of cancellation of the *HV Access Authority*; and

- v. Delivering the cancelled *HV Access Authority* to the *Substation* control point or directly to the person authorised category 5.5 responsible for the return *Switching*.

- (c) The *Network Controller* shall ensure the following details are recorded:

- i. Parameters of the use of the *Apparatus* or plant, including warnings, or adjustments required prior to, or on return of the *Apparatus* or plant to service;
- ii. Whether the *Apparatus* is, or is not, serviceable; and
- iii. Time and date of cancellation of the *HV Access Authority*

5.3 High Voltage Testing

When *Testing HV Apparatus* requiring a *HV Testing Authority*, the *Test* shall be supervised by a person authorised category 5.3. Persons authorised category 5.3 are *Approved* to perform the duties of the *Recipient in Charge*, supervise *Instructed Persons* and can receive / cancel *HV Testing Access Authorities*.

5.3.1 Testing Not Electrically Connected Apparatus

A *Testing Authority* is not required when *Testing Not Electrically Connected HV Apparatus* which meets the requirements of 'Making Not Electrically Connected HV Apparatus Safe for Work' Rule 5.5.3. The following measures shall be applied.

The Person in charge of the *Test* shall:

- (a) Direct the control of the *Switching* of the *Test* source energising the conductors;
- (b) Ensure adequate communications are maintained with all persons involved in the *Testing*;
- (c) Warn any persons:
 - i. In the *Vicinity* of the conductors under *Test* that voltage is to be applied and, in return, receive an assurance that such persons will remain clear of such conductors during the *Test*; and
 - ii. Involved in the *Testing*, that they may only *Work* on or *Near* the conductors under *Test* when the Person in charge of the *Test* indicates to such persons which conductors are safe to approach.
- (d) Ensure, in cases where induced or *Test* voltages could be present, that safe working methods are used which avoid electric shock to persons coming within the Safe Approach Distance of *Live* conductors and any *Testing Apparatus* or connection leads;
- (e) Ensure that for the duration of electrical *Testing*, a defined *Test* area is established using appropriate *Barriers* and *Approved* notices warning persons of the dangers. If any *Exposed Conductors* to which *Test* voltages are to be applied are out of sight of the person *Switching* the *Test* source, ensure that a person is posted to warn others not to approach the *Exposed Conductors* during the *Test*;

- (f) If the *Testing* is being carried out by a 3rd party, they *Shall* be accompanied at all times during the electrical *Test* by a person with sufficient knowledge of the *Work* and the *Test* devices, to confirm with the person in charge of the electrical *Test* that the *High Voltage* conductors being tested are safe to be touched or approached whenever this becomes necessary during the progress of the electrical *Test*; and
- (g) Ensure that, at the conclusion of the *Test*, any *Apparatus* which may have become electrically charged during the course of the *Test* is fully *Discharged* and left in a safe condition.

5.3.2 Testing under a HV Testing Authority

- (a) *Testing* of *HV Apparatus* in the charge of a *Network Controller* *Shall* only be carried out following the issue of a *HV Testing Authority*;
- (b) A *HV Testing Authority* cannot be issued on *Apparatus* which is already under a *HV Access Authority*. The *HV Access Authority* must either first be cancelled or suspended.
- (c) A *HV Testing Authority* *Shall* be used where the *Work* includes:
 - The removal and/or replacement of *Access Authority* earths;
 - The use of a *Test* source, which is capable of producing currents hazardous to the human body, on the conductors of *High Voltage Electrical Apparatus*; and

- The application of *Extra Low Voltages* or voltages produced by an insulation *Testing Device* operating at 3000 volts or below, *Connected* to *Electrical Apparatus* with a capacitance greater than 4,000pF.
- (d) The person in charge of the *Test* *Shall* have knowledge of the *Work*, verify the status of the *Test* devices and control the *Testing*;
- (e) If it is necessary to change the person in charge of the *Test*, the new person in charge of the *Test* *Shall*:
 - Verify the status of the *Test* devices and all other *Apparatus* associated with the *Testing*; and
 - Understand the warnings and instructions regarding the devices and *Apparatus* that may be operated in conjunction with the *Test*.
- (f) The *Apparatus* under *Test* *Shall* be adequately *Isolated* from any other *Apparatus* under *Test* or any other *Work* party by opening isolators and/or removing conductors as required.

5.3.3 Responsibilities of the Recipient in Charge of a HV Testing Authority

In addition to the requirements of receiving a *HV Testing Authority* the *Recipient in Charge* *Shall*:

- (a) Instruct those persons *Working* under the *HV Testing Authority* regarding *Work* that may proceed during the *Testing* and provide any additional warnings that may be applicable;

- (b) Direct the control of the *Switching* of the *Test* source covered by the *HV Testing Authority*;
- (c) Ensure adequate communication is maintained with all persons involved in the *Testing*;
- (d) Warn any person in the *Vicinity* of the conductors under *Test*, that voltage is to be applied;
- (e) Receive an assurance that such person will remain clear of such conductors during the *Test*;
- (f) Where induced, or *Test* voltages, could be present, ensure that safe *Working* methods are used to restrict persons coming within the Safe Approach Distance of *Live* conductors and any *Testing Apparatus*;
- (g) Ensure that for the duration of electrical *Testing*, the entrance to the *Designated Work Area* is closed and an *Approved* notice warning that electrical *Testing* is in progress is erected at this closed entrance;
- (h) If *Test* voltages are to be applied to any *Exposed Conductors* which are out of sight of the person *Switching* the *Test* source, ensure that *Approved* notices are placed to warn against approach to the *Exposed Conductors* at such points and either:
 - Posting a person to warn others not to approach the *Exposed Conductors* during the *Test*; or

- Erect fences or equivalent *Barriers*, or shutters closed to prevent any person gaining inadvertent access to the *Exposed Conductors*.
- (i) At the conclusion of the *Work*, ensure any *Apparatus* under *Test* which may have become electrically charged during the course of the *Test* is fully *Discharged* and left in a safe condition.

5.4 Issue a High Voltage Access Authority

The issue of a *HV Access Authority* *Shall* be carried out by a person authorised to category 5.4.

5.4.1 HV Access Authority – General requirements

The general requirements for issuing a *HV Access Authority* are as follows:

- (a) Each *HV Access Authority* *Shall* have a unique number;
- (b) Each *HV Access Authority* *Shall* only be issued by a person authorised to category 5.2;
- (c) A *HV Access Authority* *Shall* not be issued where the *Work* would affect the safety of personnel working under another *Access Authority*.

5.4.2 Responsibilities of the Authorised Person issuing a HV Access Authority

The *Authorised Person* issuing the *HV Access Authority* Shall ensure that:

- (a) The person receiving the *HV Access Authority* is a person authorised to category 5.2;
- (b) The location, description of *Apparatus*, *Description of Work* and nominated access required for *Work* set out on the *HV Access Authority* that documented in the relevant parts on the *AFA*;
- (c) The steps of the *Switching Program* relevant to the *Description of Work* on the *HV Access Authority* to be issued, have been recorded as carried out (including receipt of any required SCAPs from third parties);
- (d) The *HV Access Authority* number is provided to the *Network Controller*;
- (e) The *HV Access Authority* is not issued if it is not safe for the *Work* to proceed;
- (f) Prior to issuing the *HV Access Authority*:
 - The *Designated Work Area* is established using an *Approved* process;
 - All required warnings are entered on the *HV Access Authority*, and are communicated to the *Recipient in Charge* and *Work party*;

- The *Work party* is assembled at the *Designated Work Area*;
- The conductors that are safe to *Work* on are identified and the precautions taken to make the conductors safe for *Work* are demonstrated, including local points of isolation, *Do Not Operate Tags* and *Access Authority* earths;
- The *Work party* are advised to check with the *Recipient in Charge* upon return to the worksite that they are in the correct *Designated Work Area* before recommencing *Work*;
- The *Work party* are warned of the dangers of:
 - *Near* approach to *Live High Voltage Apparatus*; and
 - *Low Voltage* or mechanical *Apparatus*.
- The *Work party* are warned to confine their *Work* to the *Designated Work Area*, the *Work* as described on the *HV Access Authority* and of their responsibilities under *Working under a HV Access Authority Rule 5.1*;
- (g) The details of the issued *HV Access Authority* are communicated to the *Network Controller*.

5.4.3 Responsibilities of the Authorised Person issuing a HV Testing Authority

In addition to the requirements of issuing a *HV Access Authority*, the *Authorised Person* Shall ensure that:

- (a) The person receiving the *HV Testing Authority* is a person authorised category 5.3;
- (b) A *Testing Authority* is not issued where the *Test* may affect the safety of personnel working under another *Access Authority*;
- (c) *Warning Tags* are affixed to all control points that are able to operate the *Apparatus* during the *Test*, in accordance with the *Switching Program*;
- (d) Warnings, instructions and applicable demonstrations are given to the Person in charge of the *Test*; and
- (e) Confirmation has been received from the *Network Controller* that all current *Access Authorities*, for *Work* on or *Near* the conductors required to be electrically tested, are either suspended or cancelled.

5.4.4 Responsibilities of the Network Controller

The *Network Controller* Shall ensure that the following details are recorded:

- (a) *HV Access Authority* number;
- (b) Time and date of issue and cancellation of the *HV Access Authority*; and
- (c) Authorised Person to whom the *HV Access Authority* is issued.

5.5 Operate High Voltage Switchgear

Operation of *HV Apparatus* Shall be carried out by a person authorised category 5.5.

5.5.1 Operate HV Switchgear - General

- (a) Operations Shall be carried out under the direction of the *Network Controller*;
- (b) All messages relating to the operation of *High Voltage Apparatus* Shall be logged.
- (c) In describing *Apparatus*, the *Apparatus* Shall be given its full name and number.
- (d) The purpose of each message and the time of transmission Shall be recorded.
- (e) *Switching Work* associated with a *Switching Program* Shall not be regarded as *Work* on or *Near High Voltage Exposed Conductors* provided that:
 - *Safe Approach Distances* are maintained; or
 - When carrying out *Electrical Operating Work* in accordance with an *Approved* process.

5.5.2 Making HV Apparatus Safe for Work

Before *Work* is performed on or *Near High Voltage Exposed Conductors* the following *Shall* be carried out in the order specified:

(a) Isolation

Conductors Shall be *Isolated* from each point of *Supply*. The points of isolation *Shall* be locked (where possible) and *Do Not Operate Tags* affixed.

The effectiveness of the points of isolation *Shall* be demonstrated by either a *Visible break*, indication or operation of the *Apparatus*.

These points of isolation *Shall* include *Low Voltage* sources which could cause the *HV* conductors to become *Live*.

If during the course of *Work* it is necessary to transfer a point of isolation to an alternative position, any *Access Authority* held by parties at that location affected by this transfer *Shall* be cancelled prior to the transfer taking place.

(b) Earthing

HV Access Authority earths *Shall* be applied to the *High Voltage* conductors, once it has been proved safe to do so, using an *Approved* method. Their placement *Shall* not be affected by the *Work* to be done and *Do Not Operate Tags* *Shall* be affixed.

HV Access Authority earths *Shall* be applied as follows:

- i. As close as practicable to the point of *Work*;
- ii. Where there is a *Conductor* at the point of *Work* that is not *Earthed*, *HV Access Authority* earths *Shall* be applied between the point of *Work* and all points of *Supply*;
- iii. Where *Work* is to be performed on or *Near* the *High Voltage Exposed Conductors* of totally *Enclosed Apparatus*, supplied from a single source via a *Cable(s)*, the *HV Access Authority* earths *Shall* be applied at the nearest practical point to the *Work* area, but *Shall* be on the same *Negative* potential connection;
- iv. Where the continuous electrical connection between the *Conductor* required to be *Earthed* and the *Access Authority* earth is provided by an *Isolator*, a set of links or a similar *Device*, this *Shall* be closed, locked closed if practicable, and a *Do Not Operate Tag* affixed;
- v. *Conductors* may be *Earthed* by means of a closed *Switch* or *Circuit Breaker*, provided that it is rendered inoperative in the closed position and a *Do Not Operate Tag* affixed.

5.5.3 Making Not Electrically Connected HV Apparatus Safe for Work

HV Substation Apparatus Not Electrically Connected or not yet commissioned for service may be *Approved* safe for *Work* and excluded from the *Access Authority* requirements of the *Safety Rules* if the conditions below are met. All persons *Working* within the *Not Electrically Connected Apparatus* area *Shall* be either *Instructed Persons* or *Authorised Persons* under category 2.2.

HV Substation Apparatus *Shall* be *Approved* as *Not Electrically Connected Apparatus* by a person authorised category 5.5, subject to the following conditions:

- (a) The *HV Apparatus* is *Not Electrically Connected* to any sources of *HV* electrical energy, achieved by the removal or absence of conductors and cannot be *Energised* by *Electrical Operating Work*;
- (b) Any risks associated with induced voltages or transferred potentials are appropriately controlled;
- (c) There is no possibility of coming on or *Near* the *HV Exposed Conductors* of other *HV Electrical Apparatus*;
- (d) Appropriate *Low Voltage* or mechanical isolations have been carried out in accordance with section 3.3
- (e) Exposed terminal connections of any *Cable* within the *Vicinity* of the *Not Electrically Connected Apparatus* *Shall* be identified;

- (f) *Not Electrically Connected HV Substation Apparatus* – safe for *Work* *Shall* be identified within a *Substation* by enclosing the *Apparatus* by a fence appropriate to the planned *Work* and affixing signs “*Not Electrically Connected Apparatus*” at regular intervals around the outside of the fence.
- (g) Prior to the start of *Work* on *Not Electrically Connected HV Apparatus*, a risk *Assessment* *Shall* be performed and documented.

5.5.4 Connection of HV Apparatus

Prior to any *Not Electrically Connected HV Apparatus* being *Connected* to the *Power* network, a *HV Access Authority* is required and a person authorised category 5.5 *Shall* confirm that:

- (a) All measures taken to identify the *HV Apparatus* as *Not Electrically Connected Apparatus* are removed;
- (b) All necessary *Apparatus* identification, warning signs, locks, fences, gates, are in place;
- (c) Advice has been provided to all persons in the associated *Work* party to regard the *Apparatus* as *Live*; and
- (d) The *Apparatus* is in a fit state to be *Energised*, and the precautions already taken for the issue of any associated *Access Authority* are appropriate.

5.5.5 Entry to Enclosed Apparatus

A person *Shall* only enter an *Enclosed Apparatus* area if they are signed onto a *HV Access Authority* for the *Enclosed Apparatus* or are a person authorised category 5.5, who is carrying out *Switching* and:

- (a) The conductors within the *Enclosed Apparatus* have been *Isolated*; or
- (b) They will not come on or *Near Exposed Conductors*; or
- (c) When carrying out *Electrical Operating Work* in accordance with an *Approved* procedure.

5.5.6 Restoration of Apparatus

The *Authorised Person* restoring the *Apparatus* after *Work Shall*:

- (a) Establish that the *High Voltage Access Authority* has been cancelled;
- (b) Dismantle the *Designated Work Area*:
 - When the *High Voltage Apparatus* covered by the *HV Access Authority* is to be made ready for service, before removing *Do Not Operate Tags*, the *Designated Work Area* and associated warning signs *Shall* be dismantled; or
 - When the *High Voltage Apparatus* is to remain out of service pending the issue of a new *HV Access Authority* for further *Work* then, provided all *Switching Program* requirements remain unaltered, the *Designated Work Area* and associated warning signs may be left in place in readiness.

- (c) Restore the *Apparatus* as per the *Switching Program*;
- (d) Arrange for required adjustments to the *Apparatus* to be carried out prior to or on return to service of the *Apparatus*.

5.5.7 Emergency Requirements

Where there is immediate risk to human life or property that requires action regarded as *Work* on or *Near High Voltage Exposed Conductors*, *Work* may proceed under the following conditions:

- (a) The conductors *Shall* be *Isolated*, *proved De-Energised* and *Earthed*;
- (b) The requirements to apply locks, *Do Not Operate Tags*, erect a *Designated Work Area* and issue *An Access Authority* are not mandatory;
- (c) Persons working who are not authorised category 5.5 *Shall* be under the continuous close and personal supervision of a person authorised category 5.5; and
- (d) As soon as possible after the immediate emergency, normal safety precautions *Shall* be applied.

6 Work on Electrical Infrastructure Outside Substations

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This section of the *Safety Rules* sets down the requirements for the safety of personnel when conducting *Work* on electrical infrastructure that is not in a *Substation*, including any *Work* that could come within *Safe Approach Distances* of overhead infrastructure.

The following documents support this section of the Safety Rules:

Category 6

- Lockout Tagout of Electrical Apparatus (non-HV)
- Overhead Electrical Schedule Trolley Wire Examinations
- SWMS OH 0007 Working Dead Line
- SWMS OH 0008 Working Live Line
- SWMS OH 0002 Overhead Network Fittings Installation and Removal
- SWMS OH 0009 Battens, Bunting and Insulating Mats Installation
- Overhead Electrical System – TMP Servicing Schedule
- Drop Zone Management Task Card
- Managing Power & Overhead Corrective Work
- Managing Power & Overhead Preventative Maintenance
- Provision of Electrical Permits
- Provision of Standard Isolation Programs Work Instruction
- General Installation and Removal of Tram Overhead Support Poles
- Overhead Electrical System Servicing Schedules
- Preparation of Application to Work on or in the Vicinity of Electrical Apparatus
- Standing Overhead Poles Live
- SWMS TM 0020 Supply 600VDC to Automatic Points and Signals
- SWMS OH 0016 600 VDC Supply Connection to Automatic Points Control Fuse Box
- Tram Overhead Works Commissioning
- SWMS OH 0005 Lifting the Wire – Escorting High Load Vehicles

6.0.1 Hazards of *Work* on Electrical Infrastructure Outside *Substations*

The following hazards *Shall* be considered before undertaking *Work* in the *Vicinity* of electrical infrastructure:

Hazard 1 *Safe Approach Distances*

Contact with, or within *Safe Approach Distances* to, a *Live Exposed Conductor* can cause severe injuries or death, which can occur by the following means:

- By touching the *Live Exposed Conductor* with any portion of the body;
- By bringing any portion of the body so close to the *Live Exposed Conductor* that an arc occurs between the *Conductor* and the body; or
- By bringing close to or touching the *Live Exposed Conductor* with material or *Apparatus*, other than *Apparatus* specially designed for such contact.

Safe Approach Distances *Shall* be maintained as specified on page 20.

Hazard 2 *Fire in the Vicinity of Live Exposed Conductors*

Fires in the *Vicinity of Live Exposed Conductors* can cause an arc to form along the path of the flame if a tongue of flame or vapour comes *Near* or makes contact with these conductors. Electrical hazards continue to exist even when a line has been *De-Energised*.

Hazard 3 *Use of High Pressure Water*

Danger can arise when using a continuous stream of high pressure water for tram cleaning and firefighting. Water is a *Conductor* and can cause an arc to form when water comes *Near* or makes contact with conductors. Electrical hazards continue to exist even when a line has been *De-Energised*.

Hazard 4 *Use of Metallic Tapes and Other Conductive Apparatus*

Danger can arise when making measurements in the *Vicinity* of conductors.

Steel tapes, metal reinforced linen tapes and long steel rules *Shall* not be used in the *Vicinity* of overhead infrastructure. Most linen tapes are metal reinforced and for this reason, *Shall* not be used in the *Vicinity of a Live Conductor*. Approved non-conductive tapes *Shall* be used in such locations.

Ladders, lengths of conduit or pipe and other similar long *Apparatus* can be a hazard if not handled correctly to keep them from coming *Near Exposed Conductors*.

Hazard 5 *Use of Mobile Plant*

When *Mobile Plant*, such as cranes, post hole diggers or elevated *Work* platforms are being used in the *Vicinity of Live* overhead infrastructure, danger may arise due to the possibility of the *Apparatus* coming on or *Near* these conductors.

Safe Approach Distances *Shall* be maintained as specified on page 20.

NOTE: PERU Operators are authorised and trained – please refer to Safe Approach Distance Table 2 special note for PERU.

Hazard 6 *Over-Dimensional Vehicles*

Attention is drawn to the possibility of over dimensional *Vehicles* coming within *Safe Approach Distances* while travelling under overhead infrastructure. A permit and escort is required for all over dimensional *Vehicles* travelling under overhead infrastructure in accordance with the *No Go Zone* procedure.

Safe Approach Distances *Shall* be maintained as specified on page 20.

Hazard 7 *Induced Voltages & Secondary Circuits*

Suitable precautions *Shall* be taken by persons to avoid the dangers of induction when carrying out *Work on Isolated Electrical Apparatus* that is located close to *Live Electrical Apparatus*. Such induction may result either from in-service *Apparatus*, *Switching* or electrical faults.

Bridges and bonds *Shall* be applied where necessary to ensure equipotential conditions are maintained. Particular care is to be taken to maintain these conditions when breaking connections.

Hazard 8 *Overhead HV Conductors*

Some locations have conductors owned by other controllers passing above the Yarra Trams overhead infrastructure. When these conductors operate at *Low Voltage* they are normally *Insulated*; when these conductors operate at *High Voltage* they are not *Insulated*.

Hazard 9 *Step and Touch Potentials*

Hazardous voltage gradients arise from currents passing between conducting materials such as an overhead line pole and the surrounding ground.

Step voltage decreases rapidly with distance from the base of a structure.

Hazard 10 *Underground Services*

Any excavation or digging has the potential to come into contact with underground services, including *HV* cables, gas, water, sewer, telecoms and *LV* cables.

Hazard 11 *Lightning*

Lightning strikes on overhead infrastructure can induce dangerous voltages. Strikes can occur up to 20km ahead of a storm.

Hazard 12 *Dangers of non-equipotential working*

If *Bridging Leads* are applied across a point fed from two different sources, and one of those sources becomes disconnected, then the bridging lead could be carrying a very high current. Removal of the bridging lead under such circumstances could result in a dangerous electric arc.

6.1 *Work in Tram Corridors not Under the control of the Network Controller*

Work required to be undertaken in tram corridors by parties not under the control of Yarra Trams *Shall* be carried out in accordance with *No Go Zone* guidelines and Yarra Trams *Approved* procedures.

This work is governed by the issuing of a permit to work. Persons authorised category 6.1 are authorised to receive a permit to work and supervise instructed persons working in the vicinity of overhead conductors.

Permit to work *Shall* be issued by a person authorised category 6.6.

Typical examples of work under a permit to work include:

- External civil works;
- Crane erection and dismantle;
- Telecommunication installations; and
- Property developments and maintenance.

On issuing the permit to work, the *Network Controller Shall* be advised of:

- (a) The permit to work number,
- (b) Time and date of issue and cancellation of the permit to work ; and
- (c) The person to whom the permit to work is issued.

6.2 Work on LV Apparatus Excluding Overhead Infrastructure

Work on LV Apparatus outside Substations excluding Work on overhead infrastructure Shall be carried out by a person authorised category 6.2.

Typical examples include:

- *Work* on automatic points;
- *Work on* electrolysis *Apparatus* outside *Substations*;
- *Work on LV Apparatus* at Tram Stops (Lighting / advertising boards); and
- Track civil works.

The following precautions *Shall* be applied before commencing *Work*:

- Excluding public from *Work* area
- Isolate, lockout and tagout locally such that it is not possible to re-energise
- Civil works – excavations / dial-before-dig

Persons undertaking this *Work Shall*:

- (a) Participate in a Pre-Work Risk Assessment;
- (b) Notify *Network Controller* of works to be undertaken and any impact to the network
- (c) Maintain *Safe Approach Distances*; if *Safe Approach Distances* cannot be maintained, the *Approved Work* procedures *Shall* be followed
- (d) Carry out all works to *Approved* processes
- (e) Ensure that the *Apparatus* is left in a safe condition
- (f) Check if anyone requiring access has medical implants that may be affected by electric fields and, if so, refer them to their physician before allowing them access.

6.3 Work on Electrical Infrastructure outside of Substations – General

Work that does not encroach *Safe Approach Distances* (see page 20) does not require an *Access Authority* and *Shall* be carried out by a person authorised category 6.3. This includes *Work* in *Tram Corridors* in the *Vicinity* of overhead infrastructure (600V DC).

Typical examples include:

- Track Maintenance Works
- Standing, painting and removing poles
- Pole Base Inspections
- Communication *Apparatus* associated with Depot Road *Isolators*
- Vegetation Management

Any personnel working adjacent to the electrical infrastructure *Shall* be trained in the hazards relevant to the *Work* being conducted and any plant, tools or *Apparatus* to be used.

Prior to undertaking *Work* on electrical infrastructure, hazards *Shall* be identified and controlled using a Pre-Work Risk Assessment.

Persons undertaking this *Work Shall*:

- (a) Participate in a Pre-Work Risk Assessment;
- (b) Notify *Network Controller* of works to be undertaken and any impact to the network;
- (c) Maintain *Safe Approach Distances*;
- (d) Carry out all works to *Approved* processes;

- (e) Ensure that the *Apparatus* is left in a safe condition; and
- (f) Check if anyone requiring access has medical implants that may be affected by electric fields and, if so, refer them to their physician before allowing them access.

Prior to any excavation *Work*, a risk *Assessment Shall* be carried out to identify potential damage to buried services. The location of other utility services *Shall* be established through Dial Before You Dig inquiry. Isolation and *Access Authorities* may be required.

6.3.1 Encroach of Safe Approach Distances of 3rd Party Apparatus

Caution must be applied to ensure that *Safe Approach Distances* (see page 20) are not encroached to 3rd Party assets and *Apparatus*. If this cannot be achieved:

- LV conductors are to be covered with *Approved Barriers*
- 3rd party HV *Apparatus Shall* be taken out of service. This requirement needs to be identified in the *AFA* so that the necessary arrangements (outage / *SCAP*) can be made.

6.3.2 Safety Observer

When *Mobile Plant* is operating in the *Vicinity* of overhead infrastructure a *Safety Observer* is required, in accordance with the Table 2 in *Safe Approach Distances* on page 20.

Safety Observers Shall be authorised and qualified in the *Work* that they are observing.

6.4 Working under a Dead Line Overhead Access Authority

Work on Overhead Infrastructure can either be undertaken as *Live Line* or *Dead Line*. For *Live line Work*, refer to section 6.7.

A *Dead Line Overhead Access Authority* is required when *Work* is to be performed on overhead infrastructure and dead line conditions are required to undertake the *Work*.

Work under this category *Shall* be carried out by an *Instructed Person* or a person authorised category 6.4.

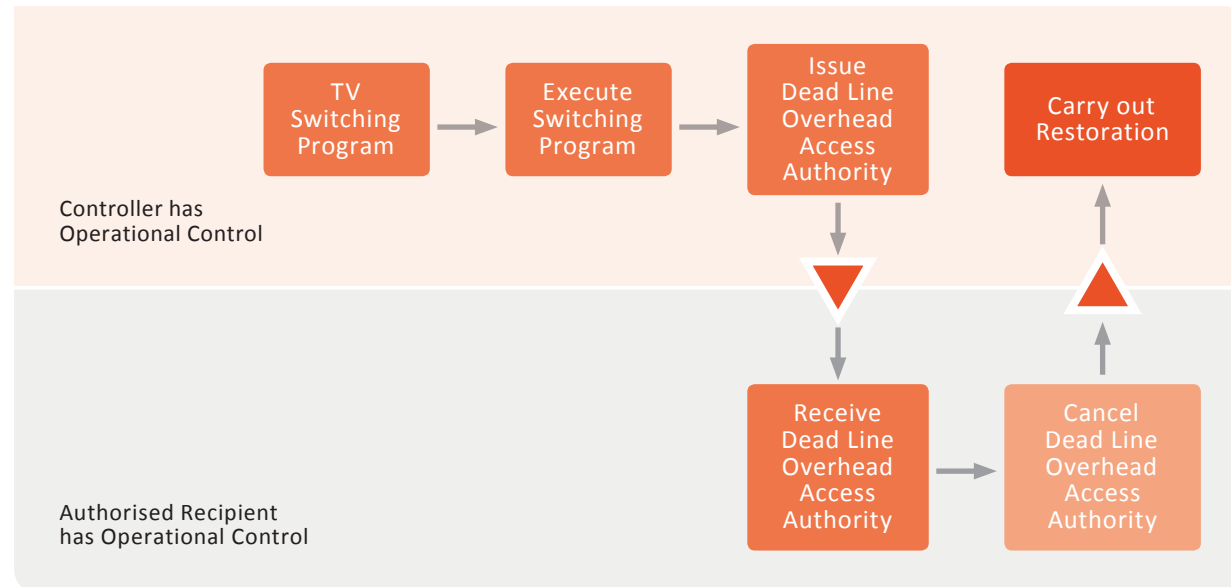
A *Dead Line Overhead Access Authority* is issued to provide a safe working environment for personnel when working on exposed overhead infrastructure.

Dead Line Overhead Electrical Access Authorities cover overhead infrastructure outside a *Switchyard*. A *Dead Line Overhead Access Authority* extends to the point of connection with the aerial *Switch*.

6.4.1 Dead Line Overhead Access Authority Flow Chart

The following diagram illustrates the points at which operational control transfers from the *Network Controller* to the *Recipient in Charge* (i.e. the holder of the *Dead Line Overhead Access Authority*).

Operational Control working under a dead line overhead access authority



6.4.2 Responsibilities of Persons working under a Dead Line Overhead Access Authority

All persons working under an overhead Access Authority *Shall*:

- Participate in a *Pre-Work Risk Assessment*;
- At the start of each shift, or upon returning after leaving site, sign on the *Dead Line Overhead Access Authority* to indicate that they understand the warnings/demonstrations given and their responsibilities under the *Dead Line Overhead Access Authority*;
- Follow any safety directions given by the *Recipient in Charge*;
- Upon entry or any return to the *Work* area and before commencing or recommencing *Work*, confirm the identity of the *Apparatus* on which they intend to *Work*;
- Sign off the *Dead Line Overhead Access Authority* at the completion of their *Work* for each shift or when leaving site; and
- Before recommencing *Work* on any subsequent shift, verify that the conditions of the *Dead Line Overhead Access Authority* covering the *Apparatus* are still valid.

6.5 Receipt of a Dead Line Overhead Access Authority

A *Dead Line Overhead Access Authority* *Shall* be received by a person authorised category 6.5. Persons authorised category 6.5 are *Approved* to:

- supervise *Instructed Persons* for *Work* under this category;
- perform the duties of the *Recipient in Charge*; and,
- receive/cancel a *Dead Line Overhead Access Authority*.

The *Recipient in Charge* *Shall* ensure:

- The location, description of *Apparatus*, *Description of Work* and the access required for *Work* as shown on the *Dead Line Overhead Access Authority* reflects that on the relevant part on the *AFA*;
- Control Measures* are identified and applied so that *Work* can be carried out safely under the *Dead Line Overhead Access Authority* (such as the installation of any *Barriers* or signage, or appointment of a *Safety Observer*);
- They understand the warnings given by the Issuer and their responsibilities under the *Dead Line Overhead Access Authority*;
- That the *Apparatus* to be worked on is positively identified and reflects that documented on the *Dead Line Overhead Access Authority*;

- (e) That all members of the *Work* party have signed on the *Dead Line Overhead Access Authority* before *Work* commences;
- (f) *Work* is restricted to the *Description of Work* on the *Dead Line Overhead Access Authority*;
- (g) The *Dead Line Overhead Access Authority* is kept safe until it is cancelled;
- (h) There is a minimum of one additional person authorised category 6.4, signed on the *Dead Line Overhead Access Authority* at all times;
- (i) That all persons required to *Work* under the *Dead Line Overhead Access Authority* are:
 - Either authorised category 6.4, or are given an appropriate briefing to enable them to *Work* as *Instructed Persons*;
 - Informed of the *Apparatus* to be worked on, its identification details and the *Description of Work* to be carried out and the extent of access to the *Apparatus*;
 - Participants in the Pre-*Work* Risk Assessment Meeting;
 - Given warnings and/or demonstrations appropriate to the *Work* being carried out;
 - Conversant with the warnings/ demonstrations given;
 - Conversant in their responsibilities under the *Dead Line Overhead Access Authority*; and
 - Signed off the *Dead Line Overhead Access Authority* at the completion of their *Work* for each shift or when leaving site.

- (j) That bonding or short circuit leads are applied to ensure equipotential conditions are maintained during the course of the *Work*;
- (k) That *Bridging Leads* are applied, where necessary, to maintain a current path when a *Conductor* is to be broken or disconnected;

6.5.1 Alterations to conditions of Work under a Dead Line Overhead Access Authority

Where the description of *Apparatus* and/or the *Description of Work* shown on a *Dead Line Overhead Access Authority* is to be altered:

- (a) A new *AFA* Shall be submitted by a person authorised category 7.1;
- (b) The new *AFA* Shall be assessed and the *Switching Program* rewritten;
- (c) The *Dead Line Overhead Access Authority* requiring the alteration(s) Shall be cancelled;
- (d) Any other affected *Access Authorities* Shall be cancelled;
- (e) Altered steps of the *Switching Program* Shall be carried out by a person authorised category 6.6; and
- (f) A new *Dead Line Overhead Access Authority* Shall be issued by a person authorised category 6.6.

Note that any *Work* that requires changes to the *Switching Program* will be at the discretion of the *Network Controller*.

6.5.2 Cancellation of a Dead Line Overhead Access Authority

On completion of *Work*, the *Recipient in Charge* Shall cancel the *Dead Line Overhead Access Authority* by:

- (a) Confirming all working short circuits and *Bridging Leads* and tools are removed;
- (b) Confirming that all Recipients signed on the *Dead Line Overhead Access Authority* have signed off;
- (c) Completing the cancellation section of the *Dead Line Overhead Access Authority*; and
- (d) Ensuring that the necessary details are communicated to the *Network Controller*.
- (e) File the cancelled DLOAA in accordance with procedures.

The *Network Controller* Shall ensure the following details are recorded:

- Any warnings or adjustments required prior to or on return to service;
- Whether *Apparatus* is serviceable or not;
- Time and date of cancellation of the *Dead Line Overhead Access Authority*.

6.5.3 Treatment of Electrolysis Conductors

Electrolysis feeder conductors are to be treated as a *Traction Voltage* conductors in the Electrical Infrastructure, so require a *Dead Line Overhead Access Authority* when undertaking dead line *Work*.

6.6 Issue a Dead Line Overhead Access Authority

The issue of a *Dead Line Overhead Access Authority* Shall be carried out by a person authorised category 6.6.

6.6.1 Dead Line Overhead Access Authority – General Requirements

The general requirements for issuing a dead line overhead *Access Authority* are as follows:

- (a) Each *Dead Line Overhead Access Authority* Shall have a unique number;
- (b) Each *Dead Line Overhead Access Authority* Shall be issued by a person authorised category 6.6;
- (c) The *Dead Line Overhead Access Authority* is not issued if it is not safe for the *Work* to proceed.

6.6.2 Prior to issue of a Dead Line Overhead Access Authority

Prior to the issue of a *Dead Line Overhead Access Authority*, the following Shall be satisfied:

- (a) Confirmation Shall be received from the *Network Controller* that all sources of *Supply* have been appropriately *Isolated* and *Earthed*;
- (b) Once this confirmation is received, the overhead infrastructure at the *Work* location Shall be identified, proved *De-Energised* and short circuited with *Approved Short Circuiting* devices;

- (c) *Approved Short Circuiting* devices at specific locations *Shall* be applied as follows:
- i. As close as practical to, and within sight of the *Work* location. The *Work Shall* be carried out in such a manner that any movement of the *Conductor* during the *Work Shall* not interfere with the effectiveness of the *Approved Short Circuiting* devices;
 - ii. Where the *Work* involves the connection, cutting or disconnection of conductors then the short circuit continuity *Shall* be maintained;
 - iii. Prior to the *Work* commencing, *Approved Short Circuit Devices Shall* be *Connected* to a common *Negative* point and then applied, one to each side of the point of *Work*; and
 - iv. *Approved Short Circuit Devices Shall* be applied between the point of *Work* and all points of *Supply* within the overhead network;
 - v. All *Short Circuit Devices Shall* have *Do Not Operate Tags* affixed to all points of connection, referencing the *Access Authority* that requires them.

6.6.3 Responsibilities of the Person issuing a Dead Line Overhead Access Authority

The *Authorised Person* issuing the *Dead Line Overhead Access Authority Shall* ensure that:

- (a) The person receiving the *Dead Line Overhead Access Authority* is a person authorised category 6.5;
- (b) The location, description of *Apparatus*, *Description of Work* and the nominated access required for *Work* set out on the *Dead Line Overhead Access Authority* reflects those documented in the relevant parts on the *AFA*;
- (c) The *Dead Line Overhead Access Authority* is not issued if it is not safe for the *Work* to proceed;
- (d) All required applicable warnings are entered on the *Dead Line Overhead Access Authority* and are communicated to the *Work* party;
- (e) They personally transmit to and receive all messages from the *Network Controller* concerning the issue and cancellation of the *Dead Line Overhead Access Authority*.
- (f) They receive clearance from the *Network Controller* to:
 - Prove *De-Energised*;
 - Apply *Approved* short circuits; and
 - Issue the *Dead Line Overhead Access Authority*.

- (g) The *Dead Line Overhead Access Authority* number is communicated to the *Network Controller*;
- (h) The *Work* party are warned to confine their *Work* to that described on the *Dead Line Overhead Access Authority* and of their responsibilities as persons working under a *Dead Line Overhead Access Authority*, Section 6.4.2.
- (i) They assemble all persons who are to *Work* under the *Dead Line Overhead Access Authority* and:
 - Demonstrate to them the conductors which are safe to be worked on; and
 - Warn them of any other conductors, in the *Vicinity* of the *Work*, which *Shall* be regarded as *Live*.

6.6.4 Responsibilities of the Network Controller

The *Network Controller Shall* ensure that the following details are recorded:

- (a) The *Dead Line Overhead Access Authority* number,
- (b) Time and date of issue and cancellation of the *Dead Line Overhead Access Authority*;
- (c) The *Authorised Person* to whom the *Dead Line Overhead Access Authority* is issued; and
- (d) The location and number of short circuits.

6.6.5 Restoration Following the Cancellation of a Dead Line Overhead Access Authority

The person responsible for restoration *Shall*:

- (a) Confirm with the *Network Controller* that the *Access Authority* has been cancelled;
- (b) Confirm whether the *Apparatus* is serviceable;
- (c) Confirm with the *Network Controller* the number of short circuits that were applied;
- (d) Remove all of the short circuits using an *Approved* method;
- (e) Confirm with the *Network Controller* that the *Apparatus* is now ready to be *re-Energised*.

Following receipt of the above confirmation, the *Network Controller Shall* arrange for the isolation and earthing applied to all sources of *Supply* to be removed in accordance with the *Switching* instruction.

6.7 Working under a Live Line Overhead Working Authority

A Live Line Overhead Working Authority is required when Work is to be performed on or Near Live overhead infrastructure.

Work under this category Shall be carried out by an Instructed Person or a person authorised category 6.7.

6.7.1 Requirement for an Equipotential Work Area

In order to provide a safe working environment when working with Live conductors, equipotential principles Shall be observed at all times. This means that the entire area being worked on must be at the same potential (the Equipotential Work Area).

No bridging or jumper leads can be applied between areas of different potential unless Approved processes are followed.

Live Line Overhead Access Authorities cover a selected section of overhead infrastructure within an Equipotential Work Area.

6.7.2 Operational Control under a Live Line Overhead Working Authority

Note that, unlike Access Authorities, Apparatus covered by a Live Line Overhead Working Authority remains under the operational control of the Network Controller at all times.

6.7.3 Responsibilities of persons working under a Live Line Overhead Working Authority

All persons working under a Live Line Overhead Working Authority Shall:

- (a) Participate in a Pre-Work Risk Assessment;
- (b) At the start of each shift, or upon returning to site, sign on the Live Line Overhead Working Authority to indicate that they understand the warnings/demonstrations given and their responsibilities under the Live Line Overhead Working Authority;
- (c) Follow any safety directions given by the Recipient in Charge;
- (d) Upon entry or any return to the Work area and before commencing or recommencing Work, confirm the identity of the Apparatus on which they intend to Work; and
- (e) Sign off the Live Line Overhead Working Authority at the completion of their Work for each shift or when leaving site.

6.8 Receipt of a Live Line Overhead Working Authority

A Live Line Overhead Working Authority Shall be received by a person authorised category 6.8. Persons authorised category 6.8 are Approved to:

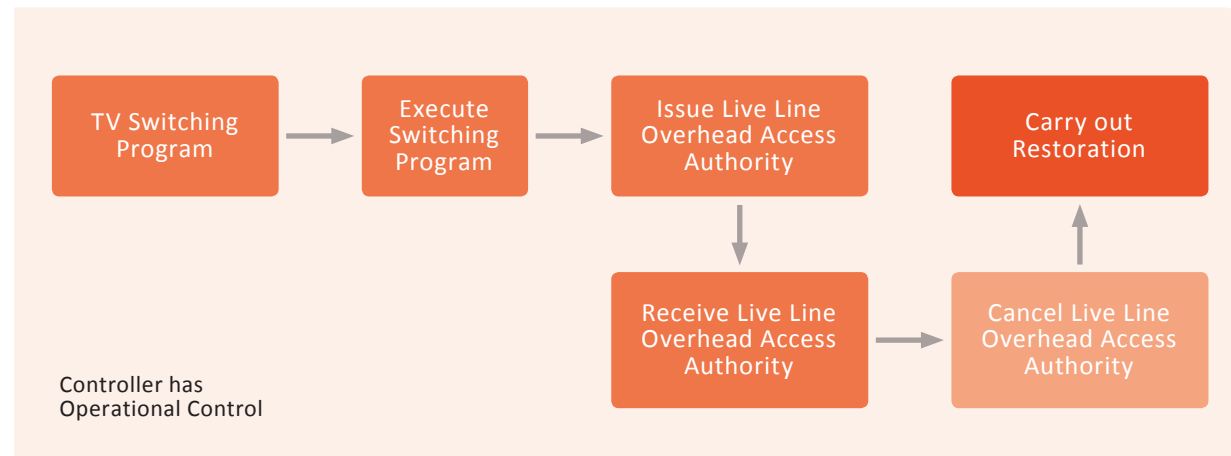
- Supervise Instructed Persons for Work under this category;
- Perform the duties of the Recipient in Charge: and,
- Receive / cancel Live Line Overhead Working authorities.

6.8.1 Responsibilities of the Authorised Person receiving a Live Line Overhead Working Authority

The Recipient in Charge Shall ensure:

- (a) The location, description of Apparatus, Description of Work and the Control Measures covering the Work area required for the Work as shown on the Live Line Overhead Working Authority reflects that on the relevant part on the AFA;
- (b) Control Measures are identified and applied, so that Work can be carried out safely under the Live Line Overhead Working Authority (such as the installation of any Barriers or signage, or a Safety Observer);

Operational Control working under a Live line overhead access authority



- (c) that they understand the warnings given by the Issuer and their responsibilities under the *Live Line Overhead Working Authority*;
- (d) That the *Apparatus* to be worked on is positively identified and reflects that documented on the *Live Line Overhead Working Authority*;
- (e) Before *Work* commences, that all members of the *Work* party have signed on the *Live Line Overhead Working Authority*;
- (f) *Work* is restricted to the *Description of Work* on the *Live Line Overhead Working Authority*;
- (g) The *Live Line Overhead Working Authority* is kept safe until it is cancelled;
- (h) There is a minimum of one additional person authorised category 6.7, signed on the *Live Line Overhead Working Authority* at all times;
- (i) There is at least one additional person who *Shall* remain at ground level throughout the *Work* who is *Competent* to perform *Low Voltage* rescue and release and CPR;
- (j) That all persons required to *Work* under the *Live Line Overhead Working Authority* are:
 - Either authorised category 6.7, or are given an appropriate briefing to enable them to *Work* as *Instructed Persons*;
 - Informed as to the *Apparatus* to be worked on, its identification details and the *Description of Work* to be carried out and the extent of access to the *Apparatus*;
 - Participants in a *Pre-Work Risk Assessment Meeting*;

- Compliant with the additional *PPE* requirements for *Live Work*;
 - Given warnings and/or demonstrations appropriate to the *Work* being carried out;
 - Conversant with the warnings/ demonstrations given;
 - Conversant in their responsibilities under the *Live Line Overhead Working Authority*; and
 - Signed off the *Live Line Overhead Working Authority* at the completion of their *Work* for each shift or when leaving site.
- (k) All *Vehicles* used for *Live line Work* *Shall* be *Approved* for this type of *Work*.

6.8.2 Cancellation of a *Live Line Overhead Working Authority*

On completion of *Work*, the *Recipient in Charge* *Shall* cancel the *Live Line Overhead Working Authority* by:

- (a) Confirming that all persons signed on the *Live Line Overhead Working Authority* have signed off;
- (b) Completing the cancellation section of the *Live Line Overhead Working Authority*;
- (c) Ensuring that the necessary details are communicated to the *Network Controller*; and
- (d) Filing the cancelled *Live Line Overhead Working Authority* in accordance with procedures.

6.9 Issue a *Live Line Overhead Working Authority*

The issue of a *Live Line Overhead Working Authority* *Shall* be carried out by a person authorised category 6.9.

6.9.1 *Live Line Overhead Working Authority* – General Requirements

The general requirements for issuing a *Live Line Overhead Working Authority* are as follows:

- (a) Each *Live Line Overhead Working Authority* *Shall* have a unique number;
- (b) Each *Live Line Overhead Working Authority* *Shall* only be issued by a person authorised category 6.9;
- (c) The *Live Line Overhead Working Authority* is not issued if it is not safe for the *Work* to proceed.
- (d) If the overhead infrastructure to be worked on is *Near* other organisation’s electrical *Apparatus*, *Approved Barriers* *Shall* be installed to prevent any encroachment of *Safe Approach Distances*. This *Shall* be done in accordance with an *Approved* process.

6.9.2 Responsibilities of the *Authorised Person* issuing a *Live Line Overhead Working Authority*

The *Authorised Person* issuing the *Live Line Overhead Working Authority* *Shall* ensure that:

- (a) The person receiving the *Live Line Overhead Working Authority* is a person authorised category 6.8;

- (b) The location, the description of *Apparatus*, the *Description of Work* and the *Control Measures* required for *Work* set out on the *Live Line Overhead Working Authority* reflect those stated in the relevant parts on the *AFA*;
- (c) The *Live Line Overhead Working Authority* is only issued if it is safe for the *Work* to proceed:
 - i. Confirmation has been received from the *Network Controller* that automatic reclosing has been de-activated for the section of overhead infrastructure covered by the *Working Authority*; and
 - ii. The issuer is satisfied that all *Work* will be conducted in an *Equipotential Work Area*.
- (d) All required applicable warnings are entered on the *Live Line Overhead Working Authority* and are communicated to the *Recipient in Charge* (including the required *Control Measures*);
- (e) They personally transmit to and receive all messages from the *Network Controller* concerning the issue and cancellation of the *Live Line Overhead Working Authority*.
- (f) They provide the *Live Line Overhead Working Authority* number to the *Network Controller*;
- (g) The *Work* party are warned to confine their *Work* to the *Work Area* described on the *Live Line Overhead Working Authority* and of their responsibilities as persons working under a *Live Line Overhead Working Authority*, Section 6.7.3.

- (h) They assemble all persons who are to *Work* under the *Live Line Overhead Working Authority* and:
- Demonstrate to them the conductors which are covered by the *Live Line Overhead Working Authority*; and
 - Warn them of any other conductors, in the *Vicinity* of the *Work*, which are not covered and so *Shall* be regarded as *Live*
- (i) The details of the issued *Live Line Overhead Working Authority* are communicated to the *Network Controller*.

6.9.3 Responsibilities of the Network Controller

The *Network Controller* *Shall* ensure that the following actions are completed:

- (a) As part of the *Switching Program*, the automatic reclosers are deactivated for *Apparatus* with this capability:
- If this is via SCADA, then tags *Shall* be applied on SCADA referencing the *Live Line Overhead Working Authority*;
- (b) Time and date of issue and cancellation of the *Live Line Overhead Working Authority* including its number are recorded; and
- (c) The *Person in Charge* to whom the *Live Line Overhead Working Authority* is issued is recorded.

6.10 Operate Traction Voltage Switchgear

Operation of *Apparatus* outside of substations *Shall* be carried out by persons authorised to category 6.10.

6.10.1 Operate Switchgear Outside of Substations – General

- (a) Operations *Shall* be carried out under the direction of the *Network Controller*;
- (b) All messages relating to the operation of *Apparatus* outside of substations *Shall* be logged.
- (c) In describing *Apparatus*, the *Apparatus* *Shall* be referred to by its full name and number.
- (d) The purpose of each message and the time of transmission *Shall* be recorded.
- (e) *Switching* operations associated with a *Switching Program* *Shall* not be regarded as *Work* on or *Near Traction Voltage Exposed Conductors* provided that:
- *Safe Approach Distances* are maintained; or
 - When carrying out *Electrical Operating Work* in accordance with an *Approved* process.

6.10.2 Making Overhead Apparatus Safe for Work Dead Line

Before *Work* is performed on or *Near Exposed Conductors* outside of substations, the following *Shall* be carried out in the order specified:

(a) Isolation

Conductors *Shall* be *Isolated* from each point of *Supply* and the points of isolation *Shall* be locked and *Do Not Operate Tags* affixed. If this is not physically possible, then isolation *Shall* be achieved using an *Approved Work* method.

The effectiveness of the points of isolation *Shall* be demonstrated by either a *Visible break*, indication or operation of the *Apparatus*.

During the *Work* if it becomes necessary to transfer a point of isolation to an alternative position, any affected *Access Authorities* *Shall* be cancelled prior to the transfer taking place and a new access permit re-issued.

(b) Short Circuiting

Overhead Access Authority short circuits *Shall* be applied to the conductors outside of substations, once it has been proved safe to do so, using an *Approved* method. Their placement *Shall* not be affected by the *Work* to be undertaken.

Dead Line Overhead Access Authority short circuits *Shall* be applied as close as practicable to the point of *Work*. In situations where there is the risk of a worker becoming subject to different potentials across or between different earths, the hazard *Shall* be reduced by the application of equipotential work zone principles.

6.10.3 Making Not Electrically Connected Apparatus Outside of Substations Safe for Work

Apparatus outside of substations that is *Not Electrically Connected* or not yet commissioned for service are excluded from the *Access Authority* requirements of the Safety Rules. Prior to the start of *Work* on *Not Electrically Connected Apparatus* outside of substations, a risk *Assessment* *Shall* be performed and documented.

6.10.4 Connection of Apparatus Outside of Substations

A *Dead Line Overhead Access Authority* *Shall* be required for the existing network prior to any *Not Electrically Connected Apparatus* outside of the substation being *Connected*.

A person authorised category 6.10 *Shall* confirm that:

- (a) All necessary *Apparatus* identification, warning signs, locks, are removed;
- (b) The *Work* party is advised that the *Apparatus* is *Live*;
- (c) The *Apparatus* is in a fit state to be *Energised*; and
- (d) The precautions already taken for the issue of any associated *Access Authority* are appropriate.

6.10.5 Access to Switch Pillar-Boxes

A person *Shall* only access a *Switch Pillar-Box* if they are authorised under categories 4.5 or 6.10 and:

- When carrying out *Electrical Operating Work* in accordance with an *Approved* isolation program; and
- When *Work* is required to be undertaken, the conductors within the *Enclosed Apparatus* have been Isolated and *Access Authority* issued.

6.10.6 Restoration of Apparatus

The *Authorised Person* restoring the *Apparatus* after *Work Shall*:

- (a) Confirm that the *Access Authority* has been cancelled;
- (b) Follow the isolation program to restore the network to normal.

6.10.7 Emergency Requirements

For the purpose of this document, emergency is defined under the Yarra Trams Emergency Response Management Plan.

Where there is immediate risk to human life, or property, that requires action regarded as *Work* on or *Near Exposed Conductors* outside of substations, *Work Shall* proceed under network operator control and the following conditions:

- (a) conductors *may* be *Isolated*, proved *De-Energised* and short circuited; and
- (b) The requirements to apply locks and *Do Not Operate Tags*, erect a *Designated Work Area* and issue An *Access Authority* are not mandatory.

7 Electrical Network Access and Operation

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7.2 ASSESSING AN APPLICATION FOR ACCESS	109
7.3 PRODUCING A SWITCHING PROGRAM	109
7.4 OPERATING SWITCHGEAR VIA SCADA	110



This section covers Electrical Network Access and Electrical Network Operation.

Electrical Network Access covers the process of obtaining permission to *Work on Apparatus* through the process of submitting and assessing an Application for Access (AFA).

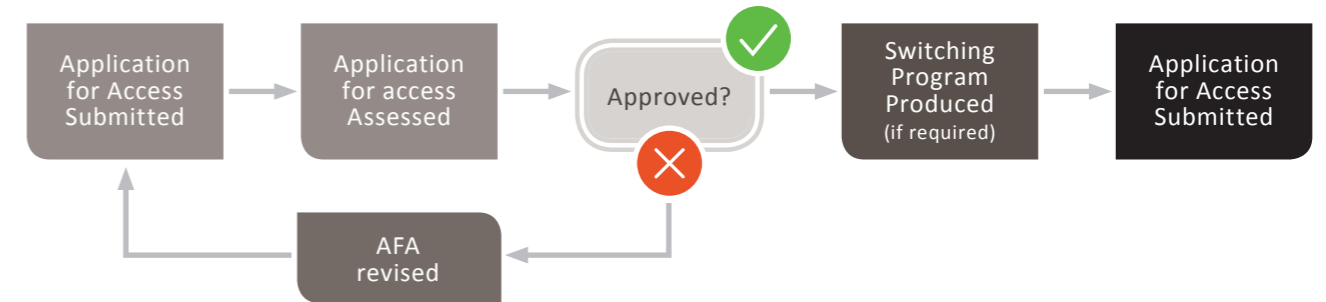
Electrical Network Operation covers the process for producing a *Switching Program* and carrying out *Switching* operations via SCADA or by instruction.

Category 7

- Tram Electrical System Diagram Issue
- Control Room Endorsement System
- Provision of Electrical Permits
- Provision of Standard Isolation Programs Work Instruction
- Power Centre Log Sheet Entries
- Preparation of Application to Work on or in the Vicinity of Electrical Apparatus

7.1 Applications for Access

Applications for *Access Shall* be submitted by a person authorised category 7.1, following the process shown below:



To *Work* on equipment in the charge of a *Network Controller*, an *Application for Access Shall* be submitted, assessed and *Approved*. Once approval is given, a *Switching Program Shall* be produced, after which the outage can proceed.

Instructions for submitting an *Application for Access* are contained in ESSOW – Provision of Electrical Permits (IN-022-WI-0007).

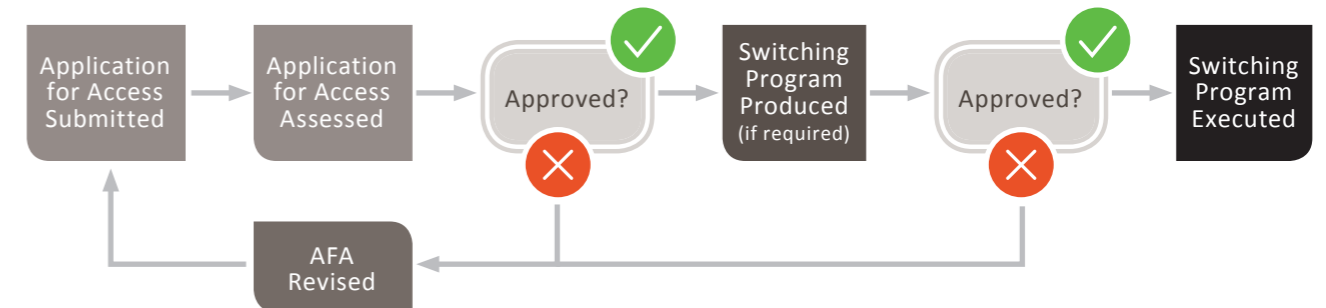
The person submitting the application is responsible for ensuring that it accurately reflects the planned *Work*. The application

must include the location, *Apparatus* identification and description of the *Work*.

Each *Application for Access Shall* be allocated a unique identification number, which *Shall* be cross-referenced against the *Switching Program* and the Access Authority.

7.1.1 Changes to Application for Access

Any changes to an *Application for Access* that require changes to the *Switching Program*, or affects An *Access Authority*, requires the process to start again with a new application:



7.1.2 Access under Emergency Conditions

Under emergency conditions, applications for access can be made verbally to the *Network Controller* and a log entry recorded. The *Approved* incident response procedures *Shall* be followed.

7.2 Assessing an Application for Access

Applications for Access *Shall* be assessed by a person authorised category 7.2.

This *Assessment Shall* establish whether:

- The *Work* can be undertaken in accordance with these *Safety Rules*; and
- The proposed timing of the *Work* can be accommodated without having a detrimental impact on the reliability of the electrical network.

7.3 Producing a Switching Program

Switching Programs Shall be produced by a person authorised category 7.3.

- (a) A *Switching Program Shall* be prepared in response to one or more Applications for Access to *Work* on or *Near Apparatus*.
- (b) The *Switching Program Shall* be:
 - Prepared by a person authorised category 7.3.
 - Checked for correctness by a second person authorised under category 7.3.

- (c) Each *Switching Program Shall* have a unique reference number.
- (d) The *Switching Program Shall* include:
 - A copy of the related Applications for Access;
 - A description of each *Apparatus* and item of *Apparatus* that is to be rendered incapable of unintentional activation;
 - The required status of those devices and *Apparatus*;
 - A description of each *Device* and item of *Apparatus* to which a tag is to be affixed
 - The type of tag;
 - Steps required to ensure the integrity of the *Isolated Apparatus* if required, e.g. proving *de- Energised*;
 - Steps required to carry out the isolation and restoration safely;
 - Steps required for the granting or receipt of a clearance from another organisation;
 - Means for recording the completion of each step, or related series of steps; and
 - Where warnings are required.

7.3.1 Alterations to a Switching Program

Alterations to the *Switching Program*, once execution has commenced, *Shall* be authorised by the *Network Controller*, who will determine whether making the required change is acceptable.

When the steps of a *Switching Program* are to be altered, after the *Network Controller* determines making the changes is acceptable, a person authorised category 7.3 *Shall*:

- Alter the *Switching Program*; and
- Ensure that the altered *Switching Program* includes steps requiring the cancellation of any affected *Access Authority*; and
- Ensure that the altered *Switching Program* is checked for correctness by a second person authorised under this category.

7.4 Operating Switchgear via SCADA

Operating *Switchgear* via SCADA *Shall* be carried out by a person authorised category 7.4. SCADA provides remote control of *Switchgear* and associated control systems from the *Control Room*.

Operating *Switchgear* via SCADA *Shall* be in accordance with these *Safety Rules* and all associated documents.