Electrical Safety Management Plan

For Employees and Contractors

Northern Territory Airports

Contents

Amendments

Contact for Inquiries

If you have any questions regarding this document contact:
The "Document Controller"

Name: Adam Renshaw
Designation: Engineer
Northern Territory Airports
PO Box 40996, Casuarina
Northern Territory 0811
Email: adam.renshaw@ntairports.com.au

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1. Introduction

1.1. Overview

This plan has been produced following a review of Northern Territory Electricity Reform Act 2000 and Regulations 2000 and NT Work Health and Safety Regulations 2011.

Northern Territory Airports (NTA) has a legal obligation under NT Work Health and Safety Act to manage risks to health and safety associated with electrical risks in the work place.

The Electrical Safety Management Plan (ESMP) applies to all Electrical Work. Electrical work means;

- The actual physical work of installing, maintaining, repairing, altering, removing or adding to an electrical installation or the supervising of that work.

Electrical Workers are defined as NTA employees and/or Electrical Contractors and Sub Contractors who are NT licenced Electrical Workers.

1.2. Objectives of Electrical Safety Management Plan

The ESMP specifies the minimum requirements for managing electrical risks for NTA employees and their contractors.

1.3. Northern Territory Airports Commitment to Electrical Safety

NTA is committed to:

- Ensuring that all work is tested and electrically safe.
- Maintaining a safe environment when Electrical Work is being conducted.
- Using only Electrical Workers who hold relevant and current licences and who are competent in carrying out the works.
- Maintaining the competency and skill of Electrical Workers at a high level.
- Ensuring that Electrical Workers have appropriate electrical safety equipment and resources to work safely.
- Monitoring and evaluating the work of Electrical Workers to ensure compliance with NTA standards and procedures.
- Auditing the ESMP to ensure continuous improvement.

2. Legal Requirements

2.1. Legislation

The following is a list of references that detail legal requirements for safely working on electrical equipment and installations in the Northern Territory.

NT Electricity Reform Act 2000
https://legislation.nt.gov.au/en/Legislation/ELECTRICITY-REFORM-ACT-2000

Electricity Reform Safety and Technical Regulations 2000
https://legislation.nt.gov.au/Legislation/ELECTRICITY-REFORM-SAFETY-AND-TECHNICAL-REGULATIONS-2000

Electrical Workers and Contractors Act 1978
https://legislation.nt.gov.au/en/Legislation/ELECTRICAL-WORKERS-AND-CONTRACTORS-ACT-1978

Electrical Workers and Contractors Regulations 1984
https://legislation.nt.gov.au/Legislation/ELECTRICAL-WORKERS-AND-CONTRACTORS-REGULATIONS-1984

Work Health and Safety (National Uniform Legislation) Regulations 2011
https://legislation.nt.gov.au/en/Legislation/WORK-HEALTH-AND-SAFETY-NATIONAL-UNIFORM-LEGISLATION-REGULATIONS-2011

2.2. Australian Standards

All Electrical Work shall be carried out in accordance with Australian Standard AS/NZS 3000 and any other Australian Standard called up by AS 3000.

Electrical installations or electrical equipment shall not be connected to supply with any known defect.

2.3. Reference Documents

All Electrical Workers must have ready access to the NTA Standards, Electrical Legislation, Codes of Practice and Australian Standards.

Typically, the most relevant Australian Standards are:

- AS3000 - Wiring Rules.
- AS3008 - Electrical Installations - Selection of Cables.
- AS3012 – Electrical Installations – Construction and Demolition Sites
- AS3017 - Electrical Installations – Verification Guidelines.
- AS3760 - In-Service Safety Inspection and Testing of Electrical Equipment.
- AS4836 - Safe Working on or near Low Voltage Electrical Installations and Equipment.
- AS2067 – Substations and High Voltage Installations.
- AS61439 – Low Voltage Switchgear and Control gear Assemblies.

3. Electrical Safety

3.1. Safe System of Work

In order to minimise potentially fatal risks, Electrical Workers on NTA worksites shall adhere to the ESMP, project specific Work Health Management Plans, related NTA OHS management system and Northern Territory Electrical Legislation, Codes of Practice and Australian Standards.

3.2. Adherence to Health & Safety Policy

All Electrical Workers must comply with the NTA Health and Safety Policies & procedures.

To achieve this NTA will:

- Develop an ESMP which incorporates an Electrical Safe System of Work.
- Provide appropriate training to ensure all work is electrically safe.
- Ensure Electrical Workers are appropriately licenced.
- Ensure appropriate electrical supervision of all Electrical Workers. This will be achieved by ensuring each Electrical Worker has a nominated Electrical Supervisor for their Electrical Work.
- Energised electrical work is generally prohibited unless one or more of the exceptions under the WHS Regulations applies.
- Ensure all tools and safety equipment are regularly tested and examined to enable all work to be completed in a safe manner.
- Records of all tested and examined tools and safety equipment undertaken will be maintained.
- Provide and instruct Electrical Workers in the correct use and maintenance of Personal Protective Equipment (PPE).
- Report all notifiable incidents to NT WorkSafe.

3.3. Basic Electrical Safety Principle

A person engaging or preparing to engage in on or near electricity infrastructure or an electrical installation must treat exposed conductors as live until they are –

- Isolated from all sources of electricity supply and proven to be de-energized
- If they are high voltage conductors, they must also be earthed.

A person shall not supervise or perform electrical work unless they are the holder of a current NT electrical licence appropriate for the work they are performing.

3.4. Incident reporting

An electrical incident means an accident:

- that results from a sudden discharge of electricity or that otherwise has, or is likely to have, an electrical origin; and
- that causes, or is likely to cause, danger to life, a shock or injury to a person or loss of or damage to property.

Therefore, electrical incidents include electric shocks, electrical injuries, fatalities, incidents that cause danger to life or loss or damage to property (for example damage due to fire or over/under voltage).

All electrical incidents shall be reported to;

- Workers direct supervisor and then escalated through the chain of command.

- NTA Health & Safety Manager
- All electrical shocks and injuries from electrical work are notifiable incidents and shall be reported to NT Worksafe through the NTA Health & Safety Manager.

All persons who have experienced any form of electric shock shall be reviewed by an ambulance paramedic or attend a Medical Practitioner immediately after the incident.

The injured person shall be accompanied at all times to the medical practitioner, by a Workplace First Aid Officer when available or the injured person's Manager or their representative.

An electric shock shall be reported to the Electrical Worker's Manager immediately and, where applicable, the area isolated and made safe as far as practicable to allow incident investigation.

3.5. Risk Assessments

All Electrical Workers associated with and who perform Electrical Work must be provided with Risk Assessment training.

A Risk Assessment is to be conducted for all electrical works – installation, maintenance and defect repair. This is a mandatory Northern Territory WHS legislative requirement.

The Risk Assessment process will adhere to all relevant Northern Territory Codes of Practice, Relevant Standards and Legislation and can also be used for maintenance or repair work.

The Risk Assessment may identify the need for a Safe Work Method Statement (SWMS) for high risk tasks. An existing SWMS may be used, but it must be reviewed to ensure it is appropriate for the work. Where there is no formal SWMS available that is appropriate for the Electrical Work being undertaken, a written safe work procedure shall be followed to identify the basic logical sequence of the tasks, associated hazards, level of risk, and appropriate control measures to be implemented prior to commencement of work, and will be monitored for effectiveness.

The Risk Assessment process shall be conducted in accordance with Australian Standard AS 4836 Safe Working on Low Voltage Electrical Installations.

3.6. Controlling the Risks

The application of control measures is the process of considering each hazard and by using the Hierarchy of Controls as per the following table. The aim is to eliminate or reduce the potential hazard. The hierarchy ranks control measures from the highest level of protection and reliability to the lowest.

Table 1 Hierarchy of Controls

Hierarchy of Controls	Meaning
Elimination	Remove the hazard
Substitution	Use an alternative
Isolation	Isolate people from the hazard
Engineering	Adapt tools and equipment to reduce the risk
Administration	Change work practice
Personal Protective Equipment (PPE)	Gloves, glasses, hearing protection etc.

You must always aim to eliminate the risk. For example, you can eliminate significant electrical risks by designing-in or designing-out certain features to eliminate hazards and working de-energised rather than energised. That is why the WHS Regulations prohibit energised electrical work subject to certain exceptions.

If eliminating the hazards and associated risks is not reasonably practicable, you must minimise the risk by one or more of the following:

- Substitution—minimise the risk by substituting or replacing a hazard or hazardous work practice with something that gives rise to a lesser risk. For example, it may be reasonably practicable to use extra-low voltage electrical equipment such as a battery-operated tool rather than a tool that is plugged in to mains electricity.
- Isolation—minimise the risk by isolating or separating the hazard or hazardous work practice from any person exposed to it. For example, it may not be reasonably practicable to eliminate energised electrical work altogether; however, even if it is necessary (for one of the legally permissible reasons) to work on an energised electrical part, it may be possible to de-energise the surrounding parts.
- Engineering controls—engineering controls are physical control measures to minimise risk. For example, insulation, guarding, and installing RCDs to prevent electric shock.

If risk remains, it must be minimised by implementing administrative controls, so far as is reasonably practicable. Administrative controls involve the use of safe work practices to control the risk, for example by providing suitable and adequate training; establishing exclusion zones; and use of permits and warning signs.

Any remaining risk must be minimised with suitable personal protective equipment (PPE), for example protective eyewear, insulated gloves, hard hats, aprons and breathing protection. The PPE should be rated for the work to be done. If working on energised equipment, the PPE must be able to protect the user from the maximum expected energy available at the work site.

4. Supervision

4.1. Requirements for Electrical Workers

Electrical Workers shall fulfil their obligations under the Northern Territory's current legislation by:

- All Electrical Workers must hold a current NT Electrical Licence.
- All Electrical Workers must be inducted prior to commencement of work on NTA precincts. Details of the induction process are available on NTA websites.
- Complying with NTA instructions and ensuring that all Electrical Work is electrically safe.
- Using Personal Protective Equipment (PPE), instruments, tools and safety equipment to complete all work in a safe manner and in compliance with legislative requirements.
- Adopting a "test before touch" approach and treating all conductors and equipment as live until proven otherwise.
- Not wilfully interfering or misusing anything that may create an unsafe situation for themselves and others.
- Reporting all incidents to their supervisor and the NTA Health & Safety Manager.

4.2. Electrical Workers Supervision

All NTA Electrical Workers shall, for all Electrical Work, report to a nominated Electrical Supervisor.

Electrical Workers will only be supervised by persons who have at least the same level of Electrical Licence. A nominated Electrical Supervisor must be:

- A qualified and NT licenced Electrical Worker, or
- An Electrical Engineer supervising electrical work as part of practising their profession, or
- An Electrical nominee or NT Electrical Contractors licence holder.

4.3. Requirements for Electrical Supervisors

The Electrical Supervisor is to ensure that Electrical Workers in their charge are performing their duties in a safe manner.

It is the responsibility of the Electrical Supervisor to ensure that all Electrical Workers in their charge comply with the ESMP by ensuring that:

- Electrical Workers are licenced and competent to carry out their allocated duties.
- All work is carried out in an electrically safe manner and that a risk assessment or SWMS has been completed for all Electrical Work and reviewed by all persons.
- All electrical work is authorised and relevant NTA permits are submitted and approved by an authorised NTA employee before work commences.
- Work complies with the appropriate standards, and the correct electrical tests have been performed and documented.
- Where appropriate that compliance testing has been completed and a Certificate of Compliance has been issued.
- That compliance test results are attached to the Certificate of Compliance as proof of testing.
- Mandatory tests can include earth continuity, insulation resistance, polarity, RCD testing and correct circuit connections.

4.4. Contractor Supervision

NTA Contract Managers/Supervisors, Project Managers/Supervisors, Site Supervisors and/or Team Leaders must not directly supervise Electrical Work, unless they have the necessary and appropriate qualification as an Electrical Supervisor.

All contract managers, supervisors, project managers, site supervisors and/or team leaders who manage or administer electrical contractors, shall ensure that all electrical contractors in their charge comply with this ESMP, by ensuring that:

- The electrical contractor and their electrical workers are familiar with, and comply with, all aspects of this ESMP so they are able to carry out electrical work in the required manner including all required documentation.
- The electrical contractor verifies through documented and signed inspection & test plans (ITP's) that all electrical work is carried out in an electrically safe manner.
- All ITP are reviewed by an NTA Electrical Supervisor or Electrical Engineer.
- Certificates of Compliance are submitted at the completion of the electrical work.

4.5. Apprentice Supervision

NTA will comply with *The Electrical Workers and Contractors Act* requirements for supervision of apprentices who are performing Electrical work.

All NTA contractors who employ apprentices that work on NTA sites must be able to demonstrate their compliance with the Act.

All Apprentices, regardless of standard of training or trade, must be under the direct control of a nominated Electrical Supervisor or nominated Electrical Worker whilst performing Electrical Work. Direct control means knowledge of the person, where they are and what activity they are performing.

The level of supervision is dependent on the type of work and the level of experience of the apprentice. Table 2 below lists the level of supervision required and extracted from the Act.

For the purpose of apprentice supervision, the following is defined;

- **Direct supervision** in relation to electrical work, means the constant personal oversight of the work by a person licensed to perform the work himself without supervision.
- **General supervision** means the oversight or superintendence of electrical work by a person licensed to perform the work himself, without supervision, and according to the nature of the work and the competence of the person undertaking it, sufficient to ensure safe and satisfactory workmanship.

Table 2 Apprentice Supervision Requirements

Type of work	Apprentice/trainee year	Supervision required
New installations (not connected to electricity supply)	1st	Direct
	2nd	Direct / General
	3rd	General
	4th or final	General
Alternations and Additions (existing installations)	1st	Direct
	2nd	Direct
	3rd	Direct
	4th or final	General
Maintenance of Installations and Equipment	1st	Direct
	2nd	Direct
	3rd	General (under isolation permit system)
	4th or final	General
Workshop Tasks	1st	Direct
	2nd	General
	3rd	General
	4th or final	General
Live Work	1st	NOT permitted
	2nd	NOT permitted
	3rd	NOT permitted
	4th or final	Direct
Isolation of Installations and Equipment	1st	NOT permitted
	2nd	NOT permitted
	3rd	Direct
	4th or final	General

5. Low Voltage Electrical work

5.1. General

A person engaging or preparing to engage work on or near electricity infrastructure or an electrical installation must treat exposed conductors as live until they are –

- Isolated from all sources of electricity supply, proven to be de-energized and all isolation points are tagged as "Do Not Operate" and locked out where practical.
- Approved permit is issued to the work party.

Energised electrical work is generally prohibited unless one or more of the exceptions under the WHS Regulations applies.

5.2. Low Voltage Access Permit

All contractors are required to submit a Low Voltage Electrical Access/Isolation Permit for review and approval to gain authorisation to perform any LV electrical works on NTA premises. The permit must be approved by an NTA Authorised Electrical person.

Permits and relevant procedures are available on the Darwin International Airport website.

The Low Voltage Access permit requires the following information;

- Location of works
- Tennant/building owner if applicable
- Description of planned works
- Drawing or sketch of the works
- Isolation/equipment details

A risk assessment for the work shall be submitted for review.

5.3. NTA Employed Electrical Workers Requirements

NTA employed electrical workers regularly maintain and repair electrical installations and have callout responsibilities to ensure safe and reliable operation of NTA assets. NTA staff are not required to submit a Low Voltage Access permit for electrical works unless the works involve the following;

- Isolation of an MSB main switch greater than or equal to 800A.
- The electrical installation has more than one supply connection.
- Energised Electrical work.
- Where works will affect safety systems or aerodrome operations.

Isolation principles shall apply for all works.

5.4. Isolation principles

Work on de-energised equipment, which may involve work near adjacent energised conductors can only proceed if that part of the installation to be worked on is isolated and any exposed conductors in the immediate work area are either:

(a) de-energised and isolated

(b) separated by design or segregated and protected with insulated barricades or insulated shrouding or insulated material to prevent against inadvertent or direct contact.

Do not assume that electrical equipment is de-energised after isolation. Testing must be done prior to work commencing.

The following isolation principles apply to all electrical work.

5.4.1. Identification

It is necessary to clearly identify the electrical equipment to be worked on and the appropriate point of supply. Identification should include labelling that is both consistent and clear at the equipment to be worked on and at all points of possible isolation, for example at the control isolator and main point of supply.

5.4.2. Isolation

The electrical equipment to be worked on must be isolated from all sources of supply. Where isolation is achieved by a removable or rack out circuit breaker or combined fuse switch, if practicable it must be racked out or removed, then locked open and tagged.

Verification of the isolation is the responsibility of the electrical worker carrying out the work. When returning after being absent from the immediate work area, it is imperative that checks and tests are carried out to ensure that the electrical equipment being worked on is still isolated when you return, to safeguard against inadvertent reconnection by another person.

5.4.3. Securing the isolation – Locking off

All circuit breakers, switches and combined fuse switch units shall be locked off where possible by the electrical worker in charge of the works.

A wide range of devices are available for locking off electrical equipment. These include switches with a built-in lock, and lockouts for switches, circuit breakers, fuses and other types of electrical equipment. Also available are safety lockout jaws (sometimes called hasps) accommodating a number of padlocks. Only devices that incorporate a lock or can accommodate one or more padlocks are suitable lockout devices.

Where locking off facilities are not fitted, other control measures that prevent energisation of the electrical installation or equipment must be used. The control measures must be able to withstand any disrupting environment, for example, not becoming ineffective due to vibration.

Alternative controls may include:

- an additional component, such as a clip, screw, bolt or pin that will prevent the switch from being operated and used in conjunction with additional control measures such as danger tags, or permit system
- other means approved by NTA. i.e. Isolation may be secured by removing and tying back connections.

5.4.4. Tagging

A tag does not perform the isolation function but acts as a means of providing information to others at the workplace that the isolating device to which it is attached has been operated for a purpose.

Tags normally used are:

• Danger Tags/Do Not Operate: Danger tags are applied by electrical workers who will be working on electrical equipment. A danger tag on an isolating device is a warning that operation of that device may endanger the electrical worker who attached the tag.

• Out of Service Tags: An out of service tag is a notice that distinguishes electrical equipment out of operation for repairs or alteration, or electrical plant that is still being installed or commissioned. While an out of service tag is attached to electrical plant or equipment, it must not be operated.

Where practicable, appropriate tags should be placed at all points of isolation used to de-energise the equipment from all sources of supply, and the information provided thereon should be clearly understandable as to the purpose of the tag and include warnings for any abnormal hazards, for example, multiple points of supply.

Tags should be dated and signed by the electrical worker in charge of the works.

Tags should only be removed by the signatories or with the permission of all the signatories to the tags or, if this is not possible, by the signatories' immediate supervisor. In this circumstance, a thorough investigation of the worksite must be carried to verify all workers are safe before any tags are removed.

5.4.5. Testing

After the electrical circuits and equipment have been isolated, locked off and tagged, the circuits or equipment must be tested to verify all supply has been removed. Verification is carried out using approved test instruments before any electrical worker attempts to start work on the electrical circuit or equipment. All electrical circuits and equipment should be treated as energised (including the neutral conductor) unless proven to be de-energised. Any voltage tests should be conducted between all conductors and between all conductors and earth.

Test equipment must be "in test" date and be tested for correct operation immediately before use, and again after use, to confirm that the instrument is still working.

6. Low Voltage Energised Electrical Work

6.1. General

Energised electrical work or working live is electrical work where part of the electrical equipment being worked on is connected to electricity or energised.

Energised electrical work is prohibited unless;

- it is necessary in the interests of health and safety that the electrical work is carried out while the equipment is energised (for example, it may be necessary for life-saving equipment to remain energised and operating while electrical work is carried out on the equipment), or
- fault finding where it is necessary that the electrical equipment to be worked on is energised in order for the work to be carried out properly, or
- it is necessary for the purposes of testing to ensure the equipment is de-energised, or
- there is no reasonable alternative means of carrying out the work.

Important Note: Additional cost and/or commercial convenience is not accepted as a reason for Energised Electrical Work.

All Electrical Workers must comply with the following Energised Electrical Work procedures.

6.2. Risk Assessments

Energised electrical work is a high-risk construction activity. A Safe Work Method Statement (SWMS) shall be completed prior to the commencement of energised electrical work.

6.3. Low Voltage Access Permits

All Energised Electrical Work, other than testing and fault finding, performed by Electrical Workers will be in accordance with the **LV Access Permit** and that the permit must be completed and approved before the work commences.

Approval for energised electrical work will only be granted where there is no reasonable alternative.

6.4. Preliminary Steps

Access to Energised terminals, for the purpose of Energised Electrical Work, will be permitted only when:

- A Risk Assessment is conducted and approved by an NTA authorised person.
- Where required by risk assessment, a Safety observer is trained, and competent in CPR and LV rescue.
- A LV rescue kit is available, and all equipment is in 'in-test' date.
- The appropriate test equipment is tested and is in 'in-test' date.
- The appropriate PPE and Electrical Safety Equipment is used and is 'in-test' date. i.e. insulating gloves, and mats.
- No uninsulated hand tools or power tools are used.
- There is no direct contact with, or movement of, Energised conductors.

6.5. Safety Observer

A competent safety observer must be present when work is carried out on energised electrical equipment, unless the work consists only of testing and a risk assessment shows that there is no serious risk associated with the proposed work.

The role of the safety observer should be clearly communicated and understood. The safety observer must:

- be competent to implement the control measures in an emergency, and
- be competent to rescue and resuscitate the worker who is carrying out the work if necessary, and
- must have been assessed in the previous 12 months as competent to rescue and resuscitate a person.

The safety observer should:

- not carry out any other work or function that compromises their role, for example they should not be required to observe more than one task at a time
- be able to communicate quickly and effectively with the electrical worker(s) carrying out the work
- not have any known temporary or permanent disabilities that would adversely affect their role and performance.

6.6. Work position

While electrical work is being carried out on energised electrical equipment, all persons are prevented from inadvertently contacting an exposed energised component of the equipment. Electrical work should be carried out from a position that minimises the risk of inadvertent contact with exposed energised parts and the risk of an electric shock path being created. For example, safe work method statements should require, so far as is reasonably practicable, that electrical workers position themselves so that:

• an involuntary action like sneezing would not cause them to touch exposed energised parts.

• no electric shock path can be created due to working in an awkward position, for example, testing components towards the rear of a washing machine via the front panel.

7.Specific hazards and control measures

7.1. Inspection and testing portable electrical equipment

All portable electrical equipment requires testing to ensure the item is electrically safe. All tested electrical equipment must be fitted with a Test Tag that complies with Australian Standard AS 3760:2010 and details of the testing shall be recorded in the Electrical Equipment Register. The test tag and register should record;

- the name of the person who carried out the testing
- the date of the testing
- the outcome of the testing, and
- the date on which the next testing must be carried out.

Portable electrical equipment shall be inspected and tested at intervals based on the equipment environment and use (Table 4 AS3760:2010);

- 12 months - Environments where the equipment or supply flexible cord is subject to flexing in normal use OR is open to abuse i.e. Public areas, portable hand tools and extension leads.
- 5 years – Environments where the equipment or supply cord is NOT subject to flexing in normal use and is not open to abuse i.e computer and office equipment

Inspection and testing of electrical equipment must be carried out by a competent person. A competent person includes;

- a licensed electrician, or
- a person who has successfully completed a structured training course and been deemed competent in the use of a pass–fail type portable appliance tester and the visual inspection of electrical equipment.

7.2. Residual Current Devices

With the release of AS3000:2018 non portable/fixed Residual Current Devices (RCD) with a minimum residual current of 30 mA are required for final sub circuits, rated 32 A or less, that are supplying

- socket-outlets,
- lighting,
- direct-connected hand-held equipment, and
- direct-connected equipment that presents increased risk of electric shock.

NTA final sub circuits installed prior to 2018 may not have RCD protection installed. If the circuit is altered, repaired or the switch board is replaced an RCD shall be installed.

Fixed Residual Current Devices shall be inspected and tested at the following intervals (table 4 AS3760:2010);

- 6 monthly push button test.
- 12 monthly operating time and push button test - Environments where the equipment or supply flexible cord is subject to flexing in normal use OR is open to abuse i.e. Public areas, portable hand tools and extension leads.
- 2 yearly operating time and push button test - Environments where the equipment or supply cord is NOT subject to flexing in normal use and is not open to abuse i.e computer and office equipment.

7.3. Unsafe electrical equipment

It is the responsibility of every Electrical Worker to regularly examine all items of Electrical Safety Equipment that they are using, to ensure the equipment is 'in-test' date and is in an electrically safe condition for the work being carried out.

Electrical equipment is unsafe if there are reasonable grounds for believing it to be unsafe. Unsafe electrical equipment should be labelled with an "Out of Service" tag indicating it is unsafe and must not be used. This is to prevent inadvertent use before the electrical equipment has been tested, repaired or replaced.

All issued Electrical Safety Equipment must be recorded on the Electrical Equipment Register.

All Electrical Safety Equipment, including insulating gloves, crooks/rescue hooks and mats, must be tested at least annually or as per manufacturer guidelines. The next test date must be marked on each item.

7.4. Unsafe Electrical Installations

If an unsafe situation is discovered in an electrical installation the defect shall be reported and made electrically safe.

For tenancies the NTA property manager and the tenant shall be notified of the defect. Responsibility of the defect will be determined, and the defect will be made electrically safe.

If a defect cannot be made electrically safe, then the NTA Electrical Coordinator shall be notified to ensure appropriate action is taken to make the installation safe. Appropriate actions may include isolation/disconnection, barricading and/or signage.

All electrical defects that result in an electric shock or injury shall be reported to the NTA Safety advisor and NT Worksafe.

7.5. Personal Protective Equipment

All Electrical Workers will ensure that appropriate Personal Protective Equipment (PPE) is selected, used and maintained in accordance with current NT workplace safety legislation and Australian Standards.

Contractors and Sub-Contractors are to ensure their Electrical Workers have the appropriate Personal Protective Equipment (PPE) for the task performed and that the PPE is used and maintained in accordance with current NT workplace safety legislation and Australian Standards.

PPE for Electrical Workers will include a full length, ankle to wrist, uniform made of 100% cotton or flame-resistant material with no metal components when working on the following;

- Energised LV work,
- Work on electrical installations that are connected to a source of supply,
- HV switching, installation and maintenance works,
- Testing and fault-finding electrical installations,

It is the responsibility of every Electrical Worker to regularly examine their PPE to ensure it is in a satisfactory condition so that their work tasks can be safely completed.

7.6. Electrical Instrumentation

It is the responsibility of every Electrical Worker to regularly examine all items of Electrical Instrumentation they are using to ensure the Electrical Instrumentation is in-test date and is appropriate, being aware of High Fault Currents and in an Electrically Safe condition for the work being carried out. There are four categories of test equipment, however, for NTA, only Categories 3 and 4 are to be used.

Categories are:

Installation Category 3: Relates to the distribution level, main switchboards etc. This category of instrument may be used on a sub/board or a main switchboard that is not supplied directly from a transformer (Usually suitable for restricted class electrical licence holders).

Installation Category 4: Relates to the primary supply level and this is the only category of instrument that is to be used to identify voltage on a main switchboard supplied directly by a transformer (Minimum requirement for all electrical fitter mechanics, or open class electricians).

Electrical Instrumentation that is used for compliance testing, i.e., Certificates of Test (CoT) or Certificates of Compliance (CoC) must be tested and calibrated at minimum 12 monthly or as per the manufacturer's recommendations. The next test date shall be marked on each item.

NTA contractors shall provide calibration certificates if requested.

7.7. Hazardous Areas

Hazardous areas are areas where there may be a fire or explosion risk due to the possible presence of flammable gases, vapours and mists. Electrical equipment within the hazardous area must be suitably rated and effectively earthed to ensure risks are adequately controlled.

Wherever flammable liquids, vapours, gases and combustible dusts are used, stored, handled or generated, a hazardous area classification is required to assess the risk of fire and explosion. Where electrical equipment is located within a hazardous area classification zone, specific requirements are mandated in AS/NZS 60079.14 (Explosive atmospheres Design selection, erection and initial inspection) for the selection and installation of the electrical equipment.

Suitably trained and licenced personnel shall design and install electrical equipment in a hazardous area in accordance with relevant Northern Territory legislation and Australian Standards.

7.8. Working Near Overhead Services

NTA has overhead power lines at varying high voltage levels in a few locations. The overhead electrical services may be owned by Power Water Corporation or NTA. The following safe approach distances must be maintained for mobile plant and persons while working near overhead electrical services.

Table 3 Safe Approach Distances

Nominal Phase to Phase voltage	**Safe Approach Distances - Mobile plant and persons**
Above 1kV & up to & including 33kV	3000mm
Above 33kV & up to & including 66kV	4000mm

A written Risk Assessment must be submitted to NTA for approval before working near overhead services. If safe approach distances cannot be maintained, then NTA Engineering should be contact to risk assess the works and determine additional controls. If the overhead service is owned by Power Water Corporation the person responsible for the works will be directed to contact the Power Water Corporation to request authority to work in the vicinity of the apparatus.

7.9. Working Near Underground Services

NTA have low voltage, high voltage, communications, water, sewerage and drainage underground infrastructure. All excavation works at NTA require an excavation permit to be approved before works proceed.

NTA underground services are not registered with Dial before you Dig. The NTA Engineer shall be contacted for underground services plans/drawings.

Permits and relevant procedures are available on the Darwin International Airport website.

The applicant must complete a written Risk Assessment before any excavation work is approved. The Risk Assessment must include information from appropriate sources such as NTA drawings and Underground Service Locating Sub-Contractors. This information should include the following:

What underground electrical services are at or near excavation works.

Location of electrical services.

Type and depth of service.

Whether it is live, i.e. energised.

If works are within 2m of High Voltage services a High Voltage Access/Isolation permit must also be submitted for approval. The NTA Engineer will risk assess the works and apply additional controls if required.

7.10. High Voltage Electrical Work

All High Voltage work, including switching, maintenance, testing and installation or disconnection to a source of supply shall be carried out by suitably trained electrical workers that have been authorised by NTA. To be authorised to work on NTA High Voltage networks an electrical workers high voltage qualifications and/or statement of experience must be submitted to the NTA Engineer for review.

A register of authorised high voltage electrical workers will be maintained by the NTA Engineer.

An approved High Voltage access/isolation permit is required for all electrical works within 3m of exposed/bare high voltage conductors. If works are within 1m of exposed/bare conductors then the high voltage asset must be isolated, proven de-energised and earthed

Permits and relevant procedures are available on the Darwin International Airport website.

All high voltage installation and maintenance works shall have an approved inspection and test plan approved by NTA. The test results must be reviewed and approved by the NTA Engineer before a high voltage asset is commissioned or returned to service.

7.11. Aeronautical Ground Lighting

Aeronautical Ground Lighting (AGL) is the generic term used to describe the various lighting systems that are provided at an aerodrome for the guidance of pilots operating aircraft both at night and in low visibility conditions.

AGL installations are critical systems required for safe operation of an aerodrome. Only NTA authorised staff and contractors are permitted to perform maintenance, troubleshooting, and repair tasks. Basic Airfield Ground Lighting Course is mandatory for staff.

AGL primary circuits are powered by constant current regulators (CCR) to control the brightness of the airfield lights. AGL installations are high voltage circuits, the voltage will vary due to circuit length, brightness setting and condition of the circuit. All work on AGL circuits shall be completed with the CCR isolated and workers shall verify that the circuits are deenergised and discharged.

Installation, maintenance and repairs of the Darwin International Airport AGL system shall be compliant with the Department of Defence Aeronautical Ground Lighting Configuration Manual (AGLCM) – RAAF Base Darwin.

7.12. Solar Generation

NTA has multiple solar generation sites. A risk assessment and relevant LV Access permits must be completed for all maintenance and repair works on solar generation systems. The following hazards should be assessed and controlled for work on solar generation systems;

- High Direct Current (DC) voltages can be present on solar array circuits, up to 850V DC, during daylight hours. DC circuits current flow should be stopped at the inverter before isolating a circuit via an isolator/switch. Solar arrays will still supply an open circuit voltage and should be treated as live.
- Solar inverters have AC and DC connections and energy storage elements. Electrical work on inverters requires isolation of all voltage supplies and confirmation that capacitors are discharged, refer to specific manufacturer inverter model manuals for discharge times.
- Working at heights for roof top systems.

7.13. Batteries

A variety of NTA electrical installations have batteries, these are typically encountered in multiples of 12V cells. Larger battery systems are present in generators and UPS equipment. The following hazards should be assessed for work on battery systems;

- Battery systems often have exposed live terminals and can generate large currents if shorted. Where practical battery systems should be installed with insulation covers or within enclosures to prevent inadvertent short circuits.
- Many batteries generate hydrogen gas when being charged. Ventilation should be provided for large battery systems installed in enclosed spaces. There is a risk of explosion if not properly vented.
- Overcurrent protection – HRC fuses or double pole circuit breaker and battery cables must be rated for a fault current capacity equal to or exceeding the fault current of the battery system.
- Batteries used for starting diesel generators or other similar high current applications can explode when used. Personnel operating such equipment shall maintain a safe distance and wear suitable PPE as required.

7.14. Work on Cables (including cutting cables)

Work on cables, including cutting, the cables shall be isolated from supply and relevant LV Access or HV access permits in place.

Cables should only be cut by hand tools if the cable can be confirmed it is disconnected from supply. For LV cables the disconnection can be traced from the supply connection to the location of the cut.

Where a cable cannot be confirmed it is disconnected from supply, the cable shall be cut using a remotely operated hydraulic device or equivalent.

8. Quality Control

8.1. Testing of Electrical Work

All Electrical Work shall be tested to ensure it complies with legislative requirements and is electrically safe. Electrical testing shall be in accordance with Section 8 of Australian Standards AS/NZS 3000:2018 - Wiring Rules and AS/NZS 3017:2007 - Electrical Installations -Verification Guidelines.

Electrical test results shall be recorded on a separate Inspection and Test Plan (ITP) test record. Test results shall be attached to the Certificate of Compliance and/or the work request. The Electrical Worker who carried out testing and details of the test equipment used must be recorded with the test results.

8.2. Site Inspection Before Leaving

Before leaving the site, a visual inspection shall be conducted to ensure all cables have been correctly terminated and the installation and/or equipment and ancillaries are electrically safe.

All completed Electrical Work must comply with relevant standards and be in accordance with the tenant's and NTA's requirements.

8.3. Certificate of Test/Compliance

The Certificate of Test/Compliance must be issued to the tenant and the NTA Electrical coordinator following all Electrical Work. Where appropriate, photographic evidence showing workmanship, shall be attached.

The Certificate of Test/Compliance must be issued to NTA as the network operator, in accordance with the relevant Territory legislative requirements.

8.4. Audits

Audits will be conducted on a regular basis to ensure that the Electrical Work completed has been conducted in accordance with all relevant legislative and Australian Standards requirements.

The relevant Electrical Supervisor, Contract or Project Managers/Supervisors, Site Supervisor and or Team Leaders will be responsible to ensure ESMP compliance audits are conducted. Completed ESMP audits will be retained in the site NTA contract file.

The auditor must be a person who is electrically qualified, competent to assess the accuracy and relevance of company procedures and is familiar with electrical safety requirements. The auditor will understand the responsibilities of electrical contractors in accordance with current Territory Electrical Safety Legislation.

8.5. Control of Documents

All recommended changes to the ESMP and associated documentation will be reviewed through consultation with appropriately qualified personnel.

8.6. Control of Records

The following documents shall be retained as required:

- Certificate of test/compliance issued to the tenant and NTA
- ITP and electrical test result work orders/project file
- Record of tests on testing instruments
- Record of tests on safety equipment
- Safety, Competency and Procedure Audit Schedule
- Training records

9. Electrical Employee Training and Assessment

9.1. ESMP Training

ESMP training is provided to all Electrical Workers directly employed by NTA.

ESMP training is required for NTA Supervisors and Managers who have Electrical Workers or Electrical Contractors reporting to them.

Electrical Contractors are required to attend ESMP training within three months of commencement and are required to demonstrate compliance with the ESMP.

9.2. Training Requirements

Electrical Employee training requirements will be assessed annually and will include, as a minimum the following;

- ESMP training.
- Annual CPR refresher.
- Annual LV rescue.
- Basic airfield lighting course
- High Voltage operator training

Internal and external training will be made available to Electrical Employees to improve technical competencies and as required by any legislative changes.

9.3. Employees Electrical Licence renewals

An Electrical worker is required to provide evidence of skills maintenance as part of an electrical licence renewal. If the employee is unable to supply enough evidence, such as Certificates of Compliance that meets the requirements of the NT Electrical Workers and Contractors Licensing Board, the employee shall attend a Board approved refresher course by a Board approved Registered Training Organisation.

10. Definitions

Approval
Agreement is reached and must be documented.

Competent Person
A person, who has acquired, through training, qualification or experience or a combination of these, the knowledge and skill enabling that person to perform the required task correctly. Having acquired through training, qualifications and experience or a combination of these, the knowledge and skills to correctly perform the task required. (AS/NZS 4836, Section 1.6.3)

De-energized
Separated from all sources of supply, but not necessarily isolated, earthed or out of commission.

Direct supervision
In relation to electrical work, means the constant personal oversight of the work by a person licensed to perform the work himself without supervision.

Disconnected
Physically separated from any source of electrical energy, and where necessary insulated or secured in a position clear of any electrical equipment that is capable of being energized.

Electrical Supervisor
An agreed and nominated licensed Electrical Worker. This person assists in ensuring that the legislative electrical compliance obligations are being met.

Electrical Worker
A person engaged in the installation, maintenance, repair, alteration, testing or fault finding an electrical installation or the supervision of that work.

Energized
Connected to a source of electrical supply or subject to hazardous induced or capacitive voltages. (AS/NZS 4836, Section 1.6.11)

Exposed Conductors
A conductive part of electrical equipment that-

a) Can be touched with the standard test finger as specified in AS/NZS 3100; and
b) Is not a live part but can become live if basic insulation fails.

Extra Low Voltage (ELV)
voltage not exceeding 50 volts AC or 120 volts DC.

Fault Finding
The process of making measurements or carrying out tests on equipment to locate faults. It may also include the process of connecting testing instruments or devices to various parts of the equipment to determine how the equipment is operating. (AS/NZS 4836, Section 1.6.14)

General supervision
Means the oversight or superintendence of electrical work by a person licensed to perform the work himself, without supervision, and according to the nature of the work and the competence of the person undertaking it, sufficient to ensure safe and satisfactory workmanship.

Hazardous Area
An area in which an explosive atmosphere is present or may be expected to be present, in quantities that require special precautions, when working on electrical installations and equipment or using test equipment.

High Voltage (HV)
Voltage that exceeds 1000 volts AC or 1500 volts DC.

Incident
An actual or an apparently imminent occurrence of an event that endangers or threatens to endanger the safety or health of any person, or which destroys or damages or threatens to destroy or damage any property, or any other event or alarm that results in a response by the reporting authority.

Isolated (electrically)
Separated from all possible sources of electrical energy and rendered incapable of being energized unintentionally.

Live Work
Electrical Work performed in circumstances in which some or all the electrical equipment the subject of the Electrical Work is energized. This includes testing, however, a safety observer is not required for testing, unless a risk assessment finds that one is required.
Live work includes: Testing, tightening live or energized terminals, tracing cables through a live switchboard, vacuuming a switchboard, component removal or replacement or drilling a hole into a live or energized switchboard.

Low Voltage (LV)
Voltage that exceeds extra-low voltage (ELV), but not exceeding 1000V AC or 1500V DC.

On or Near
A situation where an electrical worker is working on or near exposed energized conductors or live conductive parts and there is a reasonable possibility that the electrical worker's body, or any conductive medium the electrical worker may be carrying or touching during the course of the work, may come closer to the exposed energised conductors or live conductive part than 500mm.

Personal Protective Equipment (PPE)
Safety clothing and equipment for specified circumstances or areas, where the nature of the work involved or the conditions under which people are working, requires its wearing or use for their personal protection to minimize risk.

Safe System of Work
For Live Work on a low voltage electrical installation, includes, but is
not limited to a system of work that complies with the provisions of AS/NZS 4836 (Safe Working on Low Voltage Electrical Installations) about ensuring the safety of persons while performing Live Work.

Safety Observer
A person whose has been specifically assigned the responsibility of observing and warning against the unsafe approach to electrical equipment, exposed energized conductors or live conductive parts and other potential risks.

Testing
The use of logical methodology or test instruments, or test equipment by a competent person. (AS/NZS 4836, Section 1.5.25)