

Code of Practice:

Victorian traction industry electrical safety rules

The Orange Book 2024

Note to users

Victoria's statutory electrical safety requirements are set out in the Electricity Safety Act 1998 (ESA) and associated *regulations*.

This Code of Practice (Code) has been developed by the Victorian Railway and Tramway Electrical Safety Committee (VRTESC), which has been established under Section 8 of the Energy Safe Victoria Act 2005. The Code is the document defined as the 'Orange Book' in the Electricity Safety (General) *Regulations* 2019 and replaces the Victorian Traction Industry Electrical Safety Rules 2019.

Employers, employees, self-employed persons and all persons (including companies) conducting a business who employ or engage persons to *work on, or near, traction electrical supply networks* are required to be appropriately trained in accordance with this Code. They must be aware of its requirements and comply with the provisions of the Code that apply to the *work* that is being carried out.

This Code *should* be read in conjunction with the ESA and the *regulations* made under that *Act*, in particular the Electricity Safety (General) *Regulations* 2019.

Disclaimer

This publication contains *work* health and safety information. It may cover some of your obligations under various legislation that is administered by Energy Safe Victoria or WorkSafe Victoria. To ensure that you comply with your legal obligations, you must refer to the appropriate legislation. The latest laws can be accessed by visiting the Victorian legislation website at www.legislation.vic.gov.au

This publication does not represent a comprehensive statement of the law that applies to *high voltage or traction voltage electrical apparatus or work on or near traction electrical supply networks* and is not a substitute for legal advice. You *should* seek independent legal advice if you require assistance on the application of the law to your situation.

This document has been endorsed by the Victorian Energy Safety Commission.

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Further information

Anyone seeking additional information on *HV* safety should contact:

- their employer
- the relevant railway and tramway operators
- the relevant asset owner (if applicable)
- the relevant generation, transmission, and distribution companies (if applicable)
- Energy Safe Victoria.

For general workplace health and safety advice, contact:

WorkSafe Advisory Services on 1800 136 089

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1. Purpose



Victoria's workplace health and safety laws place duties on employers to ensure, so far as is reasonably practicable, a working environment that is safe and without risks to health and that persons other than employees are not exposed to risks to their health or safety arising from the conduct of the employer.

Employees also have an obligation to take reasonable care for their own health and safety and that of persons who may be affected by the employee's acts or omissions at a workplace.

Further, electricity safety laws make further provisions relating to the safety of electricity supply and use.

This Code is the document referred to as the *Orange Book* in the ***Electricity Safety (General) Regulations 2019*** and contains provisions that must be complied with in accordance with those *regulations*. Specifically, an owner or operator of a railway or tramway *supply network* must ensure that any person under the control of the owner or operator who is working on or *near* a railway or tramway *supply network*:

- is appropriately trained in accordance with this Code and its requirements
- complies with the provision of this Code that apply to the *work* that the person is carrying out
- uses an *Electrical Access Authority* for *work* on or *near* the railway or tramway *supply network*, as required by this Code.¹

Further, specified workers² must comply with the Code when working on or *near* a *railway or tramway supply network*.³

This Code also provides practical guidance in maintaining safe *work* systems in relation to the control of risks associated with *work* on, or *near*, or in the *vicinity* of *traction electrical supply networks* and adjacent *electrical apparatus* in Victoria, which will assist businesses and workers in meeting their workplace health and safety duties.

1 See r 503(1)(d) in the Electricity Safety (General) Regulations 2019

2 Refer to r 614(2) in the Electricity Safety (General) Regulations 2019

3 See r 615(b) in the Electricity Safety (General) Regulations 2019



2.

Scope and References

2.1 Scope

This Code sets out:

- key safety principles, and
- minimum electrical safety requirements required to comply with those principles.

This Code *shall* apply to all *work on, near or in the vicinity of electrical apparatus* that is part of a traction electricity *supply network* and is capable of being *energised*.

For *work near or in the vicinity of major electrical company (MEC) electrical apparatus* refer to specific interface agreements (if any) and MEC requirements. A permit issued by the relevant MEC may be required for the *work*.

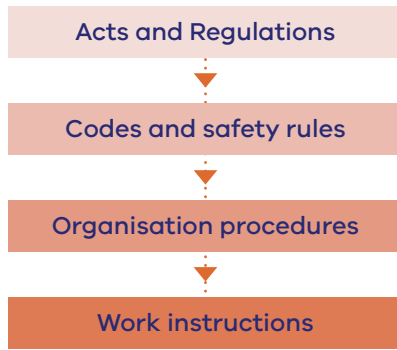
For *work on low voltage Electrical installation assets*, refer to the Electricity Safety (General) *Regulations 2019*.

This Code sets minimum requirements that *should* inform approved *workplace procedures*. These approved *procedures* may utilise other published standards and guidelines to enhance the level of safety.

In order to comply with the electrical safety requirements of this Code an *Organisation shall* either:

- apply the requirements contained within this Code, or
- vary the requirements by:
 - > completing a hazard identification and risk assessment, and
 - > ensuring the varied requirements provide a safety outcome that is equal to or better than the minimum requirements of this Code, and
 - > documenting the process, and
 - > advising Energy Safe *in writing* of the outcomes and reasons for variation(s) 14 days before implementing the variation.

Figure 1. Hierarchy of electrical safety documentation



2.2 Referenced documents

The following documents are referred to in the text of this Code in such a way that some or all of their content constitutes requirements of this document:

AS 1319	Safety signs for the occupational environment
AS1418.10	Cranes, hoists and winches - Mobile elevating <i>work</i> platforms
AS 5804.1	High-voltage live working – general
ENA	EMF Management Handbook
ENA NENS 04	National Guidelines for <i>safe approach distances</i> to Electrical and Mechanical Apparatus
ICNIRP Guidelines 2010	For limiting exposure to time varying electric and magnetic fields(1Hz-100kHz)
IEEE C95.1	IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields 0Hz to 300GHz

2.3 Definitions

For the purpose of this Code, unless the context or subject matter otherwise indicates or requires, the following definitions *shall* apply:

1. **Access authority:** any form of authorisation that allows access to, *work on or near*, or testing of *electrical apparatus*.

Examples used in this Code are:

Electrical access permit: a form of authorisation that allows access to and *work upon electrical apparatus*.

Sanction for testing: a form of authorisation to allow energisation of *electrical apparatus* for testing purposes.

Permit to *work adjacent to network assets*: a document providing *written* permission to persons to *work within safe approach distances near* or in the *vicinity* of a *network operator's network assets*.

2. **Act:** *Electricity Safety Act 1998 (Vic)* as amended from time to time.
3. **Alive:** see *live*.
4. **Appliance:** *any* instrument or device designed for use *near* or in direct contact with *live electrical apparatus*.
5. **Approved:** having appropriate *Organisational* endorsement *in writing* for a specific function.
6. **Approved training standard:** an *approved* standard that meets the National Competency Standards.

- 7. *Authorised person:*** a person with technical knowledge or sufficient experience who has been *approved* or has the delegated authority to act on behalf of the *Organisation*, to perform the duty concerned.

Examples used in this Code are:

Authorised applicant: an *approved* person who has been assessed as *competent* against an *approved training standard* to make applications for specified types of access authorities.

Authorised electrical operator: an *approved* person who has been assessed as *competent* against an *approved training standard* and authorised by a *network operator* to carry out *switching* operations on a *network asset*.

Authorised HV live worker: an *approved* person who has been assessed as *competent* against an *approved training standard* to carry out particular *work* on or *near* exposed, *live HV conductors*.

Authorised recipient: an *approved* person who has been assessed as *competent* against an *approved training standard* to receive an electrical access permit.

Authorised tester: an *authorised recipient* who has been assessed as *competent* against an *approved* training standard to receive a sanction for testing.

- 8. *Authority to work in the vicinity of electrical apparatus:*** a form of authorisation to be used where applicable to allow *work* in the *vicinity of electrical apparatus*.
- 9. *Bonded:*** *connected* together in such a manner as to ensure that all *connected* parts are maintained at the same potential.
- 10. *Cable:*** an *insulated conductor* or two or more such *conductors* laid together, whether with or without fillings, reinforcements or protective coverings.
- 11. *Circuit breaker:*** a device capable of making, carrying and breaking currents under normal and abnormal circuit conditions, such as *short circuit*.
- 12. *Competent:*** having the skills, knowledge and attributes that a person acquires, whether through training, qualifications or experience (or a combination of these) to correctly complete a task.
- 13. *Conductor:*** a wire or form of metal designed for carrying electric current.

14. **Connected:** joined together by a *conductor* capable of carrying electrical current for its required function or purpose by either physically clamping or bolting *conductors* together or closing a *circuit breaker, switch* or similar device.
15. **De-energised:** not *connected* to any source of electrical supply but not necessarily *isolated*.
16. **Designated earthing point:** an electrical connection point provided for *earthing* of *HV AC traction conductors*.
17. **Direct supervision or Directly supervised:** to provide one on one supervision of another person while maintaining visual and verbal contact at all times.
18. **Discharged:** having been *connected* to the general mass of earth in such a manner as to remove any residual electrical energy in a *conductor*.
19. **Distribution company:** a person who is the holder of a licence to distribute electricity.
20. **Earthed:** directly electrically *connected* to the general mass of earth to ensure and maintain the effective dissipation of electrical energy.
21. **Earthed/Short circuited:** in the case of *AC electrical apparatus, earthed* and *phase shorted (AC)* and in the case of *DC electrical apparatus, short circuited (DC)*.
22. **Earthing device:** an *approved* device used for *earthing* of *electrical apparatus*.
23. **Earthing/Short circuiting:** the task of making *electrical apparatus earthed/short circuited*.
24. **Effectively supervised, in relation to electrical work:**
 - a. being present at the site of the *electrical work* to the extent necessary to ensure that the *work* is being correctly performed and carried out in accordance with (when applicable) the *Act, regulations, Code* and *approved procedures*; and
 - b. being aware of the details of the *work* being performed and giving detailed instructions and directions with respect to the *work*.

25. **Electrical apparatus:** any electrical equipment that is *live* or capable of becoming *live*, including overhead lines and underground *cables*.
26. **Electrical Traction Control Officer or ETCO:** the officer responsible for control of all operations on the AC and DC traction networks. This includes Electrical System Officer (train) and Power Control Officer (tram).
27. **Electrical installation:** electrical equipment that is fixed or to be fixed in, on, under or over any land but does not include a part of a *supply network* of a railway or owned or operated by a MEC.
28. **Enclosure:** a secured area that restricts access to *electrical apparatus*.
29. **Energised:** *connected* to a source of electrical supply.
30. **Equipotential work zone:** a *work zone* (area, site) where all equipment is *interconnected* by jumpers/temporary bridges, earths, earth rods, and/or earth grids that will minimise potential voltage between all parts of the *work zone* so that any *workers* within the zone are protected from unsafe voltages under worst-case conditions of energisation.
31. **Exposed conductor:** an electrical *conductor*, approach to which is not prevented by a barrier of rigid material or by insulation that is adequate under a relevant Australian Standard specification for the voltage concerned.
32. **High voltage (HV):** a *Nominal Voltage* exceeding 1000 volts AC or exceeding 1500 volts DC.
33. **High voltage or HV electrical apparatus:** *electrical apparatus* that operates or is required to operate at *high voltage*. This definition *shall* not include the secondary wiring of instrument transformers or control devices that may operate on occasions above 1000 volts AC.
34. **In service:** the status of *electrical apparatus* being either *connected* to an electrical supply, or in a condition where it can be *connected* to electrical supply by the closing of installed isolators and/or *circuit breakers*.
35. **Instructed person:** a person under the supervision and instruction of an *authorised person*.
36. **Insulated mobile plant:** *mobile plant approved* and tested for carrying out *work* on or *near electrical apparatus*.

37. **Insulated:** separated from adjoining conducting material by a non-conducting substance that provides resistance to the passage of current, or to disruptive discharges through or over the surface of the substance at the operating voltage, and to mitigate the danger of shock or injurious leakage of current.
38. **Insulating stick:** a stick *approved* and tested for carrying out operating and *live work* on *live electrical apparatus*.
39. **Isolated:** not *connected* to any possible sources of electricity supply by means that will prevent unintentional re-energisation of the *electrical apparatus* and which is assessed as a suitable step in the process of making safe for access purposes.
40. **Live:** *energised* or subject to hazardous induced or capacitive voltages.
41. **Live line detector:** an *approved* device for determining whether the *electrical apparatus* is *live* or not *live*.
42. **Live work:** all *work* performed on components of *electrical apparatus* that are not *isolated*, proved *de-energised* and *earthed*, and *phase shorted* (AC) or *short circuited* (DC).
43. **Low voltage (LV):** a *Nominal Voltage* exceeding 50V AC or 120V DC but not exceeding 1000V AC or 1500V DC.
44. **Major Electricity Company (MEC):** a *distribution company* or *transmission company*

Does not include a *distribution company* or a *transmission company*, or a class of *distribution company* or *transmission company*, declared under section 3A of the Electricity Safety Act 1998, not to be a *Major Electricity Company*.
45. **Mobile plant:** cranes, elevating *work* platforms, tip trucks or similar plant, any equipment fitted with a jib or boom, and any device capable of raising or lowering a load.
46. **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*.
47. **Negative:** the electrical return path of a traction DC network.
48. **Negative conductor:** *rail/negative return*, *negative bus* connections or cabling, and poles/structures *bonded* to the *rail/negative return*.

49. **Network asset:** any asset that is owned or operated by a *network operator* for the purposes of generating, transmitting, distributing or supplying electricity.
50. **Network operator:** the owner, controller or operator of an electricity *supply network* including a *traction electrical supply network*.
51. **No Go Zone Rules:** the *No Go Zone Rules* as published on the Energy Safe Victoria website which include rules for the following assets and activities:
- > Distribution overhead powerlines
 - > Transmission overhead powerlines
 - > Traction overhead powerlines
 - > Underground assets
 - > Scaffolding
 - > Spotters
 - > Building *near* powerlines
 - > Working *near* powerlines for non-electrical workers.
52. **Nominal Voltage:** in relation to *AC electrical apparatus*, the phase-to-phase voltage for a polyphase system or phase-to-earth voltage for a single phase system. In relation to *DC electrical apparatus*, the designated voltage of the *electrical apparatus*.
53. **Not electrically connected:** disconnected from all sources of electrical supply by the removal or absence of *conductors*.
54. **Operating Authority:** an *organisation* or an *authorised person* who is responsible for operational control of the *electrical apparatus* concerned.
55. **Ordinary person:** a person without sufficient training or experience to enable them to avoid the dangers that *electrical apparatus* may create, who is under the control of a *railway company*.
56. **Organisation and Organisational:** a business, enterprise, company or corporation.
57. **Out of commission:** the condition of *electrical apparatus* that was *in service* and is *not electrically connected* and declared to be so *in writing* to the *Operating Authority* responsible for the *electrical apparatus*.

58. **Personal protective equipment (PPE):** clothing, equipment and/ or substances which, when worn or correctly used, are intended to protect parts or all of the body from accidental injury or disease at *work* or in the workplace.
59. **Phase shorted (AC):** in relation to AC *electrical apparatus*, that all active phases of electrical supply to the AC *electrical apparatus* have a short-circuiting device applied (are *connected to* each other).
60. **Procedure:** the documentation of a systematic series of actions (or activities) directed to achieve a desired result.
61. **Rail negative/return:** part of the return circuit of a *traction electrical supply network* that is *connected to*:
- > the *negative* bus at the source of supply (DC traction systems), or
 - > neutral and earth at the source of supply (*HV AC* traction systems).
62. **Railway company:** an *organisation* that owns or operates a traction electricity *supply network*.
63. **Recipient:** a person who has signed on an *access authority*.
64. **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*.
65. **Regulations:** Electricity Safety (General) *Regulations 2019* as amended or remade from time to time.
66. **Safe approach distance (SAD):** 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*.
67. **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*.
68. **Shall:** is to be interpreted as mandatory.
69. **Short circuit/circuiting:** the connection of a low resistance path between two or more points in an electrical circuit.

70. **Short circuited (DC):** the condition of DC *traction voltage electrical apparatus* where a connection is made with an *approved short-circuiting device* between the positive conductor to a negative conductor.
71. **Short circuiting device:** an *approved device* used for *short circuiting of electrical apparatus*.
72. **Should:** is to be interpreted as advisory or discretionary.
73. **Statement of condition of apparatus /plant (SCAP):** a statement issued by a *network operator* to other *network operators* to confirm the condition of specified *electrical apparatus* and/ or plant during the currency of the statement. A SCAP does not authorise access to or *work* upon the apparatus or plant.
74. **Substation:** a defined and enclosed or fenced space in which *high voltage* supply is generated, converted, controlled or transformed.
75. **Supply network:** a network consisting of electric lines, *substations*, circuits and any other things required for the purposes of the transmission, distribution or supply of electricity.
76. **Switch:** a device capable of making and breaking load currents. A *switch* may also serve as an isolator.
77. **Tester in charge:** an *authorised tester* to whom a sanction for testing has been issued and who is in charge of all members of the *work party* signed on that sanction for testing.
78. **Tie Station:** *substation*.
79. **Traction electrical supply network:** *High voltage* (AC) and 600v and 1500v (DC) *electrical apparatus*, including signalling, communication and rail control networks, used for the operation of rail rolling stock (trams and/or trains).
80. **Traction voltage:** a *Nominal Voltage* of 600V DC (for trams) and 1500V DC and 25kV AC (for trains).
81. **Transmission company:** a person who is the holder of a licence to transmit electricity.
82. **Vehicle:** a truck, car, utility or other general purpose conveyance used for the carriage of persons or goods (see also *mobile plant*) but does not include trams, trains or any other type of rolling stock.

- 83. **Vicinity:** a situation where it is unlikely that a person will, either directly or through any conducting medium (for example, via *mobile plant*) come within the relevant *safe approach distances*.
- 84. **Work:** a task(s) to be undertaken on, *near* or in the *vicinity* of electrical components or apparatus.
- 85. **Written or in writing means:** recorded on paper or in electronic form.

2.4 Interpretation

Where a word or phrase is given a particular meaning in this Code, other parts of speech and grammatical forms of that word or phrase have, unless the contrary intention appears, corresponding meanings.

Unless the contrary intention appears, words in the singular include the plural and vice versa, and a word indicating a gender includes all genders.

Unless otherwise specified, all references to the voltage level of *electrical apparatus* or *conductors* in this Code *shall* be taken to be a reference to the nominal or named voltage of the *electrical apparatus* or *conductors*.



3.

General Safety Requirements

Principle: An *Organisation shall have procedures relevant to providing a comprehensive safe working environment.*

3.1 Hazard identification, risk assessment and control

An *Organisation's safe system of work shall include appropriate risk management processes to ensure hazards associated with work within safe approach distances or near electrical apparatus are identified, assessed and controlled.*

Prior to working on or *near any electrical apparatus*, the persons performing the *work shall apply the safe system of work to identify, assess and control the associated hazards and risks.*

The hazard identification and risk assessment process *shall be documented, regularly reviewed and audited to ensure compliance.*

3.2 First aid

Persons who are required to *work where there is a risk of injury from live electrical conductors shall be given appropriate training on commencement and there after subject to annual competency assessment.*

Training *shall cover skills in cardio-pulmonary resuscitation, shock, burns and their role in incident assessment and management in accordance with relevant National Competency Standard Units.*

3.3 Communications

All communications relating to the operation of, or access to, *electrical apparatus shall be clear and definite. Electrical apparatus shall be referred to by name and sufficient detail shall be given to enable positive identification. Verbal instructions and statements issued over phones or radios shall be confirmed by repeating back to avoid misunderstanding.*

3.4 Forms

As a minimum, forms *shall* contain information as prescribed in Appendix A.

3.5 Use and testing of operating and live-line equipment

All sticks, gloves, sleeves, mats, protective barriers or covers, *earthing* trucks, portable *earthing devices*, insulating platforms, *insulated* elevating work platforms or other equipment used for operating the *traction electrical supply network* or performing live-line work *shall* be *approved* for the particular application.

All equipment including *personal protective equipment* used on the *traction electrical supply network* that requires regular testing to prove the effectiveness of insulation *shall* be tested at intervals as specified in *approved procedures* and marked to show the date of the next routine test. Equipment *shall* not be used after the marked test date.

Visual inspection *shall* be made for physical damage or contamination immediately prior to use.

Gloves, sleeves, mats and protective barriers or covers used for operating *electrical apparatus* or for performing *live work* *shall* not be relied upon as the sole means of protection but will complement safe work practices and *procedures* aimed at mitigating risk from work on or associated with the *traction electrical supply network*.

3.6 Insulating sticks

Insulating sticks *shall* have a length that provides appropriate insulation from *live* parts and enables a person using the stick to maintain the applicable *safe approach distance* (SAD) at all times (refer to 6.2)

When an *insulating stick* is to be used in wet conditions consideration *shall* be given to the potential for hazardous surface leakage currents.

3.7 Live line detectors

An *approved live-line detector* *shall* be used before applying an *earthing* or a *short circuiting device* to *electrical apparatus*. The detectors *shall* be tested immediately before and after use, in accordance with *Organisational procedures*.

3.8 Labelling of *electrical apparatus*

For the purposes of identification and description, *electrical apparatus shall*, wherever practicable, be clearly labelled.

3.9 Ladders

Conductive ladders (including wire reinforced) *shall* not be used on, *near* or in the *vicinity* of exposed *live electrical apparatus*, unless in accordance with *approved procedures*.

3.10 *Personal protective equipment*

All persons who may be exposed to possible electric shock, arc flash or other injury from *electrical apparatus shall* use *approved personal protective equipment*.

Any person or *Organisation shall* risk assess the possibility of exposure to electrical shock, arc flash and other injuries which may occur from a fault on any *electrical apparatus* under their control.

Personal protective equipment used for performing *live electrical work shall* not be relied upon as the sole means of protection and *shall* be complemented by suitable tools, equipment and safe systems of *work*.

Personal protective equipment shall include clothing with wrist to ankle cover and fully enclosed footwear.

Additional *personal protective equipment shall* be used in accordance with the type of *work* and the risks involved.

All protective equipment and apparel *shall* comply with relevant published standards.

General PPE requirements

1. Working on, near or in the vicinity of electrical apparatus requires approved safety:
 - > headwear, and
 - > natural fibre or alternative arc flash protective clothing, and
 - > footwear.
2. Operating electrical apparatus requires approved safety:
 - > headwear, and
 - > footwear, and
 - > natural fibre or alternative arc flash protective clothing, and
 - > hand protection, and
 - > face and eye protection.
3. The person responsible for supervising visitors whose movements are confined to normal access ways, (for example, roads, paths and stairs) in a *substation*, shall ensure that the visitors shall use the following approved items:
 - > headwear, and
 - > fully enclosed footwear, and
 - > ankle to wrist clothing.

3.11 Tapes and other measuring devices

Only approved non-conducting tapes and rulers shall be used in the vicinity of live electrical apparatus. Conductive tapes shall not be used near exposed live electrical apparatus unless approved for use in accordance with approved procedures.

3.12 Use of *safety observers*

A *safety observer shall* be posted where, after a risk assessment, it is considered that a person, equipment or *mobile plant* might inadvertently infringe *safe approach distances*.

Under no circumstances *shall* the *safety observer* be diverted to other *work* while the possibility of infringing the *safe approach distances* exists.

A person acting as a *safety observer shall*:

- a. understand the task, *work* process and sequence of *work*, and
- b. have the authority to temporarily suspend the relevant *work* at any time, and
- c. be specifically instructed in the duties and workplace hazards applicable, and
- d. be positioned to effectively observe and immediately communicate with persons performing the *work*, and
- e. monitor the *work* and warn against potential infringement of *safe approach distances*, and
- f. be capable of assisting in the case of emergency as well as being *competent* to provide first aid including the performance of electrical rescue and cardiopulmonary resuscitation, as required.

3.13 Fit state for *work*

Alcohol, drugs and diminished mental alertness or a physical condition of a person may impede their ability to *work* safely in an electrical environment.

Persons who are required to *work* on, *near* or in the *vicinity* of *electrical apparatus shall* not consume, or be under the influence of, alcohol or drugs that diminish *work* skills during *work* hours. This includes during meal or rest breaks.

Appropriate policies *shall* be implemented by *organisations* to ensure all employees, contractors and agents are in a fit state for *work*.

3.14 Work within electric and magnetic fields

3.14.1 General

Electric and Magnetic Fields (EMFs) may be present in workplaces.

Where EMFs are of high intensity, actions need to be undertaken to protect persons from any adverse effects, such as:

- irritating micro-shocks, due to electric discharge effects of strong electric fields, and
- possible biological effects associated with extremely strong electric and magnetic fields.

Before entering areas of strong electric and magnetic fields, persons fitted with implant or body-worn medical devices, including cardiac pacemakers, metallic implants, insulin pumps or pregnant, *should* consult their medical professionals, and the relevant *organisation's* officer, for information on possible electromagnetic interference with their medical devices or any possible impacts to their health.

Advisory occupational exposure limits provided in the ***International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines and the Institute of Electrical and Electronics Engineers (IEEE) C95.1 Standard*** are listed in the following sections 3.14.2 and 3.14.3.

Organisations should establish appropriate exposure limits in accordance with industry guidelines, for example ***Energy Networks Australia (ENA) EMF Management Handbook***.

3.14.2 Electric fields (50 Hz)

Advisory occupational exposure limits for electric fields based on above mentioned guidelines are as follows:

- Unrestricted: less than 10 kV/m
- Maximum permissible exposure: 20 kV/m
- Alternative controls: greater than 20kV/m

For *work* situations with field strengths greater than 20kV/m, alternative controls *shall* be used.

Such controls may include:

- restricted access
- wearing appropriately *earthed* or *bonded* conducting suits
- screening and *earthing* of *vehicles*
- screening of *work* platforms and access ways
- de-energising adjacent *electrical apparatus*.

The person responsible for planning the *work* shall include in the *work* instructions details of any appropriate measures to be taken.

3.14.3 Magnetic fields

Advisory occupational exposure to magnetic fields are as follows:

1. Magnetic fields (50 Hz)
 - > General exposure: 1 milliTesla (10,000 milliGauss)
 - > Exposure to head and torso: 2.71 milliTesla (27,100 milliGauss)
 - > Exposure to arms and legs: 75.8 milliTesla (758,000 milliGauss)
2. Static or direct current (DC) magnetic fields

Subject to the notes set out below, the 2009 ICNIRP guidelines for limits of occupational exposure to static or DC magnetic fields are as follows:

- > Head and trunk: 2000 milliTesla
- > Limbs: 8000 milliTesla

Notes:

- **Caution:** because of potential indirect adverse effects, ICNIRP recognises that practical policies need to be implemented to prevent inadvertent harmful exposure of persons with implanted electronic medical devices and implants containing ferromagnetic material. This requirement may lead to much lower restriction levels such as 0.5 milliTesla.
- **For specific work** applications, exposure up to 8000 milliTesla can be justified if the environment is controlled and appropriate *work* practices are implemented to control movement-induced effects.
- When magnetic flux densities exceed 5 milliTesla (static or DC magnetic fields) precautions *should* be taken to prevent hazards from flying metallic objects.

3.15 Victim rescue

Persons *shall* be trained in victim rescue techniques appropriate to the job function being performed.

Before performing victim rescue on or *near live exposed conductors*, the rescuer *shall* consider all hazards and methods to control the hazards to ensure the rescue can be performed safely.

Such controls may include de-energisation of the circuit, the use of *insulated* sticks and maintaining a *safe approach distance (SAD)* during the rescue.

Immediately contact the *Electrical Traction Control Officer (ETCO)* to arrange isolation or de-energisation of equipment and wait for confirmation of de-energisation before attempting to move the victim.

Victim rescue assessment and/or instruction *shall* be undertaken by relevant personnel in accordance with appropriate National Competency Standard Units.

3.16 Arc Flash hazard management

The risk of arc flash *shall* be assessed and managed as far as reasonably practicable.

Arc flash hazard management *should* include an arc flash assessment or study that takes into consideration the equipment and human interaction with the equipment.

This human interaction may include, *live work*, *live* switching or racking, fault finding, and installing isolations or earths.

In addition to the degree of interaction with the equipment, consideration *shall* be given to the risk posed to persons in the *vicinity* of the equipment.

Risk control measures *shall* be implemented, as far as is reasonably practicable, having regard to the hierarchy of controls.

Risk control measures shall be reviewed and, if necessary, revised whenever there is an indication the risks have changed, or risk control measures are inadequate.

Guidance on this topic can be found in the Energy Safe Victoria and WorkSafe Victoria Guideline, **Arc flash hazard management** available at: www.energysafe.vic.gov.au/industry-guidance/electrical/electrical-technical-information/arc-flash-hazard-management

3.17 Fire, smoke from *high voltage* apparatus

Breakdown of electrical equipment may result in fire and issue of a large amount of smoke. Fire or electrical breakdown of some types of electrical insulation may also result in release of toxic fumes.

Fire extinguishers and hoses are not designed for use on *live high voltage* equipment. Immediately contact the ETCO to arrange de-energisation and/or isolation of equipment.

3.18 Fire extinguishers

Fire extinguishers that are marked '*suitable for use on electrical fires*' are intended for use on circuits of a voltage lower than those encountered in traction, signal and industrial power supply installations.

Fire extinguishers or fire hoses of any kind *shall* not be used on *live electrical apparatus* in traction signalling and industrial power supply installations.

3.19 Unnecessary approach to *electrical apparatus*

Unnecessary approach to *electrical apparatus shall* be avoided at all times. Unnecessary contact with metallic items associated with the equipment, such as transformer tanks, overhead structures, frames, covers *shall* be avoided. When necessary, the approach to *electrical apparatus shall* be restricted to the period required to perform the *work*.

3.20 Lightning storms

Persons *shall* be warned against the hazards of working on, or in the *vicinity of electrical apparatus* during electrical storms.

3.21 Current transformer secondary circuits

The secondary circuit of a current transformer *shall* not be open circuited whilst *in service*, as a dangerous voltage may be induced on the secondary circuit.

3.22 Interference with *earthing* or *negative* connections

Interference or disconnection of *earthing*, traction return, or *negative cables* installed on *electrical apparatus* may result in serious injury or death. *Work shall only be carried out under an appropriate access authority or approved procedure.*

3.23 Voltage transformers

Extreme care must be taken when working on circuits involving voltage transformers. Following the isolation of the *high voltage* supply to a transformer, it is possible to obtain a back-feed of electricity from the secondary winding of the transformer.

Approved procedures shall be used when working on or near voltage transformers.

3.24 Epoxy resin *insulated* transformers

Particular care must be taken when approaching epoxy resin *insulated* transformers installed in a number of traction *substations*. The dielectric strength of the epoxy insulation may not be sufficient to prevent electric shock in the case of direct contact with the transformer.

3.25 DC *Negative*, 25kV AC neutral/return and electrolysis return circuits

Consideration must be given when working on *negative return* circuits, 25kV AC neutral/return circuits and electrolysis circuits, as hazardous voltages may be present in abnormal circumstances. Hence, some *works* on these circuits may need to be performed in accordance with the access authorities defined within these rules. *Approved procedures shall be used when working on such circuits.*



4. Training and Authorisation

Principle: Persons working on or *near electrical apparatus shall* have appropriate training, authorisation and currency of competency for the duty to be performed.

4.1 General

- An *organisation's safe system of work shall* include appropriate training, competency and authorisations for all persons working on or *near electrical apparatus*.
- A person's authorisation *shall* be current for the task being performed.
- Competency of persons holding authorisations *shall* be assessed at three-yearly intervals and training shall be given to restore competency where appropriate.
- During training a person may perform a task that normally requires authorisation or approval (e.g. *HV operating*), only when that person is *effectively supervised* by a person with the relevant authorisation.

4.2 *Approved training standard*

4.2.1 Introduction

Training *shall* consist of identified learning outcomes based on knowledge, skill (task), and attitude, and, where appropriate be consistent with National Competency Standards.

- a. There shall be assessment criteria established and documented for each learning outcome.
- b. The assessment method shall be documented in detail.

- c. There shall be a documented process for recognition of prior learning.
- d. Persons undergoing training must be assessed for competency against learning outcomes and such assessment must be documented.

4.2.2 Learning outcomes

Learning outcomes for training *shall* include, but are not limited to, the following:


- a. working knowledge of the relevant sections of this Code
- b. knowledge of communication processes required
- c. knowledge of the relevant *approved procedures*
- d. knowledge of the consequences of any physical tasks performed
- e. working knowledge and skill associated with the relevant:
 - 1. forms and documentation
 - 2. risk assessment
 - 3. *work practices*
 - 4. *equipment and plant*
- f. demonstration of acquired knowledge through practical exercises
- g. a clear understanding of the responsibilities associated with relevant authorisations e.g. the range of responsibilities associated with a *recipient in charge*, and other training requirements as specified in this Code.

4.2.3 Training courses

Organisations shall confirm and be satisfied that training courses and the service providers meet their recognised needs.


4.2.4 Records

Organisations shall develop and maintain an appropriate management system for recording of all training and authorisations.



5.

Entry to *Enclosures* or *Work in* the *Vicinity* of *Electrical* *Apparatus*



Principle: Entry to *enclosures* that contain *electrical apparatus* or *work* in the *vicinity* of *electrical apparatus* shall be carried out in a safe manner.

Control measures to mitigate the risk of injuries, significant property damage, fires and significant reduction in electrical safety shall be consistent with the identified risk and *work* performed.

5.1 General

Entry to *enclosures* and/or *work* in the *vicinity* of *electrical apparatus* shall be performed in a safe manner.

The control measures implemented shall minimise the risks involved and may include:

- a. defining the *work* area involved
- b. defining access routes
- c. isolating and *earthing* the *electrical apparatus*
- d. the use of barriers and signs
- e. the use of *approved* covering
- f. the use of *safety observers*
- g. the issue of the appropriate *access authority* or *authority to work* in the *vicinity* of *electrical apparatus*.

5.2 Entry into *enclosures* containing *electrical apparatus*

5.2.1 General

Entry into *enclosures* containing *electrical apparatus* shall be performed under *approved procedures*.

5.2.2 Entry by authorised, instructed and *Ordinary persons*

Authorised

Where *authorised persons* are required to enter *enclosures* containing *electrical apparatus*, the *authorised person* shall ensure that the entry is performed safely, and site-specific precautions are taken.

These precautions may include, but are not limited to:

- a. site *work* permit system
- b. site safe *work* system
- c. job safety analysis.

Instructed

Where *instructed persons* are required to enter *enclosures* containing *electrical apparatus*, the *instructed person*, the *authorised person*, the person in charge of the site and the person in charge of the *electrical apparatus* shall ensure that the entry is performed safely, and that specific precautions are taken.

This *instructed person* shall be *effectively supervised* by an *authorised person*. These precautions may include but are not limited to:

- a. *HV* awareness training
- b. site *work* permit system
- c. site safe *work* system
- d. job safety analysis
- e. the provision of specific instructions as to the location of any enclosed or *exposed conductors* or terminations or apparatus.

Ordinary persons

Where *Ordinary persons* are required to enter *enclosures* containing *electrical apparatus*, entry shall be performed in accordance with *approved procedures*, and they shall be *directly supervised* by an *authorised person*.

These precautions may include but not are limited to:

- a. site *work* permit system
- b. site safe *work* system
- c. job safety analysis
- d. the provision of specific instructions as to the location of any enclosed or *exposed conductors* or terminations or apparatus.

5.2.3 Supervision of *workers in enclosures*

Authorised

Where *authorised persons* are required to *work* in the *vicinity* of *electrical apparatus*, the *authorised person* shall ensure that the *work* is performed safely and that site specific precautions are taken.

Instructed

Where *instructed persons* are required to *work* in the *vicinity* of *electrical apparatus*, the *instructed person*, the *authorised person*, the person in charge of the site and the person in charge of the *electrical apparatus* shall all cooperate to ensure that the *work* is performed safely, and that specific precautions are taken.

An *instructed person* shall be identified as such to those responsible for their supervision.

Ordinary persons

Where *ordinary persons* are required to *work* in the *vicinity* of *electrical apparatus*, the *ordinary person* shall be directly supervised by an *authorised person*.

5.3 Work in the vicinity of *electrical apparatus*

5.3.1 General

Work in the *vicinity* of *electrical apparatus* shall be performed either:

- using specific *written work instructions*, or
- *approved procedures* shall apply in conjunction with the use of *instructed* or *authorised persons*.

5.4 Use of *mobile plant*

Mobile plant shall only be used in the vicinity of live conductors and/or electrical apparatus after precautions appropriate to the particular circumstances have been considered, and action has been taken to control the associated hazards and risks.

The control measures to be considered within a risk assessment *should* include:

- a. isolating and earthing electrical apparatus
- b. positioning the mobile plant such that the safe approach distance can be maintained in all circumstances
- c. the use of safety observers, barriers and signs
- d. the use of other precautions such as physical restrictions or control devices in conjunction with barriers
- e. the suppression of auto-reclose
- f. the alteration of protection and control settings
- g. de-energising the electrical apparatus
- h. mechanical limitation devices options on mobile plant.

When *mobile plant* and *vehicles* are travelling inside a *HV enclosure* (for example, *substation*) a site assessment shall be conducted to determine the risk of induced voltages. Identified risks shall be managed by the use of a trailing earthing conductor.

If *mobile plant* comes near *live electrical apparatus*, the *mobile plant shall be earthed* (refer to section 6, Approach to *electrical apparatus*). This *shall* be achieved by an *approved earthing* system.

When *mobile plant* is operated from outside the *mobile plant*, precautions *shall* be taken to protect the operator from hazardous step and touch potentials. No person other than the *mobile plant* operator *shall* touch the *mobile plant* while in operation.

Where *mobile plant* (for example Elevating Work Platform) is not fully *insulated*, the insulation level of each part *shall* be labelled in accordance with the appropriate standard (for example, AS1418.10) and the following permanent sign *shall* be fixed at all plant operator controls.

DANGER – BEWARE OF POWER LINES

This appliance is not fully insulated.
Do not permit any uninsulated part of this appliance
to be in close proximity to live conductors.

Insulated mobile plant shall be tested at specific intervals as per approved procedures and marked to show the date of the next routine test.

5.5 Handling objects or loads

When objects are being handled manually or by mechanical equipment, care *shall* be exercised to prevent the objects or the mechanical equipment infringing *safe approach distances*.

For manual handling, appropriate *work* methods and an appropriate number of persons *shall* be used to maintain *safe approach distances*.

For mechanical handling where there is a risk of infringing the *safe approach distances* to electrical *conductors*, the movement of loads *shall* be controlled by means of *approved* non-conducting ropes or other *approved* means (refer to section 6, Approach to electrical apparatus).

No person *shall* contact the load or any attached conducting objects until the risk of *safe approach distances* infringement is removed. Only the plant operator *shall* contact the *mobile plant* controls in accordance with *safe work procedures*. (Refer to section 5.4, Use of *mobile plant*)

5.6 Erecting or dismantling overhead *conductors*.

When overhead *conductors* (other than *insulated* or *covered conductors*) are being erected, dismantled, or replaced, *conductors* that are being moved *shall* be *earthed/short circuited* by an *approved* device before *work* is commenced and *shall* remain *earthed/short circuited* until the *work* is completed. A *conductor* that is erected *shall* be *earthed/short circuited* before it is lifted from the ground.

Consideration *shall* be given and documented as to the use of appropriate restraining devices to control such *conductors* when they are being moved.

When the application of an earth/*short circuit* is considered to be impracticable, or a safer control measure may be appropriate, alternative safety precautions *shall* be applied and subject to the following controls:

- a. they are applied to a specific task or process which has been subject to a formal risk assessment carried out in advance of the *work*, using a consultative process with subject matter experts, and
- b. they are documented as an *approved procedure* specific to the task or process.

5.7 *Work* within substations or on multi-circuit overhead lines with multiple asset ownership

For *work* within *substations* or on multi-circuit overhead lines where *electrical apparatus* is owned by more than one *organisation* or when *work* is adjacent to another *organisation's* exposed *electrical apparatus*, there *shall* be joint consideration and agreement reached and documented to carry out the *work* in a safe manner (see sections 6.9 *Work in substations*; 6.10, *Work outside of substations*; and 9.2.3, *Multiple ownership*).



6.

Approach to *Electrical Apparatus*

Principle: Persons *shall* observe appropriate *safe approach distances* when working, or operating vehicles or *mobile plant*, on or near *electrical apparatus*.

6.1 General

Part 6 of the Electricity Safety (General) *Regulations* 2019 sets out the minimum distances that persons, *vehicles*, *mobile plant*, and machinery must maintain from aerial electric conductors. Some *safe approach distances* specified in this Code are less than the minimum distances specified in the *regulations*. Only workers who have obtained *written* permission or an authorisation from the electrical asset owner or operator may adopt the *safe approach distances* (SAD) that depart from the minimum distances specified in the *regulations*.

The *safe approach distances* are based on an exclusion zone principle.

This principle defines an area around an exposed conductor into which no part of the person, *mobile plant* or object (other than *approved insulated* objects) shall encroach, unless in accordance with section 9.

Work practices shall be established to ensure persons, *mobile plant* and unapproved objects do not encroach on the *safe approach distances*. These *work practices shall* include consideration of:

- a. working beyond reach of the exclusion zone wherever practicable, and
- b. precautions to be applied when use of controlled movement is necessary, and
- c. the workspace required including the expected reach of persons performing the *work*, and
- d. the movement of *mobile plant* used for the *work*.

Expected reach *shall* include all intentional and expected movements such as adopting a *work* position, adjusting a hard hat, manoeuvring tools, and reaching for items being passed to the employee.

Unnecessary approach to *electrical apparatus* or unnecessary contact with parts not regarded as *live shall* be avoided.

Necessary approach to *electrical apparatus shall* be kept to a minimum and *shall* be restricted to the period required to perform the *work*.

For the application of *earthing/short circuiting devices* to apparatus, refer to section 8.1.3, *Earthing device* application.

SAD is based on the exclusion zone principle and is measured out from the *energised conductor*. Proper application of SAD requires consideration of the workspace necessary to perform the task or function and either working beyond reach or the use of controlled movements to stay outside the SAD.

(figures 2 (a) and 2 (b) are for illustration purpose only).

Figure 2. (a) Safe approach distance (SAD) – beyond reach

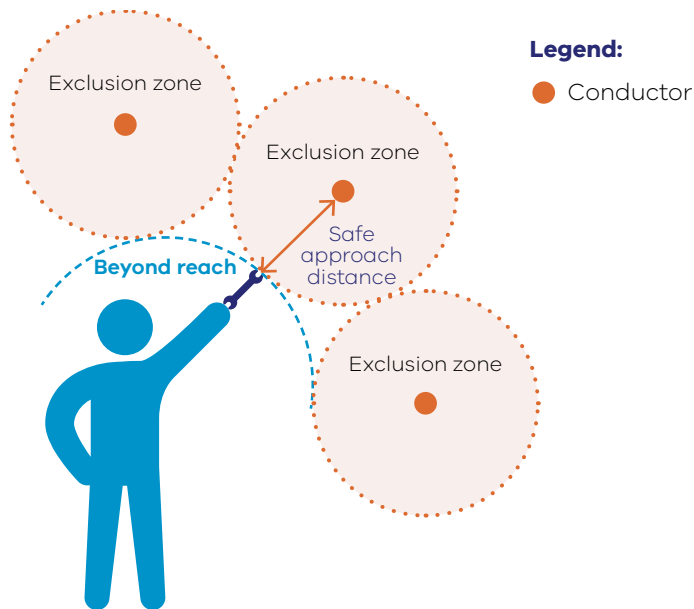


Figure 2. (b) Safe approach distance (SAD) – expected reach

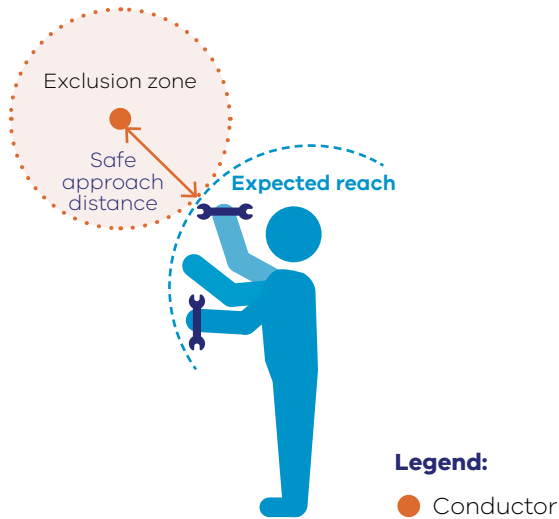
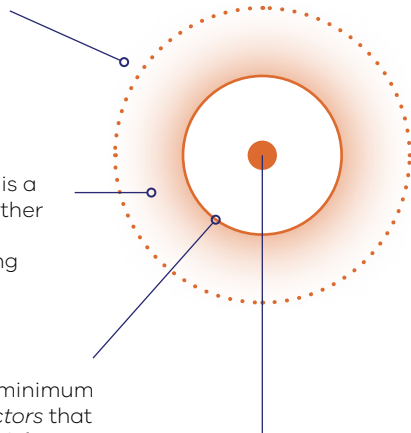


Figure 3. Illustration of differences between *safe approach distance*, *near* and *vicinity*

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**.



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

6.2 Safe approach distance – persons

6.2.1 Safe approach distance – normal

Safe approach distance – normal is 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*.

The *safe approach distances* for persons performing general *work* are as shown in table 1.

Instructed persons' safe approach distances apply while undertaking duties under supervision or as instructed by an *authorised person*.

There are elements of *electrical apparatus* that have semi-conductive insulation. Such apparatus *shall* be treated the same as *live* apparatus in consideration of *safe approach distances*. *Organisation specific procedures shall* be in place to enable activities to be safely performed on semi-conductive *insulated* apparatus.

Table 1. Safe approach distance for persons to exposed conductors

Nominal phase to phase AC Voltage (kV)	Ordinary persons (millimetres) (Note 1)	Instructed persons or authorised persons (millimetres) (Notes 2 and 3)
LV aerial lines	1,500	<i>Instructed persons—300 Authorised persons— insulated contact only</i>
1 up to and equal to 33	2,000	700
50	2,000	750
66	2,000	900
110	3,000	1,000
132	3,000	1,200
220	4,000	1,700
275	5,000	2,300
330	6,000	2,700

Nominal phase to phase AC Voltage (kV)	Ordinary persons (millimetres) (Note 1)	Instructed persons or authorised persons (millimetres) (Notes 2 and 3)
400	6,000	3,300
500	6,000	3,600
Nominal phase to earth AC voltage (kV) (Note 4)		
25	2,000	700
Nominal DC Voltage (V)		
LV DC aerial line less than 600	1,500	Instructed persons—300 Authorised persons— insulated contact only
DC (Not Less than 600 and not greater than 1,500)	1,500	Instructed persons—300 Authorised persons— insulated contact only

Notes:

1. See definition for *ordinary person*. Persons not under control of the *network operator shall* refer to the WorkSafe and Energy Safe *No Go Zone Rules* and section 12 of the Code.
2. Deliberately avoid movements that could result in distances being infringed.
3. These distances specified are based on *work* from a stable surface. Appropriate allowance *shall* be made for *conductor* sag and sway.
4. HV AC traction system.

6.2.2 Safe approach distance – special

Safe approach distance – special is the minimum distance to an *exposed conductor* from any outstretched part of a person’s body or any conducting or unapproved object touching any part of the person’s body.

Safe approach distance – special, shown in table 2, has been determined using risk analysis methodology and consideration of power frequency and *switching surge* distances, plus a reduced provision for inadvertent movement.

Safe approach distance – special, *shall* be used only by *authorised persons* performing *approved* tasks, after consideration of SAD normal, access permit, and *live-line* methods.

The recommended *safe approach distance* – special, *shall* be used only in conjunction with the following control measures:

- a. *approved safe work practice* to ensure no part of the person's body or any conducting or unapproved object touching any part of the person's body infringing the relevant *safe approach distances* – special, and
- b. positioning of the *worker* to minimise the risk of the specified distance being infringed. This includes any unapproved object or tool being held by the worker, and
- c. using a person specifically trained and authorised to perform the *work* at the *safe approach distance* – special, and
- d. *work crew on-site risk assessments* are conducted, and
- e. *safety observers* are used to monitor the *work* activities, and
- f. minimise the *workers* exposure at the *safe approach distance* – special, and
- g. addressing adverse impact of external influences on plant and equipment, e.g. traffic, boom movement, footing, and
- h. addressing adverse impact of weather and environmental conditions e.g. rain, lightning, wind, light, sag or sway of *conductors*.

The *work party shall* consider the suppression of the auto reclose function as part of the *pre-work* planning.

If these controls are not achieved, either an:

- i. access authority shall be issued, or
- j. live *work* techniques shall be applied, or
- k. alternative *safe approach distances* – special or procedures shall be developed in accordance with section 6.2.3 (Guidelines for the development and use of alternative safe approach distances – special).

Table 2. Safe approach distance – special for authorised persons only to exposed conductors

Nominal phase to phase AC voltage (kV)	Authorised persons (millimetres)
LV	300
1 up to and equal to 22	450
33	500
50	700
66	700
Nominal phase to earth AC voltage (kV)	
25	600
Nominal DC voltage (v)	
600	300
1500	300

6.2.3 Guidelines for the development and use of alternative *safe approach distances* – special

An alternative *safe approach distance* – special may be required where the distances advised in table 2 are not suitable for a particular task or process.

Determination and use of an alternative distance *shall* be subject to the following controls, which *shall* be in addition to the requirements of section 6.2.2, *Safe approach distance – special*):

- a. determined in accordance with Energy Networks Australia’s (ENA) National Guidelines for *Safe approach distances to electrical apparatus* (ENA NENS 04) and related standards and guidelines as may be appropriate, and
- b. applied only to a specific task or process that has been subject to a formal risk assessment carried out in advance of the *work* using a consultative process with subject matter experts; and
- c. documented as an *approved procedure* specific to the task or process.

6.3 *Safe approach distances – vehicles*

6.3.1 **General exception (Traction Industry)**

The *safe approach distances* for *vehicles* listed in table 3 does not apply to rolling stock where the operating envelope cannot change (providing the *vehicle* is compliant with the kinematic envelope). The kinematic envelope is the area that designates the safe limits within which the train and or rail bound *vehicle* can move laterally and vertically along the route.

6.3.2 **Ordinary persons**

An *ordinary person* in charge of any *vehicle*, except *mobile plant* when in working mode, *shall* ensure that no part of the *vehicle* or its load is placed or moved within the distances shown in column 2 of Table 3.

6.3.3 **Authorised and *instructed persons*.**

Authorised and *instructed persons* in charge of any *vehicle*, except *mobile plant* when in working mode, *shall* ensure that no part of the *vehicle* or its load is placed or moved within the distances shown in column 3 of Table 3.

Table 3. Safe approach distance for vehicles to live exposed conductors (except mobile plant when in the working mode)

Nominal phase to phase AC Voltage (kV)	Safe approach distance—for vehicles under the control of ordinary persons (millimetres) (Note 1 and 2)	Safe approach distance—for vehicles under the control of instructed persons or authorised persons (millimetres) (Note 1)
<i>Low voltage</i>	600	600
1 up to and including 33	1,000	700
50	1,000	750
66	1,000	1,000
110	1,500	1,000
132	1,500	1,200
220	4,600	1,800
275	4,600	2,300
330	5,500	3,000
400	6,400	3,300
500	6,400	3,900
Nominal phase to earth AC voltage (kV) (note 3)		
25	1,000	700
Nominal DC Voltage (V)		
600	700	600
1,500	700	600

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. See definition for *ordinary person*. Persons not under control of the *network operator* *shall* refer to the WorkSafe or Energy Safe *No Go Zone Rules* and section 12 of the Code.
3. *HV* AC traction system.

6.4 *Safe approach distances – uninsulated mobile plant*

6.4.1 **General**

Due to the physical capabilities of, and potential hazard with, *mobile plant* working adjacent to *live conductors* and/or *electrical apparatus*, specific consideration including *earthing* and *short circuiting*, shall be given to its use during planning of the *work* (refer to section 5.4, Use of *mobile plant*)

6.4.2 **Ordinary persons**

An *ordinary person* (under the control of the asset owner) in charge of the *work* shall ensure that the *mobile plant*, its gear and load are not placed or moved within the distances shown in column 2 of table 4.

A person not under the control of the asset owner shall comply with *No Go Zone Rules*. The asset owner shall comply with section 12 of the Code.

6.4.3 **Instructed persons or authorised persons**

An *instructed person* or *authorised person* in charge of the *work* shall ensure that the *uninsulated mobile plant*, its gear and load shall not approach *live conductors* and/or *electrical apparatus* within the distances shown in column 3 of table 4.

When the *work* requires a closer approach to *live conductors* than the normal *safe approach distances* given in table 4, special *safe approach distances* for *uninsulated mobile plant* may be developed and applied with consideration of the requirements set out in 6.2.3 (Guidelines for the development and use of alternative *safe approach distances* – special).

6.4.4 Closer approach than normal *safe approach distances*

When the *work* requires a closer approach to *live conductors* than the normal *safe approach distances* given in table 4, special *safe approach distances* for *uninsulated mobile plant* may be developed and applied with consideration of the requirements set out in 6.2.3 (Guidelines for the development and use of alternative *safe approach distances* – special) and meet the minimum requirements set out below.

Minimum safety requirements that *shall* be included:

- a. site and task specific risk assessment completed, and
- b. use of a dedicated *safety observer*, and
- c. two layers of insulation applied between the plant/the load and the *live conductors*:
 1. *insulated* covering/matting to be placed on *live conductors*, and
 2. *insulated* covering/matting on the load and /or *mobile plant*, or
 3. two independent layers of insulation on the *conductors*.
- d. for covered *HV conductors*: minimum special approach distances *shall* be defined, and
- e. for covered *LV conductors*: no contact allowed to the *live covered low voltage conductors* (AC & DC), and
- f. *work* to be completed only by *authorised persons*, and
- g. *work* completed in accordance with a documented *work procedure*.
- h. persons contacting the *mobile plant*, or the load, *shall* wear appropriately rated insulating gloves to the voltage of the overhead line, whilst the activity is being completed (excluding the operator when seated on the *mobile plant*)
- i. *mobile plant shall* be *earthed/short circuited* at all times during the activity
- j. where the *work* involves *distribution company* assets, *written permission* is required, and conditions are to be complied with, (for example, interface agreements, permission to *work*).

6.5 *Safe approach distance (SAD) – insulated mobile plant*

Only *instructed persons* or *authorised persons* may operate *insulated mobile plant* in accordance with table 5 and *approved procedures*.

The *insulated* portion of *mobile plant* may be allowed to contact or encroach the *safe approach distances* of a *live conductor* as specified in table 5, provided it is rated for the voltage of that *conductor*.

6.6 Emergency approach

In emergency situations where there is likely risk of electric shock to persons from electrical *conductors* or *electrical apparatus* (for example, fallen *conductor*), prompt action *shall* be taken to ensure people are kept well clear of the hazard in accordance with *approved procedures*.

All *electrical apparatus* *shall* be considered *alive* until proven *isolated* and *earthed/short circuited* by *approved* means.

6.7 Contact with *live traction electrical supply network conductors* by means of *appliances*

Only *approved* and tested *appliances* *shall* be permitted to be brought within the *safe approach distance* or into direct contact with *traction electrical supply network conductors*.

The *network operator* *shall* ensure the *appliance* is within test date immediately before using the *appliance*.

Table 4. Safe approach distance to live exposed conductors for uninsulated mobile plant when in the working mode.

Nominal phase to phase AC voltage (kV)	Safe approach distance – for mobile plant under the control of ordinary persons (millimetres) (note 1, 4, 5 and 7)	Safe approach distance – for mobile plant under the control of instructed persons or authorised persons. For insulated mobile plant refer table 5 (millimetres) (notes 1 and 2)	Safe approach distance – for mobile plant under the control of glove and barrier live line work authorised persons. For insulated mobile plant refer table 5 (millimetres) (notes 1, 2 and 3)
Low voltage	2,000	1,000	380
1 up to and including 33	2,000	1,200	1,000
50	2,000	1,300	
66	2,000	1,400	
110	4,000	1,800	
132	4,000	1,800	
220	4,600	2,400	
275	4,600	3,000	
330	5,500	3,700	
400	6,400	4,000	
500	6,400	4,600	

Nominal phase to phase AC voltage (kV)	<i>Safe approach distance – for mobile plant under the control of ordinary persons (millimetres) (note 1, 4, 5 and 7)</i>	<i>Safe approach distance – for mobile plant under the control of instructed persons or authorised persons. For insulated mobile plant refer table 5 (millimetres) (notes 1 and 2)</i>	<i>Safe approach distance – for mobile plant under the control of glove and barrier live line work authorised persons. For insulated mobile plant refer table 5 (millimetres) (notes 1, 2 and 3)</i>
Nominal phase to earth AC voltage (kV) (note 6)			
25	2,000	1,200	
Nominal DC voltage (V)			
600	2,000	1,200 (note 8)	
1,500	2,000	2,000 (note 8)	

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. When lifting a load, the *conductors* are suitably *insulated* in accordance with *approved procedures*.
4. Including *insulated* elevating *work platforms*.
5. See definition for *ordinary person*.
6. *HV AC traction system*.
7. Persons not under control of the asset owner *network operator shall* refer to the WorkSafe or Energy Safe *No Go Zone Rules* and section 12 of the Code.
8. Railway companies may reduce this clearance in accordance with *approved engineering controls* and *approved company procedures* and *shall* remain greater than 500mm.

Table 5. Safe approach distances to live exposed conductors for insulated mobile plant operated by persons who are instructed or authorised to work on or near exposed conductors

Nominal phase to phase AC Voltage (kV)	<i>Instructed persons Safe approach distances (millimetres) (Note 1, 2, 3 and 6)</i>		<i>Authorised persons working within safe approach distance (millimetres) (Note 1, 3, 4, 5 and 6)</i>	
	<i>Insulated portions</i>	<i>Uninsulated portions</i>	<i>Insulated portions</i>	<i>Uninsulated portions</i>
<i>Low voltage</i>	Contact allowable	1,000	Contact allowable	1,000
1 up to and including 33	700	1,200	Contact allowable	1,000
66	1,000	1,400	Contact allowable	1,000
132	1,200	1,800	Contact allowable	1,500
220	1,800	2,400	Contact allowable	2,000
275	2,300	3,000	Contact allowable	2,400
330	3,000	3,700	Contact allowable	3,000
500	3,900	4,600	Contact allowable	3,500
Nominal phase to earth AC voltage (kV) (Note 7)				
25	700	1,200	Contact allowable	1,000

Nominal phase to phase AC Voltage (kV)	<i>Instructed persons</i> <i>Safe approach distances</i> (millimetres) (Note 1, 2, 3 and 6)		<i>Authorised persons</i> <i>working within safe approach distance</i> (millimetres) (Note 1, 3, 4, 5 and 6)	
	Nominal DC Voltage (kV)			
600	700	1,200	Contact allowable	1,000 (8)
1,500	700	1,200	Contact allowable	1,000 (8)

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.
3. For *safe approach distance* where contact is allowed, care *shall* be exercised to prevent movement of *conductors*.
4. For *live work* in accordance with *approved procedures*.
5. Alternative *live work* minimum approach distances as per 9.6 may be applied in accordance with *Organisation procedures*.
6. A *safety observer* is required unless the *mobile plant* is incapable of infringing the *safe approach distance*.
7. *HV AC* traction system.
8. *Railway* companies may reduce this clearance in accordance with *approved engineering controls* and *approved company procedures* and shall remain greater than 500mm.

6.8 Approach to *live high voltage insulated cables*

6.8.1 General

When *work* is performed *near live high voltage insulated cables*, appropriate precautions *shall* be taken to ensure that the insulation of the *cables* is not damaged.

Cables, which are specifically designed for movement while *live*, may be moved in accordance with *approved procedures*.

Slight movement of other types of *live cables* may be permitted, but only after detailed consideration of all related circumstances by a person with a detailed knowledge of the *cables* concerned, who *shall* fully detail all precautions to be taken.

6.8.2 *Earthed metallic sheathed or screened high voltage cables*

Contact by persons may be made to external non-conductive surfaces of *live high voltage cables* with *earthed* metallic sheaths or screens. Contact with exposed metallic sheath or screen *shall* only be undertaken after consideration of transferred earth potentials and induced voltages.

6.8.3 Non-metallic screened *high voltage aerial bundled cable*

No contact by persons *shall* be made to external surfaces of *live* non-metallic screened *high voltage aerial bundled cable* or its exposed support catenary. Only suitable *live work* techniques *shall* be used for this purpose.

Access to *de-energised*, but not *earthed*, non-metallic screened *high voltage aerial bundled cable* may be permitted in accordance with *approved procedures*.

For the purposes of *insulated mobile plant work* in the *vicinity* of *live* non-metallic screened *high voltage aerial bundled cable*, the *safe approach distance* *shall* be the same as it is for exposed *high voltage conductors* (refer to table 5).

6.9 Work in substations/Tie Stations

A person *shall* not perform work in any *substation* or allow *mobile plant* to enter any *substation* without first obtaining the permission of the person in charge of the *substation* or appropriate *authorised person* and accepting all the conditions imposed by that person (refer to section 5.2 for work in the *vicinity of electrical apparatus*).

Where work is carried out in the *vicinity of electrical apparatus* within a *substation*, an *access authority* and/or authority to work in the *vicinity of live apparatus* (refer to section 5.1) *shall* be issued, where:

- *mobile plant*, elevating platform or other large vehicles will be used; or
- the work involves excavation or use of explosives.

6.10 Work outside of substations/Tie Stations

Work on or near *electrical apparatus* outside of *substations* *shall* be performed after obtaining the permission and direction of the person in charge of the *electrical apparatus*.



7.

Operation of *Traction Electrical Supply Network*

Principle: Only *authorised persons shall* undertake switching and associated duties on *traction electrical supply networks*.

Application

The requirements of this section apply to the operation of *electrical apparatus* that are part of a *traction electrical supply network*.

7.1 Persons authorised to operate the *traction electrical supply network*

Switching and associated duties on the *traction electrical supply network shall* be performed by *authorised electrical operators* whose training, duties and instructions cover the particular *electrical apparatus*. However, an *unauthorised person* may perform operations in the following circumstances:

- a. when specifically instructed by, or authorised by, the appropriate operating authority, or
- b. when specifically instructed by an authorised operator as part of electrical operator training, or
- c. in an emergency involving serious risk to persons or property, or
- d. when controlling traction electrical supply network as part of a task for process control in accordance with approved organisation procedures.

7.2 *Written* switching instructions

Wherever practicable, *written* instructions *shall* be used when operating the *traction electrical supply network*.

7.3 *Traction electrical supply network switching*

Prior to a *traction electrical supply network switching* operation, the available information regarding circuit conditions *shall* be considered, and no *electrical apparatus shall* be operated if it is unsafe to perform the operation.

After switching, correct operation of the *electrical apparatus shall* be confirmed whenever practicable.

When *electrical apparatus* is operated, the person undertaking the task *shall* be protected in an *approved* manner from electric shock, arc flash or other hazards (also refer to 3.9, *Personal protective equipment*).

7.4 Authority to operate

Under no circumstances *shall* any *circuit breaker, switch* or isolator that is part of the *traction electrical supply network* be closed without the prior approval and coordination of the *Electrical Traction Control Officer*.

No *circuit breaker, switch* or isolator that is part of the *traction electrical supply network shall* be opened without the permission of the *Electrical Traction Control Officer* except in an emergency involving an accident or serious risk of injury.

All switching operations on the *traction electrical supply network shall* be reported to the *Electrical Traction Control Officer* as soon as possible after each operation, unless permission has been given by the *Electrical Traction Control Officer* to carry out specific operations on defined *electrical apparatus*.

Localised maintenance systems (for example, interlocked sidings or depot road isolators) may be exempted from this requirement provided appropriate *approved procedures*, training and controls are implemented.

7.5 Operation of *circuit breakers* and *switches*

Only the *approved* handle or mechanism *shall* be used for manual operation of a *circuit breaker* or *switch* that is part of the *traction electrical supply network*.

The manual operation of a *circuit breaker* or *switch* *should* be performed in an unhesitating and controlled manner.

After opening or closing a *circuit breaker* or *switch*, its correct operation *shall* be confirmed by inspection of the *circuit breaker* or *switch* contacts if practicable, or by observation of the indicating devices or lamps provided for the purpose.

Where provided, the status of the *circuit breaker* or *switch* *shall* also be confirmed through the direct observation of the output of the *circuit breaker* or *switch*.

7.6 Operation of isolators

An isolator that is part of the *traction electrical supply network* *shall* only be opened after it has been ascertained that the circuit has been opened elsewhere. This may be by means of a *circuit breaker* or *switch*, and the isolator *shall* be closed before the *circuit breaker* or *switch* is closed.

However, an isolator may be used to make or break the excitation current of transformers, the charging current of transmission lines, HV AC traction catenary/contact wire systems, underground *cables* or DC *circuit breaker* control current when, in the opinion of the *Electrical Traction Control Officer*, it is safe to do so.

Only the *approved* handle, mechanism or operating stick *shall* be used for operating isolators.

Where practicable, the correct operation of the isolators *shall* be confirmed by visual inspection.

When opening an isolator by means of an operating stick, the operator *shall* be in control of the isolator and the isolator is to be reclosed immediately, *should* severe arcing occur across the open contacts.

After closing a latching type isolator, a check must be made to ensure the isolator is effectively latched in.



8.

Earthing/Short Circuiting of the Traction Electrical Supply Network

Principle: An effective *earthing* or *short circuiting* device shall be applied to ensure the safety of the work party. *Earthing/short circuiting* devices shall be applied by an *authorised person* after confirming it is safe to earth or *short circuit*.

8.1 General requirements

8.1.1 ***Earthing/short circuiting of electrical apparatus***

The *earthing* and/or *short circuiting* of apparatus that is part of the *traction electrical supply network* presents risks to persons performing the *earthing/short circuiting* and other persons nearby. *Organisations shall* establish *approved procedures* to mitigate risk to persons posed by the *earthing/short circuiting* of *electrical apparatus*.

8.1.2 ***Earthing and short circuiting devices shall be suitably rated and approved***

Earthing or *short circuiting* devices that are used on the *traction electrical supply network* shall be inspected and/or tested in accordance with *Organisation procedures*.

Earthing and *short circuiting* devices that are used on the *traction electrical supply network* shall be applied by an *authorised person* only after confirming it is safe to earth or *short circuit*.

Confirmation of Safe to Earth or *short circuit shall* be by:

- a. visual inspection of isolation(s) and testing of the *conductors*
- b. *where visual inspection of isolation(s) is not practicable*, inquiry and testing *shall be used*
- c. *where testing is not practicable*, earthing/short circuiting may take place only in accordance with approved procedures.

Earthing and short circuiting devices used on the traction electrical supply network include but are not limited to:

- a. earthing trucks
- b. earthing circuit breakers/switches
- c. portable earthing and short circuit devices
- d. permanently installed earthing and short circuiting devices.

8.1.3 Earthing and short circuiting device application

8.1.3.1 Application with an approved device

An earthing or short circuiting device used on the traction electrical supply network shall:

- a. be attached or removed using an *approved device*
- b. be regarded as having the potential to become *live* and not be handled during application or removal
- c. be *connected* to earth or *rail/negative return* before it is applied to the *conductors*, and
- d. be removed from the *conductors* before it is *disconnected* from earth or *rail/negative return*.

Exception to 8.1.3.1(b):

A portable *earthing or short circuiting device* that is *connected* to a permanently installed station *earthing system* or *negative conductor* may be handled during application or removal of the device but *shall* only be undertaken in accordance with documented and *approved* company *procedures*.

8.1.3.2 Application by hand

When hand application or removal of a portable *earthing* or *short circuiting device*(s) used on the *traction electrical supply network* is unavoidable:

- a. it *shall* be regarded as having the potential to become *live*
- b. all phases *shall* be *discharged* using an *approved device*, and
- c. another earth or *short circuit shall* be held in contact with the *conductor* using an *approved device* while the hand applied earth or *short circuit* is being attached or removed.

8.1.4 Clearances

There are some situations when an *authorised electrical operator* cannot comply with the clearances specified as *safe approach distances* when applying *earthing* or *short circuit* devices to the *traction electrical supply network* during the preparation for access (for example, discharging capacitor banks).

In these situations, *approved procedures* may permit such approach only to that part of the *electrical apparatus* that already has local isolation and is *earthed/short circuited*.

8.2 *Earthing and short circuiting for access to traction electrical supply network apparatus*

Earthing or short circuiting devices used on the *traction electrical supply network shall* be applied at locations such that *conductors* within the *work area* are effectively *earthed/short circuited* in the event of energisation from any source of supply or hazardous occurrences and be placed to remain effective if adjoining *conductors* are disconnected.

Wherever practicable *earthing and/or short circuiting devices shall* be placed either side of the worksite.

8.3 *Earthing and short circuiting of overhead lines*

Where an overhead line that is part of the *traction electrical supply network* is *earthed/short circuited* the *work planning shall* consider protection from the hazards resulting from step and touch potentials in the event of energisation by any means. This includes, for example, direct connection, equipment failure, induction or lightning.

Where *work* under an *access authority* involves the connection, cutting or disconnection of *conductors*, *approved* bridging leads *shall* be applied across the proposed *conductor* break, or *earthing* and/or *short circuiting devices shall* be applied to both sides of (and as close as practicable to) the proposed break and individually *connected* to a common earth, *earthed* return conductor or *rail/negative return* (HV AC Traction) or DC *negative conductor*.

In situations where there is the risk of a worker becoming subject to different potentials across or between different earths, the hazard will be reduced by the application of *equipotential work zone* principles.

The choice of connection for a portable *earthing* or *short circuiting device shall* be made to achieve the most effective *earthing/short circuiting* of the *work zone*.

8.3.1 **AC earthing**

In accordance with the system being worked on, an *earthing device* used on the *traction electrical supply network* *should* be applied on the basis of the following order of preference:

- a. permanently installed *earthing* system including CMEN
- b. *designated earthing points*
- c. *earthed* return conductors
- d. *earthing* ferrule in a concrete pole
- e. the ground rod of an installed pole stay or permanently driven pole stakes
- f. a temporarily driven spike at the *work* site.

During the discharge, *earthing* and phase shorting (AC) of overhead lines, no person/s other than the one/s applying the *earthing* and *short circuiting device shall* approach within six metres.

8.3.2 Short circuiting (DC) of overhead lines

Short circuiting shall be applied between the *negative conductor* and positive *conductor* of a DC *traction electrical supply network*, this shall be defined by the company's electrical access *procedures*.

The DC negative conductor may be:

- a. *rail/negative return*
- b. *negative bus in substations/Tie Stations*
- c. *conductive poles/structures bonded to the rail/negative return*

During the discharge and *short circuiting* of DC overhead lines, person/s other than the person/s applying the *short circuit* should remain two metres clear of the immediate *work area* for the duration of the *short circuiting* process.

8.4 Traction electrical supply network metal-clad switch units

The *earthing* or *short circuiting* of *traction electrical supply network* metal-clad *switchgear* and *connected* circuits by the use of probes or contact extension devices requiring manual application presents additional hazards.

Approved procedures shall define methods of operation and *earthing/short circuiting* to minimise the risk to the person applying the *earthing* or *short circuit* devices.

The *procedure* shall include that a *safety observer* be present during such *earthing/short circuiting* unless *procedures* specifically allow application by one person.

8.5 Capacitors

A safe method of discharging *traction electrical supply network* capacitors prior to access shall be included in *approved procedures*.

When *earthing* *traction electrical supply network* capacitors, the actives and where available, the neutrals shall be *earthed/short circuited* and, in addition, each capacitor shall be *discharged* before it is touched.

The same precautions shall be taken for work on *electrical apparatus* which incorporates *high voltage* capacitors, for example capacitor voltage transformers and carrier coupling capacitors.



9.

Access for *Work on or Near the Traction Electrical Supply Network*

Principle: An appropriate safe access system *shall* be applied to ensure the safety of *work* crews for *work* on or *near traction electrical supply network* or associated with the testing of *traction electrical supply network electrical apparatus*.

9.1 General

No person *shall* touch or *work* on or *near* the *electrical apparatus* of a *traction electrical supply network* unless:

- a. in the case of *exposed conductors*, the person is a *recipient* of an electrical access permit covering the *conductors*, the *conductors* have been *discharged* and *earthed/short circuited* at the *work* site, and the electrical access permit is available for reference at the site of the *work*, or
- b. in the case of a *cable*, the person is a *recipient* of an electrical access permit covering *cable* and the *de-energised* state of the *cable* at the *work* site is confirmed in accordance with section 9.8 and the electrical access permit is available for reference at the site of the *work*, or
- c. in the case of a rackable *circuit breaker* or rackable voltage transformer, the *electrical apparatus* is removed from its rack or cubicle position and placed in a designated maintenance position, or
- d. the person is working under the terms of a sanction for testing or alternative *approved procedure* on that *electrical apparatus* in accordance with section 9.3, or

- e. the *electrical apparatus* has been declared as *out of commission* in accordance with section 9.4, or
- f. the person is performing *live work* in accordance with *approved procedures*, or
- g. the person is working in accordance with the requirements of a permit to *work* adjacent to *network assets* issued by the *railway company*, or
- h. the person is working in accordance with the requirements of section 6.

9.2 Electrical access permit *procedure*

Electrical access permits may only be issued on *de-energised, isolated, short circuited* (DC) or *earthed and phase shorted* (AC) *traction electrical supply network electrical apparatus*, unless *Organisation procedures* determine otherwise.

9.2.1 Planning for an electrical access permit

Before making an application for an electrical access permit, the *authorised applicant shall* establish that the proposed *work* has been properly planned and can be carried out safely.

The *traction electrical supply network electrical apparatus* to be covered and its location *shall* be accurately defined and the *work* to be undertaken adequately described.

9.2.2 Multiple working parties

There *shall* be coordination between the parties in planning and performing the *work* to ensure that the actions of one party *shall* not endanger the safety of others when more than one electrical access permit is issued on the same *traction electrical supply network electrical apparatus*, or where separate parties are working under the terms of one electrical access permit.

9.2.3 Multiple ownership

Where the operational control of the scope of *traction electrical supply network electrical apparatus* to be covered is owned by more than one *organisation*, a protocol *shall* be established between these *organisations* for processing the application and outage requirements.

9.2.4 Issue, receipt and cancellation of electrical access permits

- a. An electrical access permit *shall* be issued and cancelled only by an *authorised electrical operator*. Electrical access permits may be issued or relinquished by telephone or radio subject to:
1. the permission of the *Electrical Traction Control Officer* to use telephone or radio to issue or relinquish electrical access permits, and
 2. the statements between the *authorised electrical operator* and the *recipient in charge* being confirmed by a witness at each end.

Note: refer to section 3.3 for further details on communications.

- b. At the time of issue of an electrical access permit the *authorised electrical operator shall* describe and show, where practicable, the *recipient in charge* and all the initial recipients:
1. the traction electrical supply network electrical apparatus covered by the electrical access permit, and
 2. the precautions taken, and
 3. the nearest points of supply, and
 4. any adjacent live electrical apparatus.

In the case of an electrical access permit issued by telephone or radio, the *recipient in charge shall* assume these responsibilities on behalf of the *authorised electrical operator*.

- c. An electrical access permit *shall* be either cancelled or suspended prior to the issue of a sanction for testing or the use of an alternative *approved procedure* for testing on the same *electrical apparatus*.
- d. *High voltage live work* and *work under an access authority shall* not be performed concurrently on the same structure.
- e. Each electrical access permit *shall* be issued to a *recipient in charge*.
- f. The *recipient in charge shall* ensure that all members of the *work party* who will approach the *traction electrical supply network electrical apparatus* sign on the electrical access permit.

- g. The issuer and *authorised recipients* all have a responsibility to ensure that the scope and the condition of the *traction electrical supply network electrical apparatus* covered by the electrical access permit is such that it *shall* be safe for the proposed *work* to be undertaken.
- h. All *recipients shall* be satisfied with the precautions taken, the location of the points of supply, and the proximity of any adjacent *live electrical apparatus*.
- i. Any person Involved in the issue or receipt of an electrical access permit who is not satisfied with the conditions, may apply to the *authorised electrical operator* to have additional precautions taken, either before the electrical access permit is issued or during the currency of the *work*.
- j. After the issue of an electrical access permit, no additional *recipients* are allowed to sign onto the permit unless appropriate instructions are given by the *recipient in charge*, as per section 9.2.5. An *authorised electrical operator*, acting with the knowledge of the *recipient in charge*, may undertake this activity.

9.2.4.1 Issue and cancellation by persons in training

A trainee under the *direct supervision* and with the countersignature of an *authorised electrical operator*, may issue and cancel an electrical access permit with the prior permission of the *Electrical Traction Control Officer*.

9.2.5 Persons permitted to sign onto electrical access permits

Persons permitted to sign onto electrical access permits *shall* be *authorised recipients* or *instructed persons* assigned to *work* under that specific electrical access permit.

In the latter case it *shall* be the responsibility of the *recipient in charge* to ensure that such persons are placed in the charge of an *authorised recipient*.

- a. The conditions under which an *authorised person shall* sign-on to an electrical access permit is that the *authorised recipient*:
 1. understands the *traction electrical supply network electrical apparatus* covered and the limits of the electrical access permit, and
 2. is satisfied with the precautions taken, and
 3. is aware of the nearest adjacent *live electrical apparatus*.

- b. The conditions under which an *instructed person* (IP) shall sign-on to an electrical access permit is that the *instructed person*:
1. understands instructions given on what approach is permitted to the *electrical apparatus*; and
 2. understands instructions given on what activity is permitted to be taken in relation to the *traction electrical supply network electrical apparatus*, and
 3. agrees to be *effectively supervised* by a nominated *authorised recipient*.
 4. is indicated on the electrical access permit by bracketing their signature with that of their supervising *authorised recipient*.

Note: identification of an *instructed person* (IP) on a permit is acceptable by the use of brackets or other means, for example (IP) beside the person's name. A *non authorised recipient* (NAR) will become an *instructed person* (IP) in this instance.

9.2.6 *Recipient working alone*

An electrical access permit may be issued to a single *authorised recipient*. The *authorised recipient* may work alone provided there is no risk of infringing the *safe approach distances* and the *authorised recipient* is working in accordance with *approved procedures*.

9.2.7 *Issuer also a recipient*

An issuer of an electrical access permit shall not be the initial *recipient in charge* but may sign-on to the electrical access permit form as an *authorised recipient*.

In accordance with *approved procedures*, the issuer may sign-on as a subsequent *recipient in charge*.

9.2.8 *Rejection of a recipient*

A person shall recommend the exclusion from an electrical access permit of any other person who at any time is considered unsafe as a *recipient*. Such instances shall be reported promptly to the person in charge of the work.

9.2.9 Earthing/short circuiting of electrical apparatus under electrical access permit

Traction electrical supply network electrical apparatus shall be earthed/short circuited before the issue of an electrical access permit, wherever practicable.

9.2.9.1 Absence of an earth/short circuit

Wherever practicable *traction electrical supply network electrical apparatus shall be earthed/short circuited before the issue of an electrical access permit. Where an earthing or short circuiting device has not been applied to electrical apparatus prior to the issue of an electrical access permit, the recipient in charge shall arrange for discharging of the electrical apparatus before any recipient touches the electrical apparatus.*

9.2.9.2 Recording of earths/short circuits

All *earthing and short circuiting devices* applied prior to and during the currency of an electrical access permit *shall be recorded on the electrical access permit or documented in accordance with organisation procedures.*

The removal of all *earthing and short circuiting devices shall be verified prior to re-energising the electrical apparatus.*

9.2.9.3 Removal of earthing or short-circuiting devices when working under an access authority

During *work under an access authority, the recipient in charge may authorise the removal of an earthing or short circuiting device for testing, re-conductoring, or other purposes, only if such action is considered necessary and safe, and provided:*

- a. *the operating authority that has operational control of the earthing or short circuiting device and the operating authority who applied the earthing or short circuiting device agree with the removal, and*
- b. *in cases where the earthing or short circuiting device is listed on the access authority, the Operating Authority who issued the access authority is consulted, to confirm that the removal of the earthing or short circuiting device will not affect any other access authorities that have been issued, and*

- c. all persons likely to be affected by the removal of the *earthing or short circuiting device* are notified, and
- d. consideration is given to induced voltages.

The *earthing or short circuiting device* that has been removed shall be replaced in the same, or other equally effective position, as soon as possible.

9.2.10 Temporary cessation of work or absence of recipients

Following a temporary cessation of *work* or when *recipients* have been temporarily absent from the *work* site, upon return each *recipient shall report to the recipient in charge* to re-confirm the conditions of the electrical access permit.

9.2.11 Testing under an electrical access permit

Testing under an electrical access permit may be undertaken in accordance with *approved procedures* that shall ensure that:

- a. a risk assessment is carried out before any testing occurs
- b. all other *work shall cease* for the duration of the testing
- c. no hazardous voltages and currents will be accessible as a result of the testing
- d. *recipient/s* conducting the testing are *competent*
- e. any stored electrical charge is considered
- f. test voltages and current do not exceed the equipment rating or test equipment rating
- g. consideration is given to maintaining earth between the *recipient/s* and the sources of supply
- h. consideration is be given to the hazards of connecting and disconnecting test equipment
- i. adequate precautions are taken for the safety of all persons during the performance of the test, and
- j. the provisions of section 9.2.9.3 (removal of *earthing or short circuiting device* when working under an *access authority*) are met.

9.2.12 Working on multi-circuit overhead lines

Where more than one *high voltage* or *traction voltage* circuit is carried on a pole or structure and *work* is to be performed on specified circuits under an electrical access permit while others remain *live*, each *recipient* of the *work* party who approaches *near* any circuits *shall* correctly identify the circuit/s under electrical access permit and all other circuits.

If there is any doubt the *recipient shall* seek clarification from the *recipient in charge*.

9.2.13 Change of electrical access permit conditions

The conditions specified and the precautions listed on the electrical access permit *shall* not be changed unless mutually agreed upon by both the *Operating Authority* and the *recipient in charge*, and

- a. only when a check has been made with the appropriate *operating authority* regarding the requirements of other electrical access permits, and
- b. all *recipients* working under the electrical access permit have been notified of the change.

9.2.14 Cancellation of an electrical access permit

9.2.14.1 *Recipients* signing off an electrical access permit.

It *shall* be the duty of each *recipient* of an electrical access permit to sign-off before the electrical access permit is relinquished.

9.2.14.2 Responsibilities of the *recipient in charge* when relinquishing an electrical access permit for cancellation.

When an electrical access permit is to be relinquished for cancellation, the *recipient in charge shall*:

- a. ensure all *recipients* signed on to the electrical access permit have ceased *work* covered by the electrical access permit and have signed off
- b. ensure all *recipients* and equipment are clear and will remain clear of the *electrical apparatus*

- c. sign-off the electrical access permit as the *recipient in charge* to indicate that the electrical access permit can be cancelled, and
- d. advise the *operating authority* of any condition of the *traction electrical supply network electrical apparatus* that could affect its operation.

An electrical access permit *should* not be cancelled by the *recipient in charge*. Appropriate *approved procedures* shall be established to cover instances where this is unavoidable.

9.2.14.3 Absence of a *recipient* at relinquishment

The practice of signing off an electrical access permit on behalf of another person is undesirable and *should* be avoided.

Appropriate *organisation procedures* shall be implemented with instructions for signing off *recipients* where the *recipients* could not sign-off in person.

9.2.14.4 *Recipient in charge* replacement during permit on issue

In the event of a person ceasing to act as *recipient in charge*, another *authorised recipient* shall become the *recipient in charge* and where practicable, the electrical access permit form shall be initialled by both.

Further:

- a. the *work party* shall be advised of the change in *recipient-in-charge*
- b. this change of *recipient-in-charge* shall be communicated to the *operating authority* and the *operating authority* shall record this change on the electrical access permit, and
- c. appropriate *organisation procedures* shall be implemented with instructions for signing over the *recipient in charge* whilst the electrical access permit is on issue.

9.3 Testing of the *traction electrical supply network*

9.3.1 General

The sanction for testing or an alternative *approved procedure* for testing *shall* be used if the testing of *traction electrical supply network* has the potential to produce currents and voltages hazardous to the human body.

The alternative *approved procedure shall* satisfy the requirements of this section (section 9.3 Testing of the *traction electrical supply network*) to achieve the same or better safety outcomes as the sanction for testing *procedure*.

9.3.2 Planning for testing of *high voltage apparatus*

Only an *authorised applicant shall* make application for a sanction for testing, this application *shall* consider the following mandatory considerations:

- a. before making an application for sanction for testing the *authorised applicant shall* establish that the proposed *work* has been properly planned and can be carried out safely, and
- b. the *traction electrical supply network electrical apparatus* to be tested and its location *shall* be accurately defined and the task to be undertaken adequately described in the application, and
- c. testing *shall* be undertaken in accordance with *approved procedures* and adequate precautions *shall* be taken to avoid exposure to hazardous voltages and currents, and
- d. only one sanction for testing *shall* be on issue on the same *traction electrical supply network electrical apparatus* at any time, and
- e. where the test is to be undertaken on *electrical apparatus*, having involvement of more than one operating authority then protocols *shall* be established for processing the application and test requirements.

9.3.3 Sanction for testing *procedure*

- a. A sanction for testing *shall* be either cancelled or suspended prior to the issue of an electrical access permit on the same *traction electrical supply network electrical apparatus*.
- b. The sanction for testing *shall* be issued to the *tester in charge* by an *authorised electrical operator*.
- c. Sanctions for testing *shall* be issued and cancelled only by an *authorised electrical operator*.
- d. The following provisions of this Code: sections 7 (Operation of *traction electrical supply network*), 8 (*Earthing of traction electrical supply network*) and 9 (*Access for work on or near traction electrical supply network electrical apparatus*) *shall* also apply to sanctions for testing.
- e. Sanctions for testing may be issued or relinquished by telephone or radio subject to the statements between the *authorised electrical operator* and the *tester in charge* or tester responsible at remote location, as appropriate, being confirmed by a witness at each end.
- f. In the case of a sanction for testing issued by telephone or radio, the *tester in charge* or the tester responsible at remote location, as appropriate, *shall* assume the responsibilities of the *Authorised electrical operator* in applying the provisions of this section 9.3.3.

9.3.4 Persons permitted to sign onto sanctions for testing

Persons permitted to sign onto a sanction for testing *shall* be *authorised testers, authorised electrical operators, authorised recipients* or *instructed persons approved to work* under that specific sanction for testing.

In the case of *authorised electrical operators, authorised recipients* or *instructed persons*, it *shall* be the responsibility of the *tester in charge* or the tester responsible at remote location to ensure that such persons are placed in the charge of an *authorised tester*, who may be the *tester in charge*.

- a. The conditions under which an *authorised tester* shall sign on to a sanction for testing are that the *authorised tester*:
 - 1. understands the *traction electrical supply network electrical apparatus* covered and the limits of the sanction for testing, and
 - 2. is satisfied with the precautions taken, and
 - 3. *is aware of the nearest adjacent live electrical apparatus.*
- b. The conditions under which an authorised electrical operator or authorised recipient shall sign on to a sanction for testing are that the authorised electrical operator or recipient:
 - 1. understands instructions given on what approach is permitted to the *traction electrical supply network electrical apparatus*, and
 - 2. understands instructions given on what activity is permitted to be taken in relation to the *traction electrical supply network electrical apparatus*, and
 - 3. aware of the *nearest adjacent live electrical apparatus*, and
 - 4. agrees to the level of supervision nominated by the *authorised tester*.
- c. The conditions under which an *instructed person* shall sign-on to a sanction for testing are that the *instructed person*:
 - 1. understands instructions given on what approach is permitted to the *traction electrical supply network electrical apparatus*, and
 - 2. understands instructions given on what activity is permitted to be taken in relation to the *traction electrical supply network electrical apparatus*, and
 - 3. is made aware of the *nearest adjacent live electrical apparatus*, and
 - 4. agrees to the *direct supervision* by a nominated *authorised tester*.

9.3.5 Responsibilities of *Tester in charge*

- a. The *tester in charge* shall ensure that the members of the work party who will be making contact with *traction electrical supply network electrical apparatus* under test and any of the test connections or approaching within the *safe approach distances* set out in this Code during the currency of the sanction for testing, sign onto the sanction for testing.
- b. The *tester in charge* shall ensure that the members of the work party are suitably experienced and trained for the work required of them and that adequate precautions are taken for the safety of all persons.

9.3.6 Relinquishment of sanctions for testing

When relinquishing a sanction for testing, the *tester in charge* shall advise the *operating authority* of the condition of the *traction electrical supply network electrical apparatus* at all related locations.

9.4 *Out of commission electrical apparatus*

9.4.1 Declaring *electrical apparatus out of commission*

An *out of commission* declaration shall include a statement of the condition of the *electrical apparatus*, including all relevant auxiliary equipment (for example, control circuits, compressed air supplies, etc).

9.4.2 Placing apparatus *out of commission*

An *out of commission* declaration shall not be made unless there is a physical removal of a portion of each of the *conductors* connecting *traction electrical supply network electrical apparatus* to electricity supply.

However, the racking out of a removable type *circuit breaker* shall be accepted as the physical disconnection of the *conductors* provided that safety measures are introduced that will prevent or impede the restoration of the removable type *circuit breaker* using normal operating and isolating *procedures*. Such measures shall be implemented in accordance with *approved procedures*.

9.4.3 Access to out of commission electrical apparatus

If the *traction electrical supply network electrical apparatus* that is declared *out of commission* may be approached and worked upon without the issue of an electrical access permit, or sanction for testing.

Although the if *traction electrical supply network electrical apparatus* is *not electrically connected* due regard shall be given to the possibility of inadvertent energisation from adjacent *electrical apparatus*, induction, lightning, static charges or other means.

9.5 Live work – high voltage and AC traction voltage

This section 9.5 is not applicable to the operation, washing or testing of *live high voltage electrical apparatus*.

Refer to *approved organisational procedures*.

9.5.1 General – HV live work

HV live work on the *traction electrical supply network* shall only be undertaken after consideration is first given to performing the *work* under *isolated* and *earthed* conditions.

Before *live work* is undertaken a hazard identification and risk assessment shall confirm that the *work* can be performed safely.

9.5.1.1 HV live work procedures

All *HV live work* on the *traction electrical supply network* shall be conducted in accordance with *approved procedures* and *approved live work* minimum approach distances.

When developing *approved procedures*, determining *live work* minimum approach distances and performing the tasks the following shall be considered:

- a. AS5804.1 *High voltage Live working*: general and related standards and guidelines as may be appropriate
- b. electrical and ergonomic distances necessary to prevent flashover
- c. possibility of inadvertent movement

- d. minimising the duration of *work* at the *live work* minimum approach distances
- e. *work* techniques that provide maximum practical distance from *live conductors*;
- f. limiting overvoltage conditions by operational or site controls
- g. *work* crew on site risk assessment
- h. control of inadvertent movement by the use of insulating barriers, *insulated* plant and *appliances* and controlled body movements
- i. and environmental conditions.

9.5.2 Minimum requirements for *HV live work*

The *procedures* for undertaking *HV live work* on the *traction electrical supply network* shall include:

- a. a requirement that persons performing *HV live work* and appointed *safety observers* shall be authorised *HV live workers*
- b. a requirement that persons undertaking *HV live* training are to be instructed and supervised by an authorised *HV live worker*
- c. a requirement to conduct a risk assessment that shall consider as a minimum:
 1. the condition of the traction electrical supply network electrical apparatus to be worked on, and
 2. the proximity of other electrical apparatus, and
 3. the proximity of earthed equipment and structures, and
 4. the protection and control settings of the traction electrical supply network electrical apparatus to be worked on, and
 5. the appointment of a safety observer, and
- d. a requirement that persons performing *live work* shall use appropriate rated and tested equipment and wear appropriate *personal protective equipment*
- e. a requirement the work shall be performed in accordance with *approved procedures*.

9.5.3 *Insulating stick work*

An authorised *HV live worker* may access *live traction electrical supply network high voltage conductors* using *insulating sticks* at the distances determined through reference to Clause 9.5.1.

9.5.4 Glove and barrier work

An authorised *HV live worker* may make *insulated* contact with *live traction electrical supply network high voltage conductors* up to 33kV when fully *insulated* from earth and other phases using *approved* and tested *personal protective equipment* and insulating devices.

9.6 Traction: DC *Live work*

9.6.1 *Live working on DC traction electrical apparatus*

Traction DC *live work* may be carried out only on DC *traction electrical supply network electrical apparatus* in accordance with *approved procedures*.

Approved procedures/processes shall determine if DC *traction electrical supply network work* can be performed safely *live*. It is the responsibility of each person on site required to *work live* to be satisfied that the *work* can be performed safely.

The *procedures* for undertaking *live work* on the DC *traction electrical supply network shall* include:

- a. a requirement that persons performing *live work* on the DC *traction electrical supply network shall* be authorised DC *live workers*
- b. a requirement that *safety observers* observing *live work on the DC traction electrical supply network shall* be authorised DC *live workers* or authorised *safety observers* for DC *live work*
- c. a requirement that persons undertaking *live traction worker training are to be* instructed and supervised by an authorised DC *live worker*
- d. a requirement to conduct a risk assessment that *shall* consider as a minimum:
 1. the condition of the traction electrical supply network electrical apparatus to be worked on
 2. the proximity of other electrical apparatus
 3. the proximity of earthed equipment and structures
 4. the protection and control settings of the traction electrical supply network electrical apparatus to be worked on
 5. the appointment of a safety observer

- e. a requirement that persons performing *live work shall* use appropriately rated and tested equipment and wear appropriate *personal protective equipment*, and
- f. a requirement that the *work shall* be performed in accordance with *approved procedures*.

Note: Insulating barriers or covers may be applied to the LV AC conductors owned by the distribution companies where *approval* has been given, for example; Interface agreements.

9.6.2 Staff permitted to do traction DC *live work*

Traction DC *Live work* on the DC *traction electrical supply network shall* only be undertaken by persons who have been trained and assessed as *competent* in traction DC *live work* techniques.

The person *shall* be authorised by the *railway company* to undertake DC *live work*.

9.7 Preparing *traction electrical supply network* for access

9.7.1 Isolation and *earthing* and phase shorting and *short circuiting*

The *traction electrical supply network* should not be regarded as being safe for the issue of an electrical access permit until it has been *isolated* and *earthed* and *phase shorted* (AC) or *short circuited* (DC).

Whenever practicable, all isolation points *should* be tagged.

Consideration *shall* be given to the isolation of sources of supply from *low voltage* or secondary circuits.

Approved procedures shall ensure the integrity of the isolation is maintained during currency of the electrical access permit.

Isolation for access *shall* either be visible, or an *approved* means used to confirm that the *electrical apparatus* is *de-energised*.

Note: Such isolation may not eliminate the effects of electrical or magnetic induction.

Earthing and short circuiting devices shall be applied as described in clause 8.2.

If earthing or short circuiting is impracticable, other appropriate precautions shall be taken and the authorised electrical operator shall advise the recipient in charge and record the absence of an earthing or short circuiting device on the electrical access permit.

9.7.2 Barriers and signs

9.7.2.1 General

Appropriate barriers *shall* be used where necessary to indicate areas containing live *traction electrical supply network electrical apparatus* and the degree of hazard.

Appropriate signs *shall* be used where necessary:

- a. to identify traction electrical supply network electrical apparatus covered by an access authority, and
- b. to identify adjacent live electrical apparatus and related hazard.

Barriers *shall* not be altered or crossed except in accordance with *approved procedures*.

In particular instances where identification is positive, such as on some *traction electrical supply network* overhead lines and underground *cables*, and provided appropriate safeguards have been taken, *approved procedures* may dispense with the use of barriers and/or signs.

9.7.2.2 Hazards that are likely to be life threatening

Situations where there is an immediate and probable risk of contact with *live traction electrical supply network electrical apparatus* *shall* be defined by the use of danger barriers and/or signs

(refer to clause 9.7.2.4), for example:

- a. areas where *safe approach distances* cannot be maintained, or
- b. areas in which *traction voltage* testing is in progress.

9.7.2.4 Descriptions of barriers and signs

Live (Alive) sign

Approved danger sign having the word *LIVE* or (ALIVE) printed in white upon a red background or otherwise conforming to AS1319.

Danger barrier and/or sign

A barrier and/or sign of suitable material will be coloured red or alternatively red and white, to indicate the presence of danger, or otherwise conforming to AS1319.

Under access permit sign

A sign of appropriate dimensions having the words UNDER ACCESS PERMIT or similar printed in white on a green background or otherwise conforming to AS1319.

Under sanction for testing sign

A danger sign of appropriate dimensions having the words UNDER SANCTION FOR TESTING printed in red on a white background or otherwise conforming to AS1319.

Warning barrier and/or sign

A barrier and/or sign of suitable material, coloured yellow, or alternatively yellow and black, to indicate the need for a warning, or otherwise conforming to AS1319.

9.7.2.5 Barriers and signs for electrical access permits

Prior to the issue of an electrical access permit, barriers and signs *shall* be erected:

- a. to make it clearly evident which *electrical apparatus* is under electrical access permit, and which is not, and
- b. to guard against mistaken or inadvertent contact with other *electrical apparatus*.

The above *shall* be achieved with the use of appropriate signs and barriers including *Live* signs and under access permit signs. In positioning signs and barriers consideration *shall* be given to all approaches to the *work area*.

Additional barriers and signs may be erected after the issue of the electrical access permit by agreement between the *authorised electrical operator* and the *recipient in charge*.

9.7.2.6 Barriers and/or signs for sanction for testing

Prior to the issue of a sanction for testing, barriers and signs *shall* be erected:

- a. to make it clearly evident which *traction electrical supply network electrical apparatus* is under sanction for testing, and which is not, and
- b. to guard against mistaken or inadvertent contact with other *electrical apparatus* or equipment under test.

The above *shall* be achieved with the use of appropriate signs and barriers including danger barriers, *live* signs and under sanction for testing signs. In positioning signs and barriers consideration *shall* be given to all approaches to the *work area*.

Additional barriers and signs may be erected after the issue of the sanction for testing by the *Tester in charge*.

9.7.3 Use of a *statement of condition of apparatus/plant (SCAP)*

9.7.3.1 General

A *SCAP* is a statement outlining the condition of *traction electrical supply network apparatus* or plant.

It *shall* be used between operating authorities to confirm apparatus or plant conditions and isolations to support an *access authority* or other operational requirements.

Note: See appendix A for the minimum requirement to be included in a *statement of condition of apparatus/plant (SCAP)*.

9.7.3.2 Use of the *written SCAP*

A *SCAP* is a documented statement issued by one *operating authority* to another, stating the condition of the specified *traction electrical supply network electrical apparatus* controlled by the issuing authority.

The *SCAP* specifies the state of the *traction electrical supply network electrical apparatus/plant* covered and does not by itself authorise work on the *electrical apparatus* or plant.

The stated conditions *shall* be maintained unless changed in accordance with the provisions referred to in this clause, or until the SCAP is relinquished by the receiving authority.

Any earths listed on the SCAP may be removed as requested by the *recipient* in accordance with clause 9.2.9.2 (recording of earths) and clause 9.2.9.3 (removal of earth when working under an *access authority*).

The SCAP *shall*, where practicable, detail all relevant precautions taken for the safety of the *work party/ies*.

Where it is not practicable to detail all such precautions, a general written statement of the condition of the *traction electrical supply network electrical apparatus/plant* (for example, *isolated and earthed*) is acceptable provided that:

- a. it is acceptable to the operating authorities, and
- b. it is acceptable to all *recipients* on the associated electrical access permit or sanction for test.

At the time of issue, the issuing *operating authority shall* describe and show the *traction electrical supply network electrical apparatus* covered by the SCAP and the precautions taken to the satisfaction of the receiving *operating authority recipient*.

SCAP details *shall* be recorded and included in the precautions taken section of any associated electrical access permit or sanction for testing permit.

Note: Where it is not practicable to show each SCAP isolation physically, other forms of communication, photographic or video evidence of the isolations can be provided.

Where a general statement is used and any isolation point is to be changed (while still maintaining general condition of isolation), prior agreement *shall* be obtained from all affected operating authorities. The receiving *operating authority shall* consult with *recipients* of affected access authorities before agreeing to any change.

9.7.3.3 Use of a Verbal *Statement of condition of apparatus/plant (VSCAP)*

VSCAP's *shall* only be used between operating authorities when:

- a. There is mutual agreement for their use, and
- b. They have *approved procedures* and systems for the logging of information both given and received, for the issue and cancellation of a VSCAP, and
- c. The *procedures* and systems guard against the inadvertent operation or restoration of *electrical apparatus*.

The *operating authority* receiving the VSCAP *shall* be responsible for the issue of relevant access authorities.

Any earths listed on the VSCAP may be removed as requested by the *recipient* in accordance with clause 9.2.9.2 (recording of earths) and clause 9.2.9.3 (removal of earth when working under an *access authority*).

9.7.4 *Traction electrical supply network metal-clad switchgear and associated electrical apparatus*

- a. For the purpose of issuing an electrical access permit, a *circuit breaker* or a voltage transformer may be regarded as *isolated* and at earth potential when it is racked out, and appropriate precautions taken to prevent re-energisation (see also Clause 9.1 General).
- b. For *work* on busbar circuits, where the physical separation of circuits within a chamber is not visibly evident, additional precautions *shall* be taken for the safety of the working party.
- c. The proposed means of access within metal-clad chambers *shall* be described to the *authorised electrical operator* by the *recipient in charge* and both must agree on the extent of access and that such access is safe.
- d. When access is required within spout bushings the contacts *shall* be confirmed as *de-energised* by an *approved* test. The circuit *shall* also be *earthed* elsewhere, or other precautions taken to ensure that the spout contacts cannot become *Live* by induction or other means.
- e. When it is not practicable to earth metalclad circuits, a risk assessment *shall* be conducted to determine the special precautions, including discharging, which are required to ensure that the *conductors* can be regarded as being at earth potential.

9.8 Working on *insulated* power or supervisory cables

9.8.1 On-site identification of *insulated cables* (including *out of commission* or *abandoned cables*)

Where it is necessary for a *cable* to be *de-energised* to enable access to the *cable* , the *de-energised* state *should* be confirmed on site by positive identification or visually tracing it from one end or by the use of a spiking or remote *cable* cutting device.

9.8.2 Spiking or remote *cable* cutting of *cables*

A spiking or remote *cable* cutting device may be used to confirm that a *cable* is *de-energised* .

When a *cable* is to be spiked by a power-operated spiking device or cut by a remote *cable* cutting device the following measures *shall* be taken:

- a. where practicable the electrical condition of the remote ends of the *cable* *shall* be confirmed as *isolated* and *earthed/short circuited*
- b. the person in charge of the *work* *shall* personally select the *cable* to be spiked or cut after careful reference to the appropriate records and the use of *cable* tracers where necessary, and
- c. an *approved cable* spiking device or remote *cable* cutting device *shall* be used by a person trained in its use and in accordance with *approved procedures* .

Prior to spiking or cutting, the *operating authority* *shall* be advised. The *operating authority* *shall* prevent the energising or re-energising of any *cable* in the *vicinity* of the proposed works until advised that spiking or cutting has been completed.

9.8.3 Working under induced voltage conditions

Whenever *work* is to be carried out on a *cable* core, sheath, armouring, oil line, etc, of a fully *insulated cable* system, careful assessment *shall* first be given to the voltage that may appear on the *conductor* via induction or other means and appropriate *earthing/short circuiting* practices and *approved work procedures* adopted.



10.

Placing the *Traction Electrical Supply Network in Service*

Principle 8 – The *traction electrical supply network* shall not be placed into service until it has been cleared for service

10.1 Clearance for service

An *Operating Authority* shall not consider *traction electrical supply network electrical apparatus* being available for service until it has been handed over from the constructing or maintaining authority by *written notification* or by *approved procedures*.

10.2 Connections to new or *out of commission electrical apparatus*

Before any electrical connection is made whereby new *traction electrical supply network electrical apparatus* or any *traction electrical supply network electrical apparatus* previously *out of commission* can be *energised* by *direct switching* or *Live work procedures*:

- a. the *operating authority* shall be notified of the intention to make such connection, and
- b. all persons associated with the *work*, and any others likely to be affected, shall be informed that no further *work* is permitted on the *traction electrical supply network electrical apparatus* unless:
 1. they are recipients of an access authority, or
 2. Live work procedures are used.

To enable the connection to be made, an appropriate *access authority* or *Live work procedure* shall be used.



11.

Low Voltage Network Assets

Principle 9 – Safe working procedures shall be established for work on or near low voltage assets

11.1 General

Persons required to *work* on or *near low voltage network assets* shall:

- a. be appropriately trained and authorised, and
- b. carry out the *work* in accordance with *approved procedures*; and
- c. identify the assets associated with the *work* to be undertaken before commencing the *work*.

Note: *traction electrical supply network* apparatus shall be managed in accordance with other relevant sections of this Code.

11.2 Work on or near Live low voltage conductors

When *work* is to be carried out on or *near Live low voltage* assets, that are *near traction electrical supply network assets*, *approved precautions* shall be taken to prevent simultaneous contact with *conductors* or conducting objects at different potentials.

11.3 Work on or near de-energised low voltage exposed conductors

Where *work* is to be carried out on or *near de-energised low voltage network assets* that are *near traction electrical supply network* apparatus:

- a. an access authority shall be issued to work on or near any exposed conductors.

For this purpose, an electrical access permit or other *approved access authority* may be used.

Exception: An *access authority* is not required for protection and control systems, *substation* service supplies, auxiliary circuits and *low voltage* service lines.

b. Control measures *shall be taken to:*

1. prevent inadvertent contact with other *Live exposed conductors*, or objects at different potentials, and
2. minimise the risks from hazardous induced voltages or unknown supplies.

c. Additional control measures *should* include:

1. proving *de-energised* in accordance with *approved procedures*
2. blocking and locking of *switches*
3. signs and tags placed at all points of isolation, that *shall* be removed only with the permission of a person identified in *approved procedures*
4. *earthing*, phase shorting (AC) or *short circuited* (DC)
5. *work* planning to minimise the risk of inadvertent contact with *Live conductors* in the *vicinity* of the *work*, and
6. insulating and other types of barriers.

Note: For *work on or near low voltage Electrical installations*, further guidance is available in AS/NZS 4836



12.

Work by Persons Not Under the Control of the *Railway Company*

Principle 10 – The *railway company shall have procedures to facilitate a safe system of access, by persons not under the control of the railway company*

12.1 General

A railway company shall have procedures to facilitate a safe system of access by persons, not under the control of the railway company, to work near or within safe approach distance or, when appropriate, in the vicinity of electrical apparatus.

For the purposes of this clause, persons not under the control of the railway company are persons or Organisations that have no contractual obligation to the railway company and are not performing work for the railway company for the particular task.

The railway company shall ensure appropriate instruction is provided to such persons on the electrical hazards.

The *railway company shall* instruct the person controlling the *work* (not under the control of the *railway company*) that the person is responsible for having a safe system of *work* in place to avoid the risk from electrical hazards and will ensure all persons are aware of the safe system of *work*.

12.2 Permit to work adjacent to network assets

Where the safe system of access referred to in clause 12.1 is used, it *shall* include the use of the permit to work adjacent to *network assets*.

When a permit to work adjacent to *network assets* is required, the *railway company shall* require a *written* application to be submitted.

The *procedure shall* require an application for a permit to work adjacent to *networks* to include sufficient information to enable the *railway company* to determine appropriate control measures to enable safe access.

The *procedure* for the permit to work adjacent to *network assets shall* include:

- a. a requirement for an approved issuer
- b. a requirement that a person be nominated to be in charge of the work, and
- c. a requirement for control measures (precautions) to be implemented by the railway company and/or the nominated person in charge of the work, and
- d. a requirement that instructions/conditions be given to the nominated person in charge of the work, and
- e. a process for the issue and cancellation of the permit.

12.3 Work on abandoned underground cables

For work by persons (not under the control of the *railway company*) on abandoned underground *cables* belonging to the *railway company*, a requirement for the use of a safe system of access *shall* be considered by the *railway company*.

12.4 Vegetation management

In this section:

Protected Aerial Line means an aerial line that forms part of a:

- a supply network owned or operated by a Major Electricity Company (MEC), or
- a traction electrical supply network, or
- a low voltage Electrical installation operating on public land, or
- a high voltage Electrical installation, or
- a low voltage private electric line.

Vegetation Management Rules means the ***Electrical Safety Rules for Vegetation Management Work Near Overhead Powerlines by non-electrical Workers***, published by Energy Safe Victoria.

Vegetation management *work* includes:

- the pruning, cutting, trimming or felling of vegetation in the *vicinity* of a protected aerial line, and
- the application of herbicides to vegetation that is in the *vicinity* of a protected aerial line.

Persons performing vegetation management *work shall* comply with the requirements of the:

- Electricity Safety (General) *Regulations* 2019, and
- The Vegetation Management Rules as published on the Energy Safe Victoria website.



Appendices

Appendix A – Information to Include in Forms

This appendix provides information that *shall* be included and other information that could be considered by *organisations* in the formal communications associated with *procedures* referenced in this Code.

Unless stated otherwise, the information may be communicated verbally or by *written* or electronic means.

Application for an *access authority*

An application for an access authority shall contain sufficient information to determine:

- the type of *access authority* to be issued, and
- *electrical apparatus* to be covered, and
- the precautions to be taken.

Examples of information that could be included are:

- *work* to be done, and
- details of special requirements by *work party* (for example, hazard control measures, cross referencing of electrical access permits), and
- instructions to be observed, and
- a unique identifying number, and
- the date, and endorsement of the applicant, and
- time and date for anticipated start and finish of *access authority*, and
- the *work* location.

Application for *authority to work in the vicinity of electrical apparatus*

An application for an *authority to work in the vicinity of electrical apparatus* shall contain sufficient information to determine:

- *work* to be done (including details of *mobile plant*), and
- the *work* location and *work* area and access routes.

- Examples of information that could be included are:
- details of special requirements by *work* party (for example, cross-referencing to related *access authority* and instructions to be observed), and
- unique identification number, and
- date and endorsement of applicant, and
- time and date for start and finish.

Personal authorisations

Authorised persons shall be issued a written statement of their authority.

The statement shall contain:

- the type of authority, and
- any limitations or extensions on the type of authority, and
- the signature of the authorising officer, and
- the date of issue.

The statement could also contain:

- the duration or authorisation review date, and
- the date of reviews and competency tests, and
- signed statement of acknowledgment by the *authorised person*, and
- the knowledge and skill required for the authority, and
- a description and scope of duties the person is authorised to perform.

Authority to work in the vicinity of electrical apparatus

The details *shall contain*:

- form number, and
- location of *work*, and
- description of *work*, day, commencement date, and
- estimated day and date of completion, and
- instructions to be observed by the *work* party, and
- receipt, relinquishment and cancelling, and
- signatures, time, date of issue.

Clearance to place *electrical apparatus* into service (may also be overhead line clearance and underground *cable* clearance)

The details *shall contain*:

- description of the *electrical apparatus* being cleared, and
- expected commissioning date, and
- authority to place into service with signature and date from the construction authority, and
- authority to place into service with signature and date from the testing authority, and
- statement that all construction persons are clear and will treat the apparatus as *Live* and provision for construction persons to sign statement, and
- statement that all commissioning tests have been completed by the testing authority and
- provision for the testing authority to sign and date the statement, and
- statement that the apparatus has been accepted by the *operating authority* and
- provision for the *operating authority* to sign and date the statement.

The details could contain:

- drawing references, and
- description of *works*, and
- statement of when *works* are ready for general inspection.

Electrical access permit and sanction for testing

The details *shall contain*:

- form number, location, application number, cancellation due time and date, and
- location or *substation*, and
- sections for *electrical apparatus* covered, and
- condition of *electrical apparatus* (for sanction for testing) and precautions taken, and
- section for issue, title, time, date, issued by, and
- sections for receipt, relinquishment of test party, and
- section for condition of *electrical apparatus* on relinquishment of sanction for testing, and
- section for cancellation, signed, title, time, date.

The details could contain:

- section for telephone or radio issue, and
- additional sections for witnesses.

Statement of condition of apparatus/ plant (SCAP)

The details of the form *shall contain*:

- statement of certification of conditions of *electrical apparatus*, and
- sections for signatures of acceptance, relinquishment and cancellation, and
- area to record electrical access permits issued or to be issued if the SCAP is required to be part of the isolation conditions listed on the electrical access permit, and
- the following statement:

"This statement covers only the state of the electrical apparatus specified hereon and does not by itself authorise work on the electrical apparatus."

Bibliography

AS/NZS 1891 series Industrial fall-arrest systems and devices

AS/NZS 1892.5 Portable ladders – selection, safe use and care

AS/NZS 4024.1 series Safety of machinery

AS/NZS 4360 Risk management

AS60903 Live working – Electrical insulating gloves

AS/NZS IEC 61111 Live working – Electrical insulating mats

ENA Doc 001 National Electricity Network Safety Code

ENA Doc 025 Power System *Earthing* Guide (EG-0) Part 1: Management Principles

ENA Doc 042 National Guidelines for Manual Reclosing of *High voltage Electrical apparatus* Following a Fault Operation (Manual Reclose Guidelines)

ENA Doc 044 Guideline for *Energised Low Voltage Work*

ENA NENS 09 National Guideline for the Selection, Use and Maintenance of Personal Protection Equipment for Electrical Arc Hazards

IEC 60855-1 Ed. 2.0 Live working - Insulating Foam-Filled Tubes and Solid Rods Part 1: Tubes and rods of a circular cross-section

IEC 61230 Live working - Portable equipment for *earthing* or *earthing* and *short-circuiting*

IEC 61243-5 Ed. 1.0 Live working - Voltage Detectors – Part 5: Voltage detecting systems (VDS)

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