

ELECTRICAL WORK

PURPOSE AND SCOPE

The intent of this document is to eliminate or minimise the risks of fatalities, injuries and incidents arising from all temporary and/or permanent electrical installations at Gamuda Australia (GA) projects / workplaces. This standard applies to all electrical work, including installation, testing, and commissioning.

CRITICAL CONTROLS

- Temporary and permanent electrical works are designed, installed, tested, and commissioned as per Australian Standards.
- Unless tested for dead, all wiring, conductors (including earth conductors), and equipment are to be treated as live.
- An appointed person in charge (electrical) is nominated and responsible for electrical works where the projects combined connected load meets or exceeds 1000kW and/or for high voltage works (Refer below).
- Personnel undertaking electrical work must be qualified/licensed electricians and authorised to perform the scope of work. (Refer below).
- Electrical work methodology consists of a process to ensure personnel are not exposed to inadvertently energised equipment.
- Electrical work must not be carried out on live electrical equipment and/or whilst the equipment is energised (subject to prescribed exceptions and circumstances).
- All circuits and powered equipment have RCD protection, where required.
- Switchboards are compliant and secured, including the area surrounding the switchboard
- All energy sources are clearly identified and marked.
- Live cabling is protected from mechanical (machinery and tools) damage.
- Work in and around electrical infrastructure is effectively managed.
- Prior to any electrical installation being energised, all testing documentation including a certificate of compliance for electrical work shall be completed and verified by an approved person/s
- All electrical work shall be risk assessed and controlled as per the hierarchy of control.
- An electrical safety management plan is in place for all electrical works.
- A high voltage safety management plan is in place for all high voltage works (>1000vAC or >1500v DC).

Note: The above controls are to be read in conjunction with the Regulations, Standards and Codes listed below.

APPOINTED PERSON IN CHARGE – ELECTRICAL

An Appointment Person in Charge will be required to oversee the electrical installation, maintenance, commissioning and operational activities on projects where the combined connected load meets or exceeds 1000kW and/or when high voltage is used. An Appointed Person in Charge is deemed competent to perform this role if they hold one of the following qualifications listed below.

- Electrical Trade License (specific for the state or territory)

- Qualified Electrical Engineer

The Project Director, in consultation with the Gamuda Electrical License Holder will formally appoint the nominated Appointed Person in Charge in writing for each project. The Appointment will be recorded using **GA-FRM-ELE-014 – Appointed Person in Charge – Electrical (Letter)**.

AUTHORISED ELECTRICAL WORKERS

Authorised electrical workers are GA employees or contractors that are authorised to undertake operations, maintenance and commissioning of electrical infrastructure at GA projects.

All authorised electrical workers are required to undertake the GA electrical worker induction. The induction provides an overview of GA electrical management plans and procedures, including an assessment to validate the electrical worker has the knowledge and skills to safely perform live testing, fault finding, isolations and/or commissioning.

The Appointed Person in Charge – Electrical (or delegate) is responsible for authorising all electrical Workers. A register of authorised electrical workers will be maintained for each project.

Authorised Electrical Workers are responsible for:

- Perform isolations in accordance with the site isolation procedures to ensure isolation points and devices are adequate, locked and signed or other precautions taken to stop the isolation point being accidentally closed prior to commencing electrical work.
- Isolate and test to prove de-energised before performing electrical work.
- Assist in the development and implementation of risk assessments and permits.
- Perform electrical work to comply with the AS/NZS 3000 Electrical Wiring Rules and/or AS/NZS 3012.
- Maintain training requirements and authorisations.
- Use electrical safety equipment that is suitable for the type of work being performed.
- Ensure electrical safety equipment is stored, tested, inspected, maintained and safe for use.
- Ensure any electrical work is tested to verify that it is electrically safe (to the extent of the impact of the work) and the test results are documented prior to energisation.

ELECTRICAL CONTRACTORS

Electrical contractors engaged for construction electrical work are not permitted to undertake any live commissioning, operation and/or live fault-finding activities. All isolations and commissioning activities must be undertaken using **GA-FRM-HSE-135 Permit to Isolate** and must be verified by an authorised electrical worker before work commences.

For projects where there is not a dedicated electrical team present, the permit to work authority shall revert to the Project / Construction Manager (or delegate) who shall be responsible for ensuring the methodology is in line with the **GA-PLN-ELE-001 Electrical Safety Management Plan** and subsequent methodologies.

Further information regarding commissioning of electrical equipment, refer to **GA-PLN-ELE-001 Electrical Safety Management Plan** and **GA-MSP-ELE-002 Testing and Commissioning**.

ELECTRICAL SAFETY MANAGEMENT PLAN

The Project Director will ensure **GA-PLN-ELE-001 – Electrical Safety Management Plan (ESMP)** (or equivalent) is developed and implemented prior to the commencement of works.

The purpose of the Electrical Safety Management Plan is to define the minimum requirements to ensure the safety of all personnel operating or working in the vicinity of electrical equipment within Gamuda operations and projects.

HIGH VOLTAGE SAFETY MANAGEMENT PLAN

The Project Director will ensure **GA-PLN-ELE-002 – High Voltage Safety Management Plan (HVSMP)** (or equivalent) is developed and implemented prior to the commencement of works whereby the project involves high voltage and/or in accordance with the network providers requirements applicable to the state and/or territory.

The purpose of the High Voltage Safety Management Plan (HVSMP) is to define the minimum requirements to ensure the safety of all personnel operating on or working in the vicinity of high voltage electrical equipment within Gamuda operations and projects. These requirements are required for private high voltage networks or assets Gamuda are in control of operationally. Projects where the supply authority assets are present, the supply authority operational requirements will take precedence e.g. powerline relocation works under the charge of the supply authority.

PRESCRIBED EXCEPTIONS AND CIRCUMSTANCES

Electrical work must not be carried out on live or energised electrical equipment while the equipment, subject to prescribed exceptions and the following circumstances.

- Extra-low voltage supplied electrical equipment (unless it forms part of an electrical installation located in an area in which the atmosphere presents a risk to health and safety from fire or explosion)
- Electrical equipment that is or is part of an active impressed current cathodic protection system within the meaning of AS 2832
- automotive electrical work
- work carried out by electricity supply authorities on the electrical equipment including line-associated equipment, controlled or operated by the authority to transform, transmit or supply electricity
- electrical work carried out on life preservation or life-saving equipment which is to remain energised and operating while electrical work is carried out, or
- electrical work being carried out on equipment which remains energised for the work to be carried out properly i.e. testing and commissioning, or
- where it is necessary for the purposes of testing to ensure the equipment is energised as required by Work Health and Safety Regulation 155, or
 - there is no reasonable alternative means of carrying out the work, and

- the work meets other requirements for carrying out energised electrical work

Before electrical work is carried out on electrical equipment the equipment is tested by a qualified electrician or person to determine whether it is energised or de-energised:

- Each exposed part is treated as energised until it is isolated and determined not to be energised, and each high-voltage exposed part is earthed after being de-energised
- Electrical equipment that has been de-energised to allow for electrical work to be carried out cannot be inadvertently re-energised. A Permit to Isolate and a lock-out and tag-out system must be in place and each person working on the isolated service must attach their own personal danger lock at the isolation point or lock box (where applicable).

ELECTRICAL INSTALLATIONS

Electrical installations will comply with AS/NZS 3000 – Electrical installations and AS/NZS 3012 – Electrical Installations – Construction and Demolition sites.

Electrical installations will be inspected and certified as correctly installed in accordance with AS/NZS 3017 – Electrical installations – Verification guidelines and relevant regulatory requirements specific to the jurisdiction where the work is being performed. This verification must be completed by a licenced electrical worker. GA will ensure that documented electrical certificates / handovers are provided.

Electrical certificates / handovers include temporary electrical installations such as temporary electrical switchboards and the establishment of temporary site offices, amenities, crib rooms or similar.

EARTH LEAKAGE PROTECTION

Earth leakage protection isolates the supply of electricity to protected circuits, socket outlets or electrical equipment in the event of a current flow to earth that exceeds a predetermined value. Earth leakage protection is achieved through the use of Residual Current Devices (RCDs). RCD's will be:

- Provided on all portable generators.
- Provided on all mains and sub-mains circuits.
- Provided on all wiring used for construction, with the construction wiring clearly marked.

Regularly tested by a competent worker in accordance with the requirements of AS/ NZS 3760 – Inservice safety inspection and testing of electrical equipment.

RCD's that have built-in test buttons and which are either individually portable or part of an extension lead, must be tested before each use to confirm the devices are operating effectively.

A record of testing (other than for daily testing of the portable RCD push-buttons) must be maintained and include the following;

- Date of the testing.
- Name and competency of the worker who conducted the testing.
- The outcome of the inspection, inclusive of trip time details.

RCDs found to not to be working, will be taken out of service immediately.

CONSTRUCTION WIRING

Construction wiring is a term used for electrical installations which supply temporary power to a construction site. It is normally intended to be removed once the construction work has finished and so will not be part of the permanent electrical installation. In addition to the control measures for electrical work, construction wiring will:

- Be installed and certified (as per AS/NZS 3012).
- Not be tied, bundled, or grouped with permanent wiring.
- Not be attached to free-standing fencing.
- Be protected by conduit or equivalent where this is a risk of mechanical damage.
- Be marked by attaching yellow “construction wiring” tape / signage at intervals not exceeding 5m.

REGULATIONS, STANDARDS AND CODES

- Work Health & Safety Regulation 2011 (QLD, ACT), 2012 (SA), 2017 (NSW, NT) and 2022 (WA); Chapter 4, Part 4.7 General electrical safety in workplaces and energized electrical work
- Electrical Safety Regulation 2013 (QLD)
- Occupational Health and Safety Regulations 2017 (Victoria) 3.5.39 Electrical plant and electrical hazards
- AS/NZS 3000 Electrical Wiring Rules
- AS/NZS 3012 Electrical Installation - Construction and Demolition Sites
- AS 1768 Lightning protection
- AS 2067 Sub-stations and high voltage installations exceeding 1kVa.c.
- AS/NZS 3017 Electrical installations - Verification Guidelines
- AS/NZS 3760 In-service Inspection and Testing of Electrical Equipment
- AS/NZS 3190 – Approval and test specifications – RCDs
- AS/NZS 2293 – Emergency escape lighting and exit signs for buildings
- AS/NZS 2790 – Electricity generating sets - Transportable
- AS/NZS 3008 – Electrical installations - Selection of Cables
- AS/NZS 3010 – Electrical installations - Generating sets
- AS 4024 – Safety of machinery
- AS/NZS 3007 Electrical installations – Surface Mines and Associated Processing Plant
- AS/NZS 1802 Reeling and trailing cables
- AS/NZS 1972 Cables other than reeling and trailing cables
- AS/NZS 2081 Electrical protection devices for mines and quarries
- AS/NZS 4240 Remote Control Systems for Mining Equipment
- AS/NZS 4871 Electrical equipment for mines and quarries
- AS/NZS 4836 Safe work on or near low voltage electrical installations and equipment
- AS IEC 61511 Functional safety
- AS 61508 Functional safety
- AS/NZS 62061 Functional safety
- SafeWork Australia Code of Practice Managing electrical risks at the workplace
- Queensland Code of Practice Managing electrical risks in the workplace
- NSW Code of Practice Managing electrical risks in the workplace

INTEGRATED MANAGEMENT SYSTEM
CRITICAL RISK STANDARD
ELECTRICAL SAFETY



- WA Code of Practice Safe Low Voltage Work Practices by Electricians
- Victoria Electrical installations on construction sites - Industry standard

FORMS AND CHECKLISTS

- **GA-PLN-ELE-001** – Electrical Safety Management Plan (ESMP)
- **GA-PLN-ELE-002** – High Voltage Safety Management Plan (HVSMP)
- **GA-MSP-ELE-002** – Testing and Commissioning of Electrical Systems
- **GA-FRM-ELE-014** – Appointed Person in Charge – Electrical (Letter)
- **GA-FRM-HSE-135** – Permit to Isolate