TECHNICAL SPECIFICATION ELECTRICAL DESIGN AND DOCUMENTATION SPECIFICATION

TCC-TTS-SPEC-E003

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 covers the documentation expected for Townsville City Council electrotechnical projects.

1.2. Scope

The present document provides guidelines for design documentation expected at project phases including, but not limited to:

- Tendering;
- Design & engineering;
- Manufacturing;
- Testing;
- Commissioning; and,
- Maintenance.

This document does not cover contractual issues; it does not cover remedial actions in the event of a contractual dispute. In these cases, consult the Contract or contact the TCC Nominated Electrical Representative. for clarification.

1.3. Electrical Specification Manual

This document forms part of the Electrical Installation section of the TCC Electrical Specification Manual (ESM) and shall be read in conjunction with other documents in the ESM and the Job Specification to determine the requirements for a particular project.

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 documents referenced in TCC-TTS-SPEC-E001 Introduction to Technical Specifications, unless specified otherwise.

1.4. 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. General

The Designer shall use the following minimum engineering requirements as a guidance to develop their Electrical, Instrumentation & Control (EI&C) Systems Design. For any EI&C design item that has not been specifically mentioned in the following specification, the designer must seek further advice from TCC Nominated Electrical Representative before proceeding with design to ensure the design requirements are met.

The following basic design considerations must be included in the design of all electrical systems.

All such work will be carried out by competent, suitably experienced professional engineers.

All equipment specified will comply with the relevant Australian Standards and be available within Australia. Where specialist equipment is not available in Australia, the designer must seek further advice from TCC Nominated Electrical Representative. before proceeding.

2.1. Professional Engineering Services

In accordance with the Quality Assurance requirements of personnel listed in TCC-TTS-SPEC-E001.

2.2. Design Deliverables

Basic design deliverables shall generally include, but not be limited to:

- Load/Instrument/Equipment/IO Lists;
- Data sheets for instruments and other equipment;
- General design calculations;
- Cable sizing calculations;
- Cable schedules showing Size, type, route length, installation method, design load;
- Maximum demand/fault level calculations;
- Operating load calculations;
- Earthing study;
- Settings of protective devices;
- Parameter settings for soft starters/VSDs;
- Functional descriptions;
- HAZOP/CHAZOP and Risk Assessments;
- Safety in Design Report;
- Hazardous Area Classification;
- Factory Acceptance Testing;
- Commissioning Procedure;
- Site Acceptance Testing;
- O&M Manuals;
- Hazardous Area Dosier Development/Update;
- Detailed drawings;
- P&ID's; and,
- Drawings and calculations detailing the effectiveness of the proposed ventilation, prior to switchboard construction.

2.3. Calculations

All electrical calculations are to be verified either by manual review or with suitable software and certified by an RPEQ.

Software name and revision shall be supplied with all calculations not manually performed.

2.3.1. PLC/Controllers

PLC equipment shall only be used where complex control functions warrant. **The Job Specification will contain specific details if a PLC is required.**

Some dedicated pump controllers maybe permitted where multiple staged pumping is required, and the approval from the TCC Electrical Systems Team has been obtained.

PLC controls will not be accepted in telemetry sites as part of the TCC radio telemetry network unless written approval is received by the TCC Nominated Electrical Representative.

A minimum of one complete set of PLC documentation shall be supplied including a descriptive functional specification, hardware manuals and a full I/O listing (in spreadsheet format). The PLC code shall include adequate labels and comments to fully describe the function of the logic. The PLC and SCADA Tags will be based on the equipment and instrument tags detailed in the functional description, electrical schematics, and instrument P&IDs.

A backup copy of the as commissioned PLC code shall be provided in native format. This requirement would also apply where telemetry units, process relays or similar are used to perform control functions.

A list of required software including exact build or revision numbers of all programming software, firmware, etc. shall be supplied.

PLC code shall be accessible and able to be modified by TCC.

2.3.2. Telemetry Radio Path

When telemetry equipment is to be installed the contractor shall be required to undertake a radio path survey to verify the suitability of the signal path and determine the requirements for antenna selection and masting. The radio path would be a line of sight from the facility location to one of the radio repeaters in TCC's existing network. Contact TCC's TCC Nominated Electrical Representative to determine which radio repeater site is to be utilised.

An acceptable radio path would have a minimum fade margin of 25dB (with ALL attenuation and losses included). The Received Signal Strength Indication at the site is to be greater than -80dBm. If the signal is marginal, it may be possible to improve the signal using a higher gain antenna or increased antenna mast height. If an acceptable signal path cannot be established to the site, then the contractor must provide an acceptable alternative or may be required to contribute to the establishment of a new repeater site.

2.3.3. Communications Design Submissions

The Contractor shall submit the following information:

- System design parameters;
- System performance;
- Details of radio path and frequencies;
- Voice and/or data transfer rate;
- Cable type and characteristics;
- Coaxial Cable testing results including VSWR;
- Segregation requirements for EMI/EMR;
- Maximum length of cables;
- Telecommunications outlets;
- Cross-connect type and characteristics;
- Cross-connect layout;
- System warranty conditions and terms;
- Certify compliance with AS 11801; and,
- Shop drawings showing layouts of equipment racks, cable routes and sizes, and equipment location diagrams.

2.3.4. Electronic Security Design Submission

Prepare details of the work to be carried out including Working Drawings and Functional Control Descriptions.

Submit working details together with additional manufacturers information describing application, selection, performance, installation, maintenance and where applicable, trouble shooting to fully describe and detail the work to be done.

Prepare all drawings with appropriate CAD tools to comply with AS 1100 using competent and experienced drafters. Working drawings, suitably modified to show the actual work installed and complying with the requirements of Section "AS INSTALLED DRAWING", may be suitable for submission as drawings of work as installed.

Include at least the following on the working drawings:

- Floor Plans at scale not less than 1:100;
- Section of plant/ceiling spaces at scale not less than 1:50; and,
- Schematic diagrams of controls and wiring.

2.3.5. Electronic Security Certification

The services contractor shall be responsible for submitting design and installation compliance certification to demonstrate design compliance of the works in accordance with this specification, statutory requirements and required Australian Standards.

The following requirements shall be fulfilled:

- Form 15-A building design or specification will if installed or carried out under the certificate, comply with the relevant laws; and,
- Form 16-That an aspect of building work complies with the building approval and the relevant building laws.

2.3.6. Emergency Generator

Where a Job Specification calls for a permanent or temporary emergency generator installation, additional design information detailing the selection of a generator is to be provided. TCC-TTS-SPEC-E006 provides details of requirements.

In particular, kVA and fault current rating based on supplied loads shall be provided as a minimum.

2.3.7. Drawings

Technical drawings are to be prepared in general accordance with AS 1100.

Electrical schematics are to be prepared in accordance with AS 4383[1] and preferably be of horizontal orientation. Symbols are to be in accordance with AS 1102[1], designated as per AS 3702[1] and be complete with line number cross-references for coils and contacts. Cubicle construction drawings are to be prepared in accordance with AS 1101.

Drawings are to include provision for document number from TCC's document control system.

The drawings included in TCC-TTS-SPEC-E013 can be used as a guide for the standard of drafting required.

Equipment labelling is covered in TCC-TTS-SPEC-E002 Installation. The Drawings shall accurately show all assigned unique labels, tags and identifiers.

[1] It is noted that these Australian Standards have been withdrawn but are still used for reference.

The minimum set of drawings would include:

- Cubicle construction including dimensions, materials and hardware details;
- General arrangement showing equipment layout;
- Single line diagrams (including small power distribution);
- Detailed schematics (including vendor drawings if referenced);
- Instrumentation loop drawings (where applicable);
- Termination drawings;
- Cable block diagrams (where applicable); and,
- Underground conduit routes as per the QECM.

Workshop drawings and supporting documents are to be submitted to the TCC Nominated Electrical Representative, for review prior to manufacture.

2.3.8. Drawings Submissions

The Contractor shall allow a period of ten (10) working days in their program for review by TCC Nominated Electrical Representative.

Acceptance of documents by TCC is not a design check and does not relieve the Contractor of responsibility for compliance to specifications or safe function of the equipment; nor does it imply acceptance of any variation contained in the documents. Any variation must be clearly identified, and explicit acceptance obtained from TCC Nominated Electrical Representative – outside of the document review process.

Any changes made to the documents between submissions must be clearly identified (e.g., revision clouds on drawings).

Unless otherwise approved by the TCC Nominated Electrical Representative, existing drawing numbers are to be retained for any modification to existing equipment, switchboards or circuits.

After the completion of workshop construction & testing, the drawings shall be revised to "Issue for Construction" status and a copy forwarded to the TCC Nominated Electrical Representative prior to commencement of site installation & commissioning.

Once the site installation works are completed and commissioned the drawings shall be revised to "As-Built" status.

One hardcopy set is to be laminated and supplied suitable for keeping in the switchboard cubicle on site.

As built drawings shall also be supplied in electronic format as a vector file in `*.dwg` file format that can be edited in AutoCAD.

All x-refs, fonts, line types etc. used in the drawings shall be included. To assist with plotting of drawings `*.pcp` files shall also be included.

2.3.9. Operation and Maintenance Manuals

The Operation and Maintenance Manual (O&M Manual) shall include as a minimum the following:

- Contents page/index;
- Electrical schematics (enclosed in plastic envelopes);
- Switchboard equipment data;
- Controlled equipment schedule;
- Manufacturers literature for all equipment supplied (in English language);
- Listing of all settings/set points for all protective and control devices including, but not limited to timers, protection relays, process relays, soft starters, variable speed drives;
- Detailed OEM programming manuals (not brochures or quickstart guides);
- Firmware and configuration files;
- PLC documentation where applicable;
- Test results (workshop and site);
- RPEQ certification documents (if applicable);

- Equipment warranties;
- Circuit design data including, but not limited to, breaker protection selection, cable sizing;
- Electrical installation test results;
- Maintenance instructions for all equipment including a schedule for when maintenance tasks are to be carried out; and,
- Functional description of plant operation.

Draft O&M Manuals are to be submitted to the TCC Nominated Electrical Representative in electronic format for approval six (6) weeks prior to commissioning.

Within two (2) weeks of commissioning the manuals are to be revised to As-Constructed status and submitted for final approval. Practical Completion will not be granted until approved O&M Manuals have been received by the TCC Nominated Electrical Representative.

An electronic copy of the O&M manuals is to be provided. The electronic copy shall consist of *.pdf files, word processor documents and spreadsheets that can be opened with standard software programs such as Adobe Reader and Microsoft Office.

2.3.10. Warranties and Licenses

All equipment warranties, registrations, licenses, 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.

2.3.11. Switchboard Equipment Data

A detailed listing of all switchboard equipment shall be provided. The list shall be a spreadsheet file, editable with Microsoft Excel. The list shall be indexed by the equipment tag number and shall contain the manufacturer’s name, catalogue number and contact details and other information necessary to identify the equipment to permit replacement.

A detailed datasheet shall be provided for all electrical switchboards detailing all specifications as per AS61439.

A copy of the equipment list shall be included with the workshop drawings for initial review and shall be included in the O&M manuals.

2.3.12. Controlled Equipment Schedule

This schedule is a detailed listing of all electrical circuits supplied from the switchboard. The list shall be a spreadsheet file, editable with Microsoft Excel. The list shall provide the electrical design details for each circuit including the voltage rating, power rating of equipment, the full load current, the type, rating and setting of the circuit breaker and the circuit cable size.

A copy of the equipment list shall be included with the workshop drawings for initial review and shall be included in the O&M manuals.

2.3.13. Summary of Document Submissions and Inspections

The following table is an example of the expected documents and typical submission times:

Milestone	Document/Inspection	Comment
Tender submission	Technical Data	Required to allow assessment of what has been offered with tender. May also require drawings, supplier data and other information
Within #[1] weeks of contract award	Detailed design calculations inc: • Drive/load list • Maximum demand • Load balance • Cable schedule • Circuit breaker selection • Harmonic study (if applicable) • Ventilation study (if applicable) • Radio survey (if applicable) Workshop drawings for switchboards RPEQ certified drawings (if applicable)	Review of workshop drawings will not occur until full design information is provided. Allow ten (10) working days for review
Switchboard Construction	Inspections required at: • Completion of sheet metal Completion of wiring	Minimum seven (7) days' notice required
Workshop Testing	Witnessed testing at place of swbd manufacture	Minimum seven (7) days' notice required
	As-built drawings for swbd	Required before commencement of site commissioning
Site Construction	Inspections during construction phase	As required
Site Testing	• Electrical safety testing • Functional testing • Commissioning of telemetry/control system • Thermoscan of swbd (if applicable)	Minimum six (6) weeks' notice req
Practical Completion	• Electrical safety document • As-constructed drawings • Draft O&M manual • Supply of spares (if applicable)	Practical completion will not be granted until satisfactory documentation has been received
Completion	• Final O&M manuals • CAD files for drawings	
Final Completion	• Thermoscan (if applicable)	2 weeks prior to end of defects period

Note [1]: Refer to the Contract for submission dates.

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