

TWEED SHIRE COUNCIL

**ELECTRICAL
DESIGN
SPECIFICATION**

EL13

ELECTRICAL FIELD EQUIPMENT

Table of Contents

1 Citation 3

2 Origin of document, Copyright 3

3 Versions..... 3

4 Standards **Error! Bookmark not defined.**

5 Cables 3

 5.1 General 3

 5.2 High Voltage Cable 4

 5.3 0.6/1kV Power Cables 4

 5.4 Control Cables 4

 5.5 Instrumentation Cables 5

 5.6 Control System Intercommunication Cables 5

 5.7 Intrinsically Safe Cables 5

 5.8 Conduits..... 5

 5.9 Cable Ladder or Tray 5

 5.10 Junction Boxes and Field Enclosures 5

 5.11 Sirens and Hooters..... 6

6 Field Control Devices..... 7

 6.1 General 7

 6.2 Proximity Switches for General Use 7

 6.3 Local Isolators 7

 6.4 Local Control Stations 8

 6.5 Solenoid Valves..... 9

 6.6 Flow Switches 9

ELECTRICAL FIELD EQUIPMENT

1 CITATION

This document is named “Tweed Shire Council, Electrical Design Specification EL13 - Electrical Field Equipment”

2 ORIGIN OF DOCUMENT, COPYRIGHT

This document was originally produced for Tweed Shire Council. This document is copyright to Tweed Shire Council.

3 VERSIONS

VERSION	AMENDMENT DETAILS	CLAUSES AMENDED	DATE ISSUED (The new version takes effect from this date)	Authorised by the Director of Engineering Services
1.1	Original version		1 November 2005	

4 STANDARDS

The equipment and materials supplied under this Specification must comply with the latest relevant Australian Standards, or, in their absence, with the latest relevant IEC Standards, together with the requirements of competent Authorities having jurisdiction over all or part of their manufacture, installation and operation.

In particular, all equipment and materials supplied must comply with the relevant requirements of the following Regulations, Standards and Reference Specifications.

AS 1939	Degrees of Protection Provided by Enclosures for Electrical Equipment (IP Code)
AS 2053	Conduits and Fittings for Electrical Installations
AS 2380	Electrical Equipment for Explosive Atmospheres - Explosion - Protection Techniques
AS 3439	Low Voltage Switchgear and Control Gear Assemblies
AS 5000	Electric Cables – Polymeric Insulated
EL-01	General Requirements and Information
EL-03	Preferred Electrical Equipment

5 CABLES

5.1 General

All cables must be oil resistant.

Where termite problems may occur, all direct buried cable must be provided with a nylon jacket and sacrificial PVC sheath.

Where cables cross a pivot point, such as with travelling machines, flexible cable must be used.

5.2 High Voltage Cable

All high voltage distribution cables must be XLPE or polymeric insulated, steel wire armoured and PVC sheathed.

All cores must be individually screened with heavy-duty circular stranded copper conductors.

5.3 0.6/1kV Power Cables

All 0.6/1kV power cables must have circular stranded copper conductors.

In all areas cables must be of PVC/PVC or PVC/XLPE construction.

All power cables from VSD drives to motors must be cable specifically designed for VSD drive applications. The cable must be installed and terminated to the cable manufacturer's requirements.

Within office areas, control rooms and other non-industrial areas, PVC/PVC cables must be used.

Sizing of motor circuit power cables must be such as to ensure that voltage drop during starting must not exceed 20% of rated system volts. Special requirements (e.g. wound rotor motor) may dictate a lower voltage drop.

5.4 Control Cables

Extra-low voltage control cables must be as specified for "Instrumentation Cables" in Clause 5.5 below.

Low voltage control cables must be, as a minimum, 1.5mm², 0.6/1kV, PVC insulated and PVC sheathed, and include a dedicated earth core. Unless otherwise approved by the Council, sheaths must be black in colour.

In the case of multi-core low voltage control cables, control cores must be coloured white and numbered with black numerals. Cables must have 20% spare cores, subject to a minimum of 2 spare cores.

In the case of 2-core + earth low voltage control cables, control cores may be coloured red and black, where the black core functions as a neutral, or, where both control cores are active, they may be coloured red and white.

All control cables must be sized such as to ensure that the voltage drop is not greater than 5% of the rated control voltage in any part of the circuit.

5.5 Instrumentation Cables

Instrument cables must be not less than 7/0.50 (1.5mm²), PVC insulated, overall screened pairs or triples, and black PVC sheathed. Where specified elsewhere, each pair or triad must be individually screened, and individually provided with a drain wire.

5.6 Control System Intercommunication Cables

The cable installed must be in accordance with the control system supplier's requirements. The cable must be either:-

- twisted pair, minimum size of 7/0.50 (1.5mm²), individually shielded pairs, overall screen and PVC-insulated;
- coaxial cable with impedance characteristics as specified by control system supplier;
- fibre optic cable where specified.

5.7 Intrinsically Safe Cables

Intrinsically safe cables must have an earthed screen and a light blue outer sheath.

5.8 Conduits

All underground conduits must be of heavy-duty rigid UPVC complying with AS 2053.

All other aboveground conduits must have a diameter of not less than 20 mm. Conduit and fittings must comply with AS 2053 with "heavy protection" coating.

5.9 Cable Ladder or Tray

All cable ladder and tray systems must be of stainless steel, aluminium, PVC, of heavy-duty construction (typically NEMA 20B), with rung spacing not more than 300mm. Accessory fittings must be factory made and compatible with the cable ladder or tray system supplied.

Where aluminium cable ladders are used, the installation must be protected from galvanic corrosion. As a minimum, galvanic isolation spacers and 316 stainless steel bolts and nuts must be used.

Cable ladders must be installed such that the manufacturer's loading recommendations are not exceeded, and the ratio of maximum deflection to span length does not exceed 1:200. In addition, the installation must be capable of withstanding a point load of 110 kilograms without permanent deflection.

All installations must be designed to allow not less than 20% spare capacity.

Cable tray must only be used where approved by the Council.

5.10 Junction Boxes and Field Enclosures

All junction boxes in plant areas must be of polycarbonate or stainless steel, protected to not less than IP66 in accordance with AS 1939. Pressed metal junction boxes may only be used in non-plant areas.

Junction boxes containing more than eight (8) terminals must be classed as marshalling boxes.

ELECTRICAL FIELD EQUIPMENT

Marshalling boxes must be of folded sheet steel construction, not less than 2mm thick, corrosion resistant or corrosion protected, and protected to not less than IP56 in accordance with AS 1939.

They must be equipped with gasketed lockable doors, and must be fitted with removable bottom entry gland plates. The roof must slope away from the door, with the leading edge protruding past the door seal.

Marshalling boxes must be fitted with rigidly mounted terminals sufficient in number and size for termination of the cable cores shown on the drawings, including spare cores, communication wires and screen drain wires. A minimum of 20% spare terminals must be installed.

Terminal strips must be spaced not less than 50mm from the adjacent cable duct. They must be mounted and located to give easy access to terminations and to enable ferrule numbers to be read without difficulty. Ferrules must be read from top to bottom with cores vertical and left to right with cores horizontal.

Terminal strips must be positioned not less than 200mm vertically clear of the gland plates.

Terminals must be as per [Standard Specification EL01](#).

Spring-loaded terminals must be used for all wires up to 2.5mm². No more than two wires must be connected to any one such terminal.

Terminals must be grouped according to voltage level and function and labels must be provided on the fixed portion of the terminal boards showing the function and circuit reference of the group.

The wording must be in accordance with [Standard Specification EL02](#) or as approved by the Council.

Insulating barriers must be provided between adjacent terminals at different voltage levels.

Wiring at different voltage levels must be segregated.

Transparent insulating shrouds must be provided over terminals operating at voltages greater than 50V. The actual voltage levels must be identified with a label on each shroud.

All marshalling boxes must be provided with pre-drilled and tapped earth bars.

Marshalling boxes must be identified with door labels, in accordance with [Standard Specification EL01](#).

5.11 Sirens and Hooters

Pre-start warning sirens and hooters must operate at 24V DC (unless otherwise specified), with a current draw of less than 1 amp, giving a sound output of not less than 115dB (A) at 1m.

They must be protected to not less than IP65 in accordance with AS 1939.

A stainless steel weather shield must be installed over all sirens and hooters.

6 FIELD CONTROL DEVICES

6.1 General

All devices must be of a heavy-duty type, of proven design, suitable for the application. Except where otherwise approved by the Council, all device housings must be of metallic construction.

6.2 Proximity Switches for General Use

Proximity switches capable of being connected directly to the plant programmable controller must be used. The preferred proximity switches are shown in **Standard Specification EL03**. Requirements are as follows:

- Sensor Type 2-wire rectangular inductive, non-flush mounted Protection Not less than IP66 in accordance with AS 1939
- Termination Chamber Screw terminal type
- Sensing Range 20mm
- Operational Range 3-100mA at 24V DC
- Off-State Leakage Current Not more than 1mA
- Sensing Head Five positions of the active zone
- Switch Status Integral LED

6.3 Local Isolators

Unless otherwise specified, all motors must be fitted with a lockable local isolator.

The isolator must be of the full-load current break type, fitted with early break and late make auxiliary contacts.

Local Isolators must be provided with the following:

- Motor full load break rated isolator, mechanically interlocked with the door.
- Viewing window to observe status of isolator main contacts.
- Terminals of the isolator must be shrouded and labelled with an appropriate warning message approved by the Council.
- A sloped rain hood that extends past the top door seal by at least 60mm.
- All equipment must be mounted rigidly and braced sufficiently to prevent vibration.
- Provide the Council with invoiced proof (prior to installation) that the materials supplied for incorporation into the work under the contract are the type and of the quality called for on the Drawings or stated in the Specification.
- Locks must be ¼ turn requiring a tool to operate.
- All rotary type isolator handles must be mounted such that the hand is vertical – with the “head end” pointing up – when the isolator is open. Isolators must be closed by rotating the handle 90° in the clockwise direction.

- All metal doors must be provided with an earth stud, and must be bonded to the enclosure with an earth strap.
- All gland plates must be made of brass minimum 4mm thick. They must be sealed with neoprene rubber gaskets, and must have earthing studs.
- Minimum requirements for drives of 15kW and above must be for gland plates of 6mm, and gaskets of 3mm.
- Labelling as per **Standard Specification EL01**.
- Refer to **Standard Specification EL03 Preferred Electrical and Instrument Equipment**.

6.4 Local Control Stations

Unless otherwise specified, all motors must be fitted with a local control station.

The local control station must be fitted with the following items:

1. A sloped rain hood that extends past the top door seal by at least 60mm.
2. Locks must be ¼ turn requiring a tool to operate.
3. Gland plate made from minimum 4mm thick brass.
4. All metal doors must be provided with an earth stud and must be bonded to the enclosure with an earth strap.
5. The local push buttons and switches must be mounted on the door of the local control station and be IP66 rated.
6. The local control station shall be combined with the local isolator; however, the local control station must be in a totally separate compartment and have a totally separate door to the local isolator.
7. Labelling as per Standard Specification **EL01 General Requirements and Information**.

Four types of stations are applicable - the one to be used must be as detailed in the Specification Drawings, and in the Instrument and Electrical Equipment Lists.

The types are:

1. Standard Local control station (LCS) - with one START pushbutton, and one combined STOP / EMERGENCY STOP pushbutton.
2. Reversing local control station (LCS) – with one FORWARD and one REVERSE pushbutton, and one combined STOP/EMERGENCY STOP pushbutton.
3. VSD local control station (LCS) – with one START pushbutton, one EMERGENCY STOP pushbutton, and one standard STOP pushbutton.
4. Emergency stop station (ES) - with one EMERGENCY STOP pushbutton.

Pushbuttons must be in accordance with **Standard Specification EL-01**.

Refer to **Standard Specification EL-03** for the preferred equipment.

6.5 Solenoid Valves

Unless otherwise specified, solenoid valves must be brass body, soft seating general purpose type with epoxy resin encapsulated coil protected to IP65 in accordance with AS1939. The coil voltage must be 24V DC.

Solenoids that are not integral to pneumatic valves must be installed inside stainless steel “Valve Box” enclosures. Where multiple valves are located in common process areas the solenoids may be grouped together on a common manifold inside Valve Boxes.

Valve boxes must incorporate the following items:

1. Stainless Steel enclosure with sloped roof with 60mm overhang
2. On/off status indication LED on solenoids
3. Transparent viewing window to monitor LED status
4. Manual override function on solenoids
5. Quick connect type pneumatic fittings
6. Terminals for field cables
7. Valve identification labels

6.6 Flow Switches

Flow switches must be suitable for outdoor installation, compact in size and protected to not less than IP66 in accordance with AS 1939. They must have a single pole double throw switch, adjustable for sensitivity to flow. The wet end must be stainless steel or equivalent (not plastic).