PowerWater

CORPORATE PROCEDURE

ACCESS TO HIGH VOLTAGE APPARATUS

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ACCESS TO HIGH VOLTAGE APPARATUS

1. PURPOSE

This *procedure* sets out the requirements for gaining access to *high voltage apparatus*.

2. SCOPE

This *procedure* covers *access* to *high voltage electrical apparatus* in *switchyard*s, switchrooms, cages, cables and overhead lines owned, controlled or operated by Power and Water.

3. REFERENCES

Power and Water Access to Apparatus Rules

Workplace Health & Safety Act 2009

Workplace Health and Safety Regulations 2008

4. ROLES AND RESPONSIBILITIES

4.1 Persons *shall* be appropriately authorised to enter *high voltage switchyard*s and *cage*s.

5. DEFINITIONS

5.1 ***Access authority*** - means any form of authorisation, which permits access to work on or test *apparatus*.

5.2 ***Apparatus*** - means *electrical apparatus* and mechanical apparatus.

5.3 ***Approved*** - means having appropriate organisation endorsement in writing.

5.4 ***Authorised person*** - means a competent person with technical knowledge or sufficient experience who has been *approved* to act on behalf of Power and Water to perform the duty concerned.

5.5 ***Cage*** - means a fully fenced or walled area, room or compartment, with a secured means of access, identified by a notice, containing *high voltage exposed conductors* which do not maintain *standard safety clearances*.

5.6 ***Conductor*** - means a wire, *cable* or form of metal designed for carrying electric current.

5.7 ***Controller*** - means the *approved* person responsible for control and/or operation of *apparatus,* confined spaces and high risk areas within premises owned, controlled or operated by Power and Water.

5.8 ***Designated high voltage access area*** - means an area, which includes *high voltage conductor*s, which is defined by a barrier or similar structure as a requirement for the issue of an *access authority*.

5.9 ***Electrical apparatus*** - means any electrical equipment, including electrical motors, transformers, switchgear, overhead lines and underground cables, the *conductor*s of which are *live* or can be made *live*.

5.10 ***Electrical operating work*** - means the operation of switching devices, links, fuses or other connections intended for ready removal or replacement, proving *conductor*s

de-energised the application or removal of earthing and short circuiting equipment and the application or removal of locks, where the facility exists, and/or tags.

5.11 ***Energised*** - means connected to a source of energy.

5.12 ***Exposed conductor*** - means a *conductor*, approach to which is not prevented by a barrier of rigid material or by insulation which is adequate under a relevant Australian Standard specification for the voltage concerned.

5.13 ***High voltage (HV)*** - means a nominal voltage exceeding 1000 volts alternating current or exceeding 1500 volts direct current.

5.14 ***In the vicinity*** - means either a situation where:

(a) a person is in close proximity to and there is a risk of either directly, or through any conducting medium, of unintentionally coming within relevant *safe approach distance*s to *live conductor*s; or

(b) there is a likelihood of unintentional contact with *apparatus* or services that could cause personal injury or damage.

5.15 ***Live*** - means *energised* or subject to hazardous induced or capacitive voltages.

5.16 ***Mobile plant*** - means a crane, elevating platform, tip-truck or similar plant, any equipment fitted with a jib or boom and any device capable of raising or lowering a load.

5.17 ***Preparation/restoration instruction (PRI)*** - means a documented instruction setting out the steps required to prepare the *apparatus* for access and to restore the *apparatus* after access has been relinquished.

5.18 ***Procedure*** - means the documentation of a systematic series of actions (or activities) directed to achieve a desired result.

5.19 ***Safe approach distance to live conductors*** - means the minimum separation in air from a *live exposed conductor* that *shall* be maintained by a person, or any object (other than insulated objects designed for contact with *live conductor*s) held by or in contact with that person.

5.20 ***Shall*** - means mandatory.

5.21 ***Should*** - means advisory or discretionary.

5.22 ***Standard safety clearances*** - means the clearances used in the design of *high voltage* installations to provide safe conditions from *high voltage exposed conductor*s for a person walking at ground level, or a person on any fixed ladder or platform.

5.23 ***Switchyard*** - an area identified by an *approved* sign(s) and surrounded by fences or walls that prevent unauthorised access inside which *high voltage exposed conductors* maintain standard safety clearances.

5.24 ***Totally enclosed electrical apparatus*** - means *electrical apparatus* within which the *conductor*s can only be exposed by unbolting or unlocking covers or opening shutters designed to prevent unintentional access.

6. RECORDS

Nil.

7. ATTACHMENTS

Nil.

8. PROCEDURES

8.1 Access to *high voltage switchyard*s, switchrooms and *cage*s

8.1.1 Personal entry to *switchyard*s and secured switchrooms

(a) To enter a *switchyard* or secured switchroom a person *shall* be:

(i) an *authorised person*;

(ii) specifically instructed by an *authorised person* to enter the area and is accompanied by an *authorised person*; or

(iii) instructed by an *authorised person* to enter the area and has been clearly instructed on the limits of the areas that may be entered, the hazards existing and the precautions that *shall* be observed.

(a) Persons entering *switchyard*s or secured switchrooms for other than *electrical operating work shall* notify the relevant area *controller* and advise:

(i) their name, service number and contact details i.e. mobile phone;

(ii) the number of persons entering;

(iii) the nature, and likely duration, of the entry; and

(iv) time of exit.

8.1.2 Personal entry to *cage*s

A person *shall* only enter a *cage* if:

(a) they are signed on an *access authority* for work or test in the *cage*; or

(b) they are *a* person authorised to carrying out *electrical operating work*; and

(i) the *high voltage conductors* within the *cage* have been *isolated*; or

(ii) they will not come within the relevant *safe approach distance*s to *high voltage exposed conductors*.

8.1.3 Gates and doors

(a) The gates or doors giving access to *switchyard*s, *cages* and secured switchrooms *shall* be kept locked closed at all times when not in immediate use.

(b) Gates, doors and access ways *shall* be kept free of obstruction to ensure ready access and exit in the case of emergency.

(c) Emergency exit doors *shall* have suitable signs affixed, such as, “Emergency Exit” or “Alarmed Emergency Exit” to indicate their usage. The signs *shall* be fitted to both the inside and outside of the emergency exit.

8.1.4 Access requirements for *mobile plant or* vehicles to *switchyard*s

(a) An *authorised person* admitting a vehicle or item of *mobile plant shall* ensure that its operation is appropriately supervised at all times while it is within the *switchyard*.

(b) *Mobile plant or* excavators are to be *earthed* when working within 8 metres of *high voltage exposed conductors*. This is in addition to the requirements of any Legislation, codes of practice or guidelines, including the need for a *safety observer*.

8.1.5 *Electrical operating work* in *switchyard*s and switchrooms

When entering *switchyard*s and switchrooms for the purposes of carrying out *electrical operating work* the *authorised person shall*:

(a) notify the relevant *controller* of their entry;

(b) provide the area *controller* with the *preparation/restoration instruction* (*PRI*) number and step/s to be attended to at the *switchyard* or switchroom;

(c) wait on permission from the *controller* to proceed;

(d) advise the *controller* on completion of the *PRI* steps indicated;

(e) advise the area *controller* when leaving the *switchyard* or switchroom and secure all access doors and gates.

8.2 Access for work or test on *live electrical apparatus*

8.2.1 Work or test on *live high voltage apparatus* in a *switchyard* or *cage*

(a) Work or test that brings any person within the *safe approach distances* of *exposed conductors* of *high voltage apparatus* in a *switchyard* or *cage shall* have the *conductors* isolated, proved de-energised and earthed and a *designated high voltage access area* erected to identify the *conductors* that can be worked on or tested prior to the issue of an *access authority*.

(b) This *procedure* recognises "barrier in", i.e. the *high voltage conductors* to be work on or tested are inside a defined area (see figure 8.2.1.1) and "barrier out", i.e. the *high voltage conductors* to be work on or tested are not inside a clearly defined area but alternatively all other *live electrical apparatus* in the immediate area of the conductors to be worked on or tested are enclosed by a barrier or barriers *(*see Figures 8.2.1.2).

(c) There may be situations where one method is preferred to the other, which may be due to the configuration of the *apparatus* rendering the application of the other method inappropriate. Where a *designated high voltage access area* is to be erected, the method used *should* achieve the best safety outcomes taking into account relevant hazards and associated risks.

(d) In respect to the erection of a *designated high voltage access area* this *procedure* recommends the "barrier in" method as the preferred method for the erection of a *designated high voltage access area.* This preference is due in part to the reason that the entrance to the *designated high voltage access area* can be clearly defined and access to and from the area can be readily controlled.

(e) Where the application of the one "barrier" method is deemed mandatory for access to certain *electrical apparatus,* measures *shall* be taken to ensure the mandated method is always implemented, for example, a notation on the *preparation/restoration instruction* and/or the application of *approved* work instructions.

Figure 8.2.1.1 *Designated high voltage access area* – "Barrier in" method

Figure 8.2.1.1 *Designated high voltage access area* – "Barrier out" method

8.2.2 *Designated high voltage access area* – "Barrier in" method

(a) Where the "barrier in" method for the erection of a *designated high voltage access area* is used the following requirements *shall* apply:

(i) Red with black writing 'DANGER HIGH VOLTAGE KEEP OUT' *shall* be used to define the area where *high voltage conductors* have been made safe for work or test. The tape used for defining *designated high voltage access areas shall* not be used for any other purpose.

(ii) In establishing a *designated high voltage access area* the *authorised person* may use any fixed structure to form part of this perimeter, e.g.

fences, walls, fixed barriers. The *authorised person* may use stands to support the tape defining the *designated high voltage access area*.

(iii) Where doors, gates or entranceways of fixed structures are used to form part of the perimeter of a *designated high voltage access area* they *shall* be securely locked and/or taped across with Red with black writing 'DANGER HIGH VOLTAGE KEEP OUT' tape. *Switchyard* perimeter gates are not to be used to define the entrance to a *designated high voltage access area*.

(iv) Each *designated high voltage access area shall* have only one entrance which *should* be at least one (1) metre in length and one point five (1.5) metres in width. Gates or doors, other than the perimeter gates or doors, providing entry to a *switchyard* may be used to define an entrance to the *designated high voltage access area*.

(v) Red with black writing 'DANGER HIGH VOLTAGE KEEP OUT' tape used to define a *designated high voltage access area should* be between one (1) metre and one point two (1.2) metres in height and the entranceway *should* face the most likely direction from which the work party will approach. If the *switchyard* has separate *high voltage apparatus* enclosures or dividing fences that are at least one point two (1.2) metres in height, these may be included to form part of the barrier identifying the *designated high voltage access area*.

(vi) The *access authority* issued for work or test in the *designated high voltage access area shall* be displayed at the entrance to the *designated high voltage access area*.

(vii) Persons entering or leaving a *designated high voltage access area shall* use the established entrance.

(viii) The entrance to a *designated high voltage access area* is to remain open during work or test under an *access authority*.

(ix) The entrance to the *designated high voltage access area* is to be closed when work or test is not in progress, and the *access authority* removed from display at the entrance.

(x) If it is necessary to make a temporary additional entrance to a *designated high voltage access area* to permit the passage of plant or materials, precautions *shall* be taken to ensure that the safety of persons working under the *access authority* is maintained. As soon as the necessary movement has been completed the temporary entrance *shall* be closed to re-establish the *designated high voltage access area* to its original status.

(xi) Where it is possible for a person working or testing in the *designated high voltage access area* to move along a structure above ground level into the vicinity of *conductor*s which are *live,* notices "Live high voltage conductors above or beyond" *shall* be erected at applicable points.

(xii) Where *high voltage* testing equipment is used within a *designated high voltage access area*:

- a separate and distinctive blue and white striped barrier tape *shall* be used to designate the test equipment area;
- the test equipment area *shall* have only one entrance which *shall* be closed whilst testing is in progress; and

- during testing a caution sign *shall* be erected at the closed entrance of the test equipment area signifying that testing is in progress.

8.2.3 *Designated high voltage access area* – "Barrier out" method

(a) Where the "barrier out" method for the erection of a *designated high voltage access area* is used the following requirements *shall* apply:

(i) Red with black writing 'DANGER HIGH VOLTAGE KEEP OUT' *shall* be used to enclose *high voltage conductors* that may be *live* and are in the immediate area of the work or test to be conducted. The red and with black writing tape used for enclosing the *high voltage apparatus shall* not be used for any other purposes.

(ii) In establishing the *designated high voltage access area* the *authorised person* may use any fixed structure to form part of the area or areas to be enclosed, e.g. fences, walls, fixed barriers. The *authorised person* may use stands to support tape enclosing *high voltage apparatus*.

(iii) Red with black writing 'DANGER HIGH VOLTAGE KEEP OUT' barriers *should* be between one (1) metre and one point two (1.2) metres in height. If the *switchyard* has separate *high voltage apparatus* enclosures or dividing fences that are at least one point two (1.2) metres in height, these may be included to form part of the barrier.

(iv) Appropriate signage shall be affixed to, or adjacent to, enclosed *live high voltage conductors* to indicate the *high voltage conductors shall* be regarded as "*live*".

(v) The *access authority* issued for work or test *shall* be displayed at the point from which the work party would be expected to approach the *designated high voltage access area*.

(vi) When work or test is not in progress the *access authority shall* be removed from display at the point of expected entrance.

(vii) If it is necessary to alter the *designated high voltage access area* to permit the passage of plant or materials, precautions *shall* be taken to ensure that the safety of persons working under the *access authority* is maintained. As soon as the necessary movement has been completed the alteration to the *designated high voltage access area shall* be re-established to its original status.

(viii) Where it is possible for a person working or testing in the *designated high voltage access area* to move along a structure above ground level into the vicinity of *conductor*s which are *live,* notices "*Live high voltage conductor*s above or beyond" *shall* be erected at applicable points.

(ix) Where *high voltage* testing equipment is used within a *designated high voltage access area*:

- a separate and distinctive blue and white striped barrier tape *shall* be used to designate the test equipment area;
- the test equipment area *shall* have only one entrance which *shall* be closed whilst testing is in progress; and
- during testing a caution sign *shall* be erected at the closed entrance of the test equipment area signifying that testing is in progress.

8.2.4 Erection of a *designated high voltage access area* - Special circumstances

(a) Where a *designated high voltage access area* is required to be erected that is not specifically covered in this *procedure*, the *authorised person* required to erect the *designated high voltage access area shall:*

(i) consult with the *controller* on the configuration and appropriateness of the *designated high voltage access area* to be erected;

(ii) ensure that the person to receive the *access authority* for work or test is fully aware of and understands the existing special circumstances and the methods used to define the *designated high voltage access area*; and

(iii) document on the *access authority* the existing special circumstances.

8.2.5 Work or test on *live high voltage totally enclosed electrical apparatus*

(a) Where work or test is to be performed on *exposed conductors* of *high voltage* motors, transformers or switchboards the *conductor*s to be worked on or tested *shall be* clearly identified by the erection of a *designated high voltage access area* in accordance with clauses 8.2.2, 8.2.3 or 8.2.4 of this *procedure*.

8.2.6 Work or test on *live electrical apparatus* of overhead lines

(a) Where practicable, when overhead line work is to be performed on public land, Red with black writing 'DANGER HIGH VOLTAGE KEEP OUT' tape on self supporting stands *shall* be used to define the work area and to control traffic and non *authorised person*al access. Depending on the risk assessment, barricades or fences and appropriate signage may need to be erected.

(b) Where overhead line work is to be performed on private property, Red with black writing 'DANGER HIGH VOLTAGE KEEP OUT' tape on self supporting stands and appropriate signage *shall* be used to define the work area and to control non authorised access.

(c) On multi-circuit *high voltage* overhead line structures the *conductor*s that are to be regarded as *live shall* be identified as follows:

(i) coloured flags *shall* be draped from suitable points on multi-circuit overhead structures; and/or

(ii) fixed warning signs attached where it is possible to move along a structure into the vicinity of *conductor*s that *shall* be regarded as *live* and from which persons will need to keep clear.

8.2.7 Work or test on *high voltage cables*

(a) Areas of work or test on, or within the *safe approach distance*s of, the *exposed conductor*s of *live high voltage cables shall* be identified as *designated high voltage access areas*.

(b) Where it is necessary to perform identification and/or *conductor* phasing checks at *cable* terminations points the termination points *shall* be identified by *designated high voltage access areas*.

8.2.5 General requirements for work or test in *switchyard*s and switchrooms

When working within *switchyard*s and switchrooms, sound workshop practices *shall* be adopted. In particular, the following aspects *should* be noted:

(a) doors, panels or covers enclosing *live* equipment *shall* be kept closed except when work is being performed inside that enclosure;

(b) materials *shall* not be allowed to obstruct doorways, or passageways, hinder normal operations, work, or access to fire extinguishers, deluge showers, first aid kits where fitted, telephones, control switches or any operating equipment;

(c) long objects such as ladders, conduits and the like, *shall* be handled with great care near *live exposed conductor*s. Whenever possible, long objects *should* be carried by two people, holding the objects below *should*er height in a horizontal position and as close as practical to the ends of the object, so as to maintain maximum control;

(d) extreme care *shall* be taken when using portable radio and telephone *apparatus* with protruding whip aerials in areas containing exposed *live electrical apparatus*. At all times, persons *shall* ensure that no parts of this *apparatus* come closer than the *safe approach distance*s to *live exposed conductor*s;

(e) when *mobile plant* is being used within a *switchyard* and is capable of coming within twice the *safe approach distance* to *electrical apparatus*, the *mobile plant shall* be fitted with a trailing earth cable connected to the earth grid of the *switchyard*. The trailing earth must be capable of carrying the maximum prospective fault earth current of that *switchyard*. Additionally, a safety observer *shall* be appointed to observe the movement of the *mobile plant* and to give warning to the operator where the *mobile plant* may encroach on twice the *safe approach distance*;

(f) oil spills, or other liquid insulating fluid spills, *shall* be notified to the *controller* immediately and quickly and effectively contained to prevent oil escaping into surrounding areas, storm water drains or sewers. Spill refuse and contaminated cleaning materials *shall* be disposed of in accordance with approved environmental *procedure*s; and

(g) excavation work within a *switchyard shall* not be commenced until the location of all underground cables, earthing *conductor*s, ducts, etc *in the vicinity* of the proposed excavation have been positively identified.

8.2.6 Fire protection systems

(a) When carrying out work or tests on *electrical apparatus* with fixed fire protection systems, adequate precautions *shall* be taken to ensure the safety of personnel and equipment. Precautions may include isolation and tagging and/or making non-auto fire detection and extinguishing systems.

NOTE: Where any fixed fire protection system(s) is made inactive or non auto, the *controller shall* be notified prior to the deactivation of the system.

(b) On the completion of work or test, fixed fire detection and extinguishing systems, made non-auto prior to the work or test, *shall* be reset for auto operation in accordance with *procedure*s for each specific location and the *controller* notified immediately.