# TECHNICAL SPECIFICATION INTRODUCTION TO ELECTRICAL TECHNICAL SPECIFICATIONS

*TCC-TTS-SPEC-E001*

## Revision History

| Revision | Status | Prepared by | Reviewed by | Approved by | Date |
|---|---|---|---|---|---|
| 0 | Issued for Use | D Philipson | L Eastlake | T Laveti | 25/09/2025 |

# Contents

# 1. Introduction

## 1.1. Purpose

This document introduces the Electrical Specification Manuals (ESM) for Townsville City Council Electrical Projects and shall be read in conjunction with the Job Specification and other relevant documents to determine the full requirements for a particular project. It consists of 13 separate Specifications, one specification each for:

| | | |
|---|---|---|
| 1. | TCC-TTS-SPEC-E001 | Introduction (This document) |
| 2. | TCC-TTS-SPEC-E002 | Installation |
| 3. | TCC-TTS-SPEC-E003 | Electrical Design |
| 4. | TCC-TTS-SPEC-E004 | Electrical Switchboards |
| 5. | TCC-TTS-SPEC-E005 | HV Distribution (Under review) |
| 6. | TCC-TTS-SPEC-E006 | Auxiliary Power Supplies |
| 7. | TCC-TTS-SPEC-E007 | Motor Control Centres (MCC's) |
| 8. | TCC-TTS-SPEC-E008 | Electrical Instrumentation |
| 9. | TCC-TTS-SPEC-E009 | Control Systems |
| 10. | TCC-TTS-SPEC-E0010 | Electrical Services |
| 11. | TCC-TTS-SPEC-E0011 | Pumpstations |
| 12. | TCC-TTS-SPEC-E0012 | Preferred Equipment List |
| 13. | TCC-TTS-SPEC-E0013 | Templates and Documentation |

The intention of the ESM is to provide consistency in electrical design and installation requirements that will better enable council to fulfil its duties in the delivery and implementation of their electrical works.

Contractors shall comply with all requirements in this document and the referenced documents.

Townsville City Council makes no warranties, express or implied, that compliance with the contents of the ESM will be sufficient to ensure safe systems of work or operation.

Townsville City Council accepts no liability whatsoever in relation to the use of the ESM by any party, and Townsville City Council excludes any liability which arises in any manner by the use of this set of documents.

## 1.2. Scope

The present document establishes:

- General operating and environmental conditions for Townsville City Council sites
- General electrical requirements
- General Quality Assurance requirements

All documents in the ESM are continually being refined and represents the current preferred standard. However, Townsville City Council is always prepared to consider new developments that may offer advantages such as cost saving, improved control or reliability.

This specification covers the requirements for materials, the standard of workmanship to be employed in the construction, and the design of electrical equipment and installations, and instrumentation for use at TCC facilities.

This document is not a complete works specification. Additional project specific documentation will be required to fully detail the required works. This additional documentation will be called the Job Specification in this document.

A checklist is included as Appendix F of TCC-TTS-SPEC-E013 to provide guidance on the elements required to be covered under the Job Specification.

This specification should be read in conjunction with the Job Specification to determine the requirements for a particular project. Any conflict between this specification and the Job Specification should be referred to the TCC's Nominated Electrical Representative for clarification.

The following definitions shall apply in this document:

| | |
|---|---|
| **TCC Nominated Electrical Representative** | TCC position responsible for the standard of council's electrical infrastructure. Can also refer to their nominated delegate including electrical engineer, electrical technical officer or systems technical officer. |
| **Contractor** | Refers to the person or entity responsible for the supply of the Electrical installation as define within the contract. This can include a Developer, Consultant, Head Contractor, Electrical Contractor, switchboard manufacturer or equipment supplier. |
| **Job Specification** | A set of documentation to define the specific requirements for a particular installation. This can include standard specifications, project specifications, drawings, data sheets, schedules, catalogues, brochures and the like. |

While this specification represents the current preferred standards, Council is prepared to consider new developments that may offer advantages such as cost saving, improved control or reliability. Any such alternatives are to be submitted to the TCC's Nominated Electrical Representative for approval prior to inclusion.

## 1.3. Exceptions and Feedback

Should the Contractor propose any exceptions, deviations or variations from this specification or referenced documents, such variations shall be submitted in writing to the TCC Nominated Electrical Representative for approval.

If there exists a requirement that is unclear or ambiguous, the Contractor shall contact the TCC Nominated Electrical Representative for clarification and feedback.

# 2. Referenced Standards and Regulations

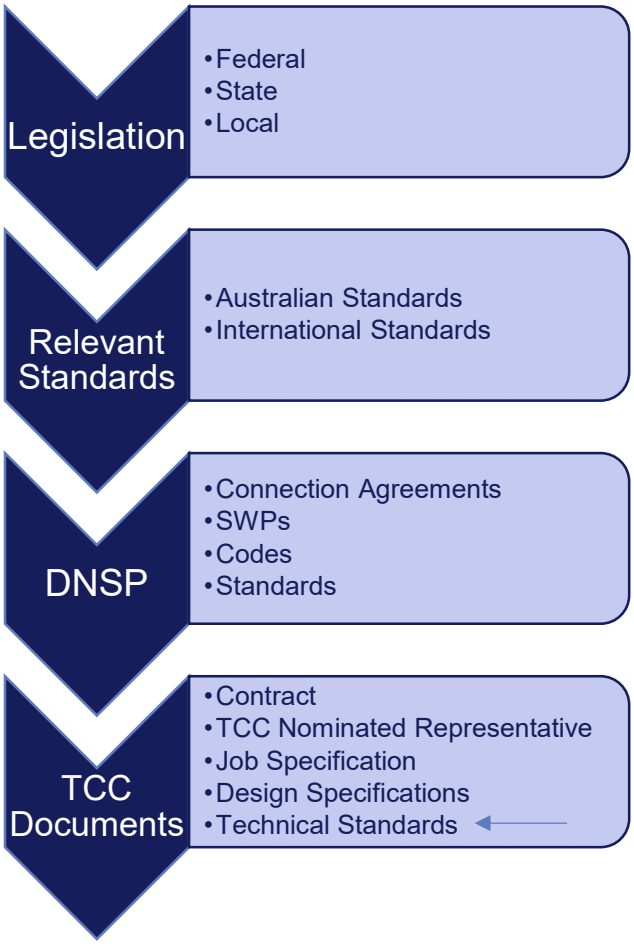
Design, materials and workmanship shall conform to the requirements of:

- Queensland legislation including the Electrical Safety Act and Code of Practices
- Supply Authority e.g., Ergon Energy
- Australian Communications and Media Authority (ACMA)
- Any other Authority having jurisdiction over the works
- All relevant Australian Standards
- Relevant IEC Standard or British Standard where no Australian Standard exists
- To the satisfaction of the TCC's TCC Nominated Electrical Representative

The Contractor shall be responsible for ensuring that all equipment and materials supplied are in complete accordance with the requirements of all relevant authorities and that all required approvals are obtained.

The following documents are referenced in this standard. Where a document is named without a specific version, the latest available version shall apply.

In order of precedence from top to bottom, the design, materials and workmanship of all electrical projects shall comply with the requirements of:



## 2.1. Australian Standards

Australian Standards listed are for general reference, indicating commonly referenced standards by the ESM:

| | |
|---|---|
| AS 1000 | The international system of units (SI) and its application |
| AS 1074 | Steel tubes and tubulars for ordinary service |
| AS 1100 | Technical drawing |
| AS 1101 | Graphical symbols for general engineering |
| AS 1102 | Graphical symbols for electrotechnical documentation |
| AS 1158 | Lighting for roads and public spaces |
| AS 1170 | Structural design actions |
| AS 1289 | Methods of testing soils for engineering purposes |
| AS 1319 | Safety signs for the occupational environment |
| AS 1345 | Identification of the contents of pipes, conduits and ducts |
| AS 1359 | Rotating electrical machines-General requirements |
| AS 1397 | Continuous hot-dip metallic coated steel sheet and strip - Coatings of zinc and zinc alloyed with aluminium and magnesium |
| AS 1603 | Automatic fire detection and alarm systems |
| AS 1657 | Fixed platforms, walkways, stairways and ladders - Design, construction and installation |
| AS 1668 | The use of ventilation and air conditioning in buildings |
| AS 1670 | Fire detection, warning, control and intercom systems - System design, installation and commissioning |
| AS 1680 | Interior Lighting |
| AS 1680 | Interior and workplace lighting |
| AS 1767 | Insulating liquids |
| AS 1768 | Lightning protection |
| AS 1851 | Routine service of fire protection systems and equipment |
| AS 1897 | Fasteners - Electroplated Coatings |
| AS 1931 | High-voltage test techniques |
| AS 1940 | The storage and handling of flammable and combustible liquid |
| AS 2053 | Conduits and fittings for electrical installations |
| AS 2067 | Substations and high voltage installations exceeding 1 kVac |
| AS 2118 | Automatic fire sprinkler systems |
| AS 2202 | Alarm and electronic security systems |
| AS 2293 | Emergency escape lighting and exit signs |
| AS 2293 | Emergency lighting and exit signs for buildings |
| AS 2381 | Electrical equipment for explosive gas atmospheres - Selection, installation and maintenance - General requirements |
| AS 2700 | Colour Standards for General Purposes |
| AS 2768 | Electrical insulating materials Evaluation and classification based on thermal endurance |
| AS 3000 | Electrical installations (Australian/New Zealand Wiring Rules.) |

| | |
|---|---|
| AS 3000 | Electrical installations (known as the Australian/New Zealand Wiring Rules) |
| AS 3008 | Selection of cables |
| AS 3008 | Electrical installations-Selection of cables |
| AS 3010 | Electrical installations-Generating sets |
| AS 3011 | Electrical installations secondary batteries installed in buildings |
| AS 3013 | Electrical installations classification of the fire and mechanical performance of wiring system elements |
| AS 3013 | Electrical installations-Classification of the fire and mechanical performance of wiring system elements |
| AS 3017 | Electrical installations - Verification guidelines |
| AS 3084 | Telecommunications installations -Telecommunications pathways and spaces for commercial buildings |
| AS 3085.1 | Telecommunications installations -Administration of communications cabling systems |
| AS 3439 | Low-voltage switchgear and control gear assemblies |
| AS 3702 | Item designation in electro-technology |
| AS 3731 | Stationary batteries-Nickel-cadmium |
| AS 3833 | The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers |
| AS 4024 | Safety of machinery |
| AS 4029 | Stationary batteries-Lead-acid |
| AS 4044 | Battery chargers for stationary batteries |
| AS 4070 | Recommended practices for protection of low voltage electrical installations and equipment in MEN systems from transient over voltages |
| AS 4214 | Gaseous fire-extinguishing systems |
| AS 4428 | Fire detection, warning, control and intercom systems - Control and indicating equipment |
| AS 4509 | Stand-alone Power Systems - Safety and Installation |
| AS 4594 | Internal Combustion Engines Performance |
| AS 4777 | Grid Connection of Energy Systems via Inverters Installation Requirements |
| AS 5000 | Electric cables - Polymeric insulated |
| AS 5033 | Installation and safety requirements for photovoltaic (PV) arrays |
| AS 5139 | Electrical installations - Safety of battery systems for use with power conversion equipment |
| AS 60034 | Rotating electrical machines |
| AS 60038 | Standard Voltages |
| AS 60079 | Explosive atmospheres |
| AS 60079 | Explosive atmospheres |
| AS 60204 | Safety of Machinery |
| AS 60269 | Low-voltage fuses |
| AS 60529 | Degrees of Protection provided by Enclosures |
| AS 60529 | Degrees of protection provided by enclosures (IP Code) |

| | |
|---|---|
| AS 60598 | Luminaires |
| AS 60896 | Stationary lead-acid batteries |
| AS 60947 | Low voltage switchgear and control gear |
| AS 61000 | Electromagnetic compatibility (EMC) |
| AS 61439 | Low voltage switchgear and control gear assemblies |
| AS 61800 | Adjustable speed electrical power drive systems |
| AS 62271 | High-voltage switchgear and control gear |
| AS 11801 | Information technology - Generic cabling for customer premises |
| AS/CA S008 | Requirements for customer cabling products |
| AS/CA S009 | Installation requirements for customer cabling (Wiring Rules) |
| NEMA V2 | Cable Tray Installation Guidelines |

## 2.2. International Standards

International Standards listed are for general reference, indicating commonly referenced standards by the ESM:

| | |
|---|---|
| CISPR 11 | Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement |
| ISO 3046.4 | Reciprocating internal combustion engines—Performance Part 4: Speed governing |
| IEC 60085 | Electrical insulation – Thermal evaluation and designation |

## 2.3. Legislation

| | |
|---|---|
| Queensland Government | Electrical Safety Act 2002 |
| Queensland Government | Electricity Act 1994 |
| Queensland Government | Electricity Regulation 2006 |
| Queensland Government | Professional Engineers Act 2002 |
| Queensland Government | Work Health and Safety Act 2011 |
| AEMC | National Electricity Rules |
| Ergon/Energex | Queensland Electricity Connection Manual |

# 3. Abbreviations and Definitions

## 3.1. Abbreviations

| Acronym | Definition |
|---|---|
| **AC** | Alternating Current |
| **AI** | Analogue Input |
| **AO** | Analogue Output |
| **BCA** | Building Code of Australia |
| **BESS** | Battery and Energy Storage Systems |
| **CB** | Circuit Breaker |
| **CHAZOP** | Control Hazardous and Operability |
| **CPU** | Central Processor Unit |
| **CT** | Current Transformer |
| **DC** | Direct Current |
| **DI** | Digital Input |
| **DO** | Digital Output |
| **DOL** | Direct Online |
| **DNSP** | Distribution Network Service Provider |
| **DS** | Design Specification |
| **EI&C** | Electrical Instrumentation & Control |
| **ELV** | Extra Low Voltage |
| **EMC** | Electromagnetic Compatibility |
| **ESM** | Electrical Specification Manual |
| **FAT** | Factory Acceptance Tests |
| **FD** | Functional Description |
| **FOBOT** | Fibre Optic Break Out Tray |
| **GPO** | General Purpose Outlet |
| **HAZOP** | Hazardous and Operability |
| **HMI** | Human Machine Interface |
| **HRC** | High Rupture Capacity |
| **HV** | High Voltage as defined in AS |
| **IO** | Input/Output |
| **ITP** | Inspection and Test Plan |
| **LED** | Light Emitting Diode |
| **LAN** | Local Area Network |
| **LCS** | Local Control Stations |
| **LV** | Low Voltage |
| **MCC** | Motor Control Centre |

| | |
|---|---|
| **MEN** | Multiple Earth Neutral |
| **MOV** | Metal Oxide Varistor |
| **MPR** | Motor Protection Relay |
| **N/C** | Normally Closed Contact |
| **N/O** | Normally Open Contact |
| **O&M** | Operation and Maintenance |
| **P&ID** | Piping & Instrumentation Diagram |
| **PID** | Proportional, Integral and Derivative control |
| **PFR** | Phase fail relay |
| **PLC** | Programmable Logic Controller |
| **PMU** | Power Monitoring Unit |
| **PSTN** | Public Switched Telephone Network |
| **PV** | Process Variable |
| **PVC** | Polyvinyl Chloride |
| **RCD** | Residual Current Device |
| **RPEQ** | Registered Professional Engineer of Queensland |
| **QA** | Quality Assurance |
| **RTU** | Remote Telemetry Unit |
| **SAT** | Site Acceptance Tests |
| **SCADA** | Supervisory Control and Data Acquisition |
| **SPD** | Surge Protection Device |
| **SRF** | Surge Reduction Filter |
| **TCC** | Townsville City Council |
| **THD** | Total Harmonic Distortion |
| **TOL** | Thermal Overload |
| **UPS** | Uninterruptible Power Supply |
| **VSD** | Variable Speed Drives |
| **VESDA®** | Proprietary Aspirating Smoke Detection System |
| **WAN** | Wide Area Network |

## 3.2. Definitions

| Term | Definition |
|---|---|
| **Connection** | A physical link between the Distribution System and the premises of the TCC site to allow the flow of electricity across the Connection Point. |
| **Connection Agreement** | Refers to the contract between TCC and the DNSP in respect of an agreement to carry out certain works to either establish or alter a Connection or an agreement for the provision of ongoing services |
| **Connection Point** | The physical point of supply or link where the electricity supply is transferred from DNSP assets to TCC assets at the TCC project site. |

| | |
|---|---|
| **Contractor** | A person or company who provides materials or labour to deliver a service for Townsville City Council. This includes Developers, Consultants, Electrical Contractors, equipment suppliers and consultants. |
| **Design Service Life** | The period for which an electrical equipment or installation shall be safely useable for its intended purpose with routine maintenance. No major repair shall be required within the stated period. |
| **Design Specification** | Design Specifications are documents in the ESM containing specific requirements for a repeatable application or situation. Example: |
| **Distribution Network** | TCC-TTS-SPEC-E011 Pumpstation Electrical Design-Requirements concerning the construction and design of electrical equipment for application in pumpstation design. |
| **Electrical Specification Manual** | Design specifications shall not contain requirements pertaining to a specific project or job. |
| **TCC Nominated Electrical Representative** | A network owned and operated by a Distribution Network Service Provider that is not a transmission network. |
| **Extra Low Voltage** | Not exceeding 50 Vac or 120 V ripple-free d.c. as defined in AS/NZS 3000 Clause 1.4.128 a) |
| **High Voltage** | Exceeding low voltage as defined in AS/NZS 3000 Clause 1.4.128 c) |
| **Informative** | For information and guidance only |
| **Job Specification** | A set of documentation to define the specific requirements for a particular job. This can include the Contract, standards, project specific specifications, drawings, data sheets, schedules, catalogues, brochures and the like. |
| **Low Voltage** | A voltage of greater than Extra Low Voltage and no more than 1,000Vac or 1,500Vdc as defined in AS/NZS 3000 Clause 1.4.128 b) |
| **Normative** | A term used to describe an element of a Standard to which it is necessary to conform in order to be able to claim conformance with the Specification. |
| **Principal Contractor (Principal)** | The Principal, who has entered into a Contract with the TCC, and may be the sole Contractor or the appointed company managing the construction of a project by appointing and overseeing sub-contractors to deliver different elements of a development or construction or supply of items under a contract arrangement. |
| **Technical Standard** | Technical standards are documents in the ESM that contain the minimum expected requirements by Townsville City Council for an electrotechnical domain. Example: |
| **Standard Drawing** | TCC-TTS-SPEC-E002 Electrical Installation-Requirements concerning the installation of electrical equipment by qualified tradespersons |

# 4. Terminology

In the Electrical Specification Manual:

- the word “shall” indicates a mandatory requirement that should be strictly followed to conform to the standard.
- the word “should” indicates a recommended or preferred requirement but not mandatory as other courses of action and options may be more suitable.
- the word “may” indicates a permissible course of action or option while still conforming to the standard.

# 5. General

## 5.1. Design Philosophy

The equipment shall be designed and constructed to:

- ensure safe, reliable and efficient operation
- withstand the electrical and mechanical loads, temperatures, pressures and vibration that will be encountered under normal service and under fault conditions
- ensure that operation or failure of any component does not cause damage to other equipment
- minimise electrical interference
- require the minimum of maintenance
- prevent the ingress of dust, moisture, vermin or other foreign matter
- facilitate safe cleaning, maintenance and repairs
- comply to all relevant Australian Standards

## 5.2. Regulatory Approval

It shall be the Contractor's responsibility for ensuring that all equipment and materials supplied are in complete accordance with the requirements of all relevant authorities and that all required approvals are obtained.

## 5.3. Liaise with Distribution Network Service Provider

The Contractor shall make all necessary arrangements and applications for the full permanent power to be available at the connection point before the start of commissioning. The Contractor shall prepare and submit to the TCC Nominated Electrical Representative any documents requiring the signature of the nominated representative.

The Contractor shall make all payments required to effect connections. Certified copies of all certificates required by the DNSP and other authorities having jurisdiction over the site shall be provided to the TCC Nominated Electrical Representative.

The Contractor will be held responsible for any consequential damage or loss resulting from a failure to comply with the above requirements.

## 5.4. Interruptions to Existing Electrical Supply

Where an existing supply is provided to a TCC installation that is still operational, the Contractor shall maintain electrical supply throughout the duration of the works.

Should it be necessary to interrupt electrical supply then written application shall be made to the

TCC Nominated Electrical Representative at least two weeks beforehand. This notification shall include a description of the works to be executed, the installation affected and the projected duration and timing of the interruption.

Interruptions to electrical supply are strictly at the discretion of the TCC Nominated Electrical Representative, and should the requested interruption not be possible, the Contractor shall reschedule the works to a time at which an interruption can be tolerated, at no additional cost.

## 5.5. Provision for Handling Equipment

All heavy parts of the plant supplied under the Contract shall have provision for lifting, slinging and handling during erection and overhaul or maintenance. All parts normally lifted during periods of maintenance and weighing greater than one tonne shall be marked with their weight.

Eyebolts shall be provided where necessary to facilitate handling and overhaul of the various parts of the plant.

The contractor shall provide all cranes, elevated work platforms, forklifts and handling equipment required for the works under this contract along with suitably trained and licensed operators for each item of handling equipment supplied.

## 5.6. Tools

The Contractor shall supply any special tools that may be necessary to complete the works under this contract. All special tools required for the mounting, disassembly, maintenance, and use of installed equipment shall be supplied to the TCC Nominated Electrical Representative in a purpose designed box or receptacle.

All supplied tools shall be new and unused.

## 5.7. Packing and Transport

All Equipment shall be carefully packed and secured for transport in such a manner that it is protected from all dust and climatic conditions during loading, transport, unloading and subsequent storage in the open.

Equipment shall be suitably packed and protected against vibration, movement and shock that may occur during loading and transport.

Heavy and bulky equipment shall be provided with adequate lifting fixtures to facilitate ready handling during transit and on arrival at site. Instruments, relays, and fragile items shall be packed separately.

The responsibility for safe delivery remains with the Contractor, and any damages will be repaired or replaced by the Contractor at the contractor's cost. All equipment supplied shall be clearly identified on the outside of any case with packing notes or order information plus the type and number of items contained therein and the gross weight.

## 5.8. Units of Measurement

Unless specified otherwise AS ISO 1000 (SI system) shall be used. Any clarifications can be directed to the TCC Nominated Electrical Representative.

## 5.9. Operating Conditions

The Contractor shall supply any special tools that may be necessary to complete the works under this

### 5.9.1. Design Life

Unless otherwise specified in the Job Specification, electrical installations and equipment shall meet the requirements for a design service life of 20 years.

### 5.9.2. Environmental Conditions

All equipment shall be suitable for operation in a tropical coastal environment.

Unless specified otherwise, the equipment will be required to operate continuously under the conditions listed in Table 5.1.

Table 5.1 Environmental Conditions and Limits

| Environmental Variable Name | Value |
|---|---|
| **Minimum ambient temperature** | 4°C |
| **Maximum ambient temperature** | 44°C |
| **Minimum relative humidity** | 33% |
| **Maximum relative humidity** | 100% |
| **Elevation** | Not exceeding 1000m |
| **Atmosphere** | Refer to Job Specification[1] |
| **Location** | Refer to Job Specification[1] |
| **Wind Loading** | Refer to Job Specification[1] |

[1] A corrosive environment is a location where H2S gas or other corrosive chemicals and gases can exist during normal operation and can be both indoor and outdoor areas. All council wastewater facilities are considered to be corrosive environments.

## 5.10. Service Conditions

All equipment supplied shall be of suitable construction, form, and function for the intended duty of the equipment.

Equipment in contact with process fluids shall be intrinsically suitable for the fluid at elevated temperatures, regardless of stated process temperature.

The stated equipment maximum operating temperature shall be more than the sum of the maximum ambient temperature stated in TCC-TTS-SPEC-E001 Section 5.9, equipment self-heating, equipment mutual heating, radiant heating from exposure to sunlight and the heating effects of elevated temperature process fluids.

If requested the Contractor shall supply calculations, to the satisfaction of TCC Nominated Electrical Representative, of expected temperature rise at equipment locations as a result of equipment losses, exposure to the sun and other factors.

Equipment installed in permanently cooled areas must be rated for operation under the atmospheric conditions stated above, such as would be encountered when air conditioning units are off-line.

## 5.11. Master Keying

All locks supplied under the terms of the contract shall be master keyed to the Townsville City Council master key system. The TCC Nominated Electrical Representative will provide details of this system upon request.

# 6. Corrosion Protection

All equipment and fixings shall be selected so that it is suitable for the corrosive effect of the environment in which it is installed. The equipment shall provide a service life of at least the periods nominated in the Job Specification without excessive maintenance.

Stainless steel components shall not be used in low oxygen environments that will prevent the formation of the protective chromate layer. Fixings shall be suitable for use with the base material of the component that is fixed, and shall consist of either:

- Stainless steel or
- Plated steel, with a plating thickness to suit the aggressiveness of the environment.

Where dissimilar metals are installed in moist or aggressive environments care shall be exercised to avoid the effects of galvanic corrosion. In this case the components shall be either inherently sealed from the environment, e.g., stainless steel electrically isolated from each other by separating them with either:

- A minimum 3mm air gap or
- A minimum 2mm of UV resistant, non-hygroscopic material such as rubber, PVC or polythene.

Welding of corrosion protected surfaces shall not be permitted unless specifically directed in the Job Specification. Stainless steel components shall be thoroughly passivated after welding or being subject to any process that creates an oxide layer.

# 7. Basis of Design

## 7.1. General

All parts of the Electrical Specification Manuals (ESM) should be used as the basis of design requirements for all TCC works. Design deviations will not be accepted without prior approval.

## 7.2. Standard Voltages

Unless specified otherwise, system voltages will be in accordance with AS 60038.

### 7.2.1. Low Voltage Supply

400V/230V 50Hz ±6% a.c.

### 7.2.2. Control Voltage Supplies

The control voltage will generally be 230Vac or 24Vdc In some cases, additional supplies of 24Vac, 24Vdc or 12Vdc may be required for specific equipment as stipulated in the Job Specification.

## 7.3. Earthing

Low Voltage and Control systems shall be arranged for a MEN earthing system (TN-C-S) in accordance with AS 3000 and DNSP requirements.

Refer to the Job Specification for High Voltage earthing requirements.

## 7.4. Metering

Where kWh metering is required, it shall be installed in strict compliance with the DNSP requirements. Refer to the DNSP Electricity Connection and Metering Manuals. Special attention is drawn to the requirements for:

- spacing/shielding meters from heavy current carrying conductors.
- mounting heights of meters (when the switchboard is installed on site)

For external switchboards, DNSP meters shall be housed in a section of the switchboard with access via a dedicated door that can be fitted with a DNSP padlock. A viewing window is not required.

When the main switchboard is located inside a building, the DNSP metering shall be located in a separate cubicle mounted in an external location accessible to the meter readers. The material of construction will be typically stainless steel. A proprietary type metering enclosure can be used. Refer to the Job Specification for details of meter locations and metering cubicle.

The required metering tariff will be specified in the Job Specification.

## 7.5. Power Factor

The minimum requirement for power factor is to comply with the terms of the Connection Agreement for the facility. Where economically viable however, it is preferred for power factor to be between 0.95-0.99 lagging.

Power factor correction equipment, if required, is to be installed in enclosures separate to the switchboard.

## 7.6. Harmonics

Electrical installations for Townsville City Council shall be designed to ensure that any distorting or fluctuating loads do not result in harmonic emissions or voltage regulation issues that are unacceptable to both the internal facility network and the Distribution Network.

Electrical systems shall comply with the requirements of AS/NZS 61000 series and, any voltage fluctuation emission or current harmonic emission limits imposed by the Connection Agreement.

Compliance shall be determined at the Connection Point or, the secondary terminals of the TCC facilities substation transformer.

Systems shall be constructed to withstand the short circuit stresses generated by the fault level stated in the Job Specification.

## 7.7. Fault Levels

If a fault level is not stated within the Job Specification, the fault level shall be calculated as the maximum possible fault level at the point of supply.

## 7.8. Arc Fault Considerations

All switchboards are to be designed and constructed to ensure reliable and safe operation and that maintenance activities can be performed safely. The design of the switchboard shall reduce the probability that an internal arcing fault can occur and, if one did occur, limit as far as practicable the harmful effects the arcing fault can cause. Switchboards shall be designed such that when the doors are closed, heated gases and pressure wave shall be directed away from persons in front of the switchboard.

Ideally the design of the switchboard shall limit the incident energy to < 1.2cal/cm2 within the working distance. It is acknowledged that this is not always practicable. Consult with TCC Nominated Electrical Representative in such cases to determine the final requirements.

A suitable warning label/s shall be fixed to the switchboard describing the arc flash risk, incident energy, arc flash boundary and the PPE requirements.

For switchboards rated at 800A or higher, the Job Specification will detail the requirements.

## 7.9. Hazardous Areas

The primary goal is to remove Hazardous Areas if possible. Secondary to this is to design such that no electrical equipment is placed within Hazardous Areas. Where these conditions cannot be meet, then:

- Preference for Intrinsically Safe Circuits where required.
- Ex e for motors, lights, junction boxes.
- Ex m for solenoid valves.
- Ex d in all other instances or where these mitigation techniques cannot be applied.

The Contractor shall comply with all the compulsory requirements of the current legislation and regulations. Particular attention should be given to Section 221 of the Electrical Safety Regulation 2013.

## 7.10. HV Equipment

The Contractor shall comply with all the compulsory requirements of the current legislation and regulations. Particular attention should be given to Section 221 of the Electrical Safety Regulation 2013.

## 7.11. Rating and Duty of Equipment

All equipment and systems shall be rated for the maximum duty as limited by the upstream protective devices. Where adjustable MCCBs are installed, the equipment shall be rated for the maximum possible settings on the device.

Enclosed compartments shall either be of the completely sealed type or furnished with sufficient ventilation to disperse condensation. All contactors, relay coils and other devices with working metallic parts exposed to the atmosphere shall be supplied with certified conformal coatings or other approved method of tropicalisation. All items must have appropriate IP ratings.

## 7.12. Lighting Design

The Contractor shall ensure that lighting for works complies with AS 60598, AS 1680, AS 2381 and Building Code of Australian.

Emergency and exit lighting designs shall comply with AS 2293 for all sites.

The work shall comply with the above standards, whether or not specific reference is made. Other particular standards relating to equipment and materials including relevant approval and tests specifications, not listed above, also apply to this sub-section.

Particular attention should be applied to emergency lighting and lighting for public spaces (AS 1158) as required.

Provide a RPEQ certified form 15 with the design as part of the drawing review submission.

## 7.13. Fire Protection

The Contractor shall detail specific methods employed to limit the risk, effects and spread of fire.

All electrical works shall comply with the appropriate standards and authorities relevant to fire detection. Where existing fire protection installation methods or systems have been damaged or removed during modification work, the contractor is to repair to the latest standards.

### 7.13.1. Certificate of Compliance

Forward to the Chief Officer of the local fire authority, with a copy to the TCC Nominated Electrical Representative, a certificate stating that the installed fire services system complies in full with the Codes and authority requirements. Provide it prior to practical completion and in the form required by the Authority.

### 7.13.2. Existing Protection

Ensure the existing fire alarm and protection system remains effective throughout the duration of the works, portions of the existing system only being disconnected when new systems for the area or function concerned are commissioned and ready to be connected.

### 7.13.3. Out of Hours Protection

Do not allow any portion of the building to be unprotected or because of ineffective alarms outside normal working hours.

# 8. Quality Assurance Requirements

## 8.1. General

The Quality Assurance requirements for electrical systems build on the QA requirements outlined in the Townsville City Plan Planning Scheme Policies.

The Contractor shall make good any damage to equipment or surface finishings occurred during installation such that repairs meet standards specified for that equipment.

## 8.2. Engineering Design

As defined in the Townsville City Plan Schedule 6.4.2.5 (1) (a); quality assured personnel for engineering must be a Registered Professional Engineer of Queensland as legislated by the Professional Engineers Act 2002.

To demonstrate compliance with the Professional Engineers Act all design documentation, drawings, calculations etc. that form a professional engineering service are to be certified by a Registered Professional Engineer Qld (RPEQ). To certify a document the RPEQ shall certify the document with their name, signature and RPEQ number. By doing so the RPEQ warrants that the documentation was prepared in compliance with the Professional Engineers Act and shall produce an installation that:

- Is safe to construct, operate and maintain
- Complies with applicable legislation and standards
- Complies with the project specification
- Is fit for purpose

RPEQ certification may be required at multiple stages of any given project including but not limited to:

- Design
- Inspections during construction
- Commissioning
- Final documentation

The Job Specification will detail the requirements for RPEQ certification.

Note that regardless of the requirement in the Job Specification, RPEQ certification may be required for other elements of the works to comply with legislative requirements, Codes of Practice, DNSP requirements etc.

## 8.3. Materials and Workmanship

### 8.3.1. Materials

All materials shall be new and of the best quality, manufactured and tested in accordance with the relevant Australian Standards.

Where a Job Specification requires existing equipment to be reused it shall be removed, tested, repaired, recertified and reinstated. The TCC Nominated Electrical Representative reserves the right to reject any materials, equipment or works if they deem it unacceptable for the intended duty or not undertaken in a workmanlike manner.

Repair of defective or rejected parts, materials or equipment shall not be permitted under any circumstances. Where available, vermin and fire-resistant equipment and parts shall be used.

### 8.3.2. Installation Personnel

All electrical work shall be performed by qualified electrical workers holding an appropriate certification/licence issued by the Electrical Safety Office, Queensland.

The person or firm responsible for the electrical work shall hold an Electrical Contractors Licence issued by the Electrical Safety Office, Queensland.

Installation shall also comply with the rules and regulations of the DNSP and the requirements of any other Authority having jurisdiction over the installation.

All certificates of compliance and registration are to be obtained by the Contractor in the TCC Nominated Electrical Representative name, at no cost to TCC.

## 8.4. Spare Parts

The Job Specification will detail what spare parts, if any, are required to be supplied as a deliverable.

## 8.5. Warranty

All equipment warranties, registrations etc. shall be made out in the name of Townsville City Council and submitted in accordance with the supplier's instructions. Copies of all documents are to be included in the hand-over documentation.

# 9. Appendix A - ESM Document Register

| Document No. | Rev. | Title |
|---|---|---|
| **TCC-TTS-SPEC-E001** | 0 | Introduction to Electrical Technical Standards |
| **TCC-TTS-SPEC-E002** | 0 | Electrical Installation |
| **TCC-TTS-SPEC-E003** | 0 | Electrical Design Documentation |
| **TCC-TTS-SPEC-E004** | 0 | Low Voltage Switchboards |
| **TCC-TTS-SPEC-E005** | 0 | High Voltage Distribution |
| **TCC-TTS-SPEC-E006** | 0 | Auxiliary Power Supplies |
| **TCC-TTS-SPEC-E007** | 0 | Motor Control Centres |
| **TCC-TTS-SPEC-E008** | 0 | Electrical Instrumentation |
| **TCC-TTS-SPEC-E009** | 0 | Control Systems |
| **TCC-TTS-SPEC-E010** | P4 | Electrical Services (Not released) |
| **TCC-TTS-SPEC-E011** | 0 | Pumpstation Electrical Design |
| **TCC-TTS-SPEC-E012** | 0 | Preferred Equipment List |
| **TCC-TTS-SPEC-E013** | 0 | Templates and Documents |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