

TRANSPORT FOR NSW (TfNSW)
TfNSW SPECIFICATION D&C TS931
TUNNEL ELECTRICAL BOARDS

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TUNNEL ELECTRICAL BOARDS

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VERSION FOR: DATE:

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FOREWORD

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This document should be read with all the documents forming the Project Deed.

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REVISIONS TO PREVIOUS VERSION

This document has been revised from Specification TfNSW D&C TS931 Edition 1 Revision 0.

TfNSW SPECIFICATION D&C TS931

TUNNEL ELECTRICAL BOARDS

1 GENERAL

1.1 SCOPE

This specification sets out the requirements for the design, manufacture and testing of the main switchboard, distribution board(s) and control panel(s) (collectively termed “electrical boards”) for the electricity supply within tunnels, including tunnels in motorways, and long underpasses.

Installation of the electrical boards is covered under Specification TfNSW D&C TS932.

1.2 RELATED SPECIFICATIONS

The Specification is a Level 3 document which forms part of the suite of TfNSW specification documents for Motorway Systems (see figure below). Other documents within the suite are:

Level 1

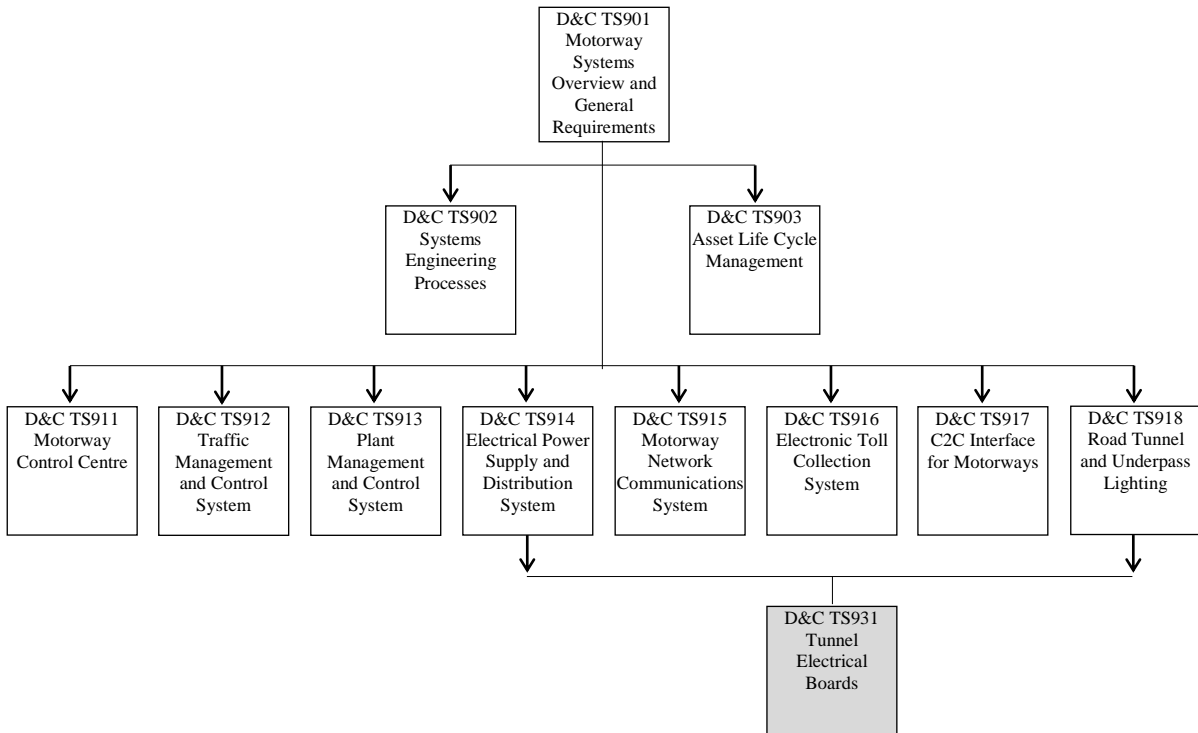
- D&C TS901 “Motorway Systems Overview and General Requirements”.

Level 2

- D&C TS911 “Motorway Systems - Motorway Control Centre”;
- D&C TS912 “Motorway Systems - Traffic Management and Control System”;
- D&C TS913 “Motorway Systems - Plant Management and Control System”;
- D&C TS914 “Motorway Systems - Electrical Power Supply and Distribution System”;
- D&C TS915 “Motorway Systems - Motorway Network Communications System”;
- D&C TS916 “Motorway Systems - Electronic Toll Collection System”;
- D&C TS917 “Motorway Systems - C2C Interface for Motorways”;
- D&C TS918 “Motorway Systems - Road Tunnel and Underpass Lighting”.

Level 3

- D&C TS932 “Tunnel and Underpass Electrical Services Works”.



1.3 STRUCTURE OF THE SPECIFICATION

This Specification includes a series of annexures that detail additional requirements.

1.3.1 (Not Used)

1.3.2 (Not Used)

1.3.3 Schedules of HOLD POINTS, WITNESS POINTS and Identified Records

The schedules in Annexure TS931/C list the **HOLD POINTS** and **WITNESS POINTS** that must be observed. Refer to Specification TfNSW D&C Q6 for the definitions of **HOLD POINTS** and **WITNESS POINTS**.

The records listed in Annexure TS931/C are **Identified Records** for the purposes of TfNSW D&C Q6 Annexure Q/E.

1.3.4 Referenced Documents

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 1023). For convenience, the full titles are given in Annexure TS931/M.

1.4 DEFINITIONS AND ACRONYMS

1.4.1 Definitions

The terms “**you**” and “**your**” mean “the Contractor” and “the Contractor’s” respectively.

The terms “**main switchboard**”, “**distribution board**”, and “**control panel**” are collectively termed “**electrical boards**”.

The following definitions apply to this Specification.

“**Supplier**” can mean either the manufacturer or distributor of the equipment or components.

1.4.2 Acronyms

The following acronyms apply to this Specification:

AC	Alternating current
DC	Direct current
DIN	Deutsches Institut für Normung
GPO	General purpose outlet
PVC	Polyvinyl chloride
TfNSW	Transport for NSW
SWTC	Project Deed Scope of Works and Technical Criteria
WAE	Work-As-Executed (Drawings)

2 DESIGN

2.1 GENERAL

2.1.1 Standards

- (a) Design of electrical boards must comply with the relevant Australian Standards, TfNSW specifications and the Project Deed Scope of Works and Technical Criteria (SWTC).

2.1.2 Operating Environment

- (a) Electrical boards located outside equipment rooms inside tunnels must be designed to be:
- (i) suitable for operating within the tunnel environment;
 - (ii) fire resistant, non-flammable, and its components must be of low smoke and halogen free composition;
 - (iii) rated for 0 to 40°C ambient temperature.

2.1.3 Degree of Protection

- (a) Enclosures for electrical boards must have the following minimum degree of protection to AS 60529:
- (i) installed inside environmentally controlled equipment rooms: IP41;
 - (ii) installed outside equipment rooms but within tunnels: IP65.
- (b) Control devices must have the following minimum degree of protection to AS 60529:
- (i) mounted inside electrical boards: IP20;
 - (ii) mounted on the face of electrical boards: same degree of protection as the enclosures on which they are mounted, or better.

2.1.4 Component Interchangeability

- (a) For the purposes of component interchangeability and minimising the number of spare parts required, identical components must be used wherever possible.

2.2 INTERNAL LAYOUT AND DIMENSIONS

2.2.1 Form of Internal Separation

- (a) Switchboards and distribution boards must have form of internal separation in accordance with AS/NZS 61439.2 conforming to the following:
 - (i) switchboard: Form 3b;
 - (ii) distribution boards: Form 2b.

2.2.2 Layout of Components

- (a) Layout and arrangement of the individual components within the switchboards and distribution boards must be such that it facilitates the ease of fault finding and servicing when in operation.
- (b) The layout of components within the enclosures must allow for safe and efficient access to the components during installation, operation, maintenance, and modification of the electrical boards.

2.2.3 Spare Capacity

- (a) Within main switchboards and distribution boards, after installation of all components, there must be at least 15% of spare capacity (in the form of clear mounting space), to permit future installation of additional components in the boards.

2.2.4 Dimensions

- (a) The dimensions of electrical boards must be such that after installation in their design locations, they comply with the access requirements specified in AS/NZS 3000.
- (b) All cubicles, irrespective of the sizes of the components to be accommodated within them, must be of uniform height and depth. The overall depth of cubicles must not exceed 600 mm.

2.2.5 Shipping Lengths

- (a) Shipping lengths of electrical boards must not exceed 2700 mm. Where shipping lengths of electrical boards exceeding 2700 mm are proposed, the Contractor must demonstrate that the break points will facilitate their installation and eventual disposal, and obtain approval of the longer shipping lengths from the Principal.

2.2.6 Access

- (a) Access inside the electrical boards through the front side is the preferred means. If access through a different side is proposed, it must be demonstrated to the Principal that installation, operation and maintenance activities can still be carried out safely and efficiently. The alternative means of access must be approved by the Principal prior to manufacture.
- (b) Door openings must be large enough to permit the removal of components without difficulty during installation and servicing.

2.3 OTHER REQUIREMENTS

2.3.1 Main Switches

- (a) A main switch must be provided for each electrical board.

2.3.2 Busbars

- (a) Main busbars must be located inside an enclosed chamber within the cubicle and completely separated from other sections of the electrical board.
- (b) Busbar temperature rise must comply with the requirements of AS/NZS 61439.5.
- (c) A neutral bar must be fitted in accordance with AS/NZS 3000.
- (d) Busbars must not be exposed when the electrical boards are accessed for cabling and maintenance work after site installation.

2.3.3 Earth Bars

- (a) Earth bars must be provided for each electrical board.
- (b) Earth bars must be of suitable size for the components to be installed.

2.3.4 Circuit Breakers

- (a) Circuit breakers if installed in main switchboards must be located within a separate compartment.
- (b) Where a distribution board is fitted with a control section, it must be segregated from the circuit breakers.

2.3.5 Fuses

- (a) Fuses may be used only where unavoidable, and their use requires the approval of the Principal.

2.3.6 General Purpose Outlets

- (a) A 230 V single-phase general purpose outlet (GPO) must be provided within the switchboard for test equipment purposes, unless there is a dedicated wall mounted GPO in the vicinity of the switchboard which is not more than 3 m from the board.

2.3.7 Enclosure Lighting

- (a) A 230 V single-phase fluorescent light, operated by a door limit switch, must be provided within the switchboard. This is not required when the switchboard is located within a well-lit equipment room and the equipment room lighting is sufficient to illuminate the switchboard with personnel standing in front of the switchboard.

2.3.8 Appearance

- (a) The front faces of cubicles must, as far as possible, be of similar materials and design so that the finished electrical board presents a uniform appearance.

2.4 DESIGN DOCUMENTATION AND DRAWINGS

2.4.1 General

- (a) All Design Documentation, including drawings, listed in the agreed schedule must be submitted to the Principal prior to the commencement of manufacture of the electrical boards.

2.4.2 Design Documentation Drawings

- (a) Design Documentation drawings must include (but not limited to) the following:
 - (i) General Arrangement drawings;
 - (ii) circuit diagrams;
 - (iii) installation drawings, where applicable.
- (b) The following details must be shown on the Design Documentation drawings:
 - (i) all necessary fault-limiting and/or protective devices;
 - (ii) degree of protection rating for enclosures;
 - (iii) sufficient data, including all loading details, necessary for design of the supporting structures.

2.4.3 Format

- (a) Design Documentation, including drawings, must be submitted electronically in both native and PDF formats.

3 COMPONENTS AND MATERIALS

3.1 ELECTRICAL COMPONENTS

3.1.1 Main Switches

- (a) Main switches must have a rating that is adequate for full load continuous duty and must be of load break type.

3.1.2 Terminal Blocks

- (a) Terminal blocks for the termination of all outgoing and incoming cables within electrical boards, must be of adequate size with 20% spare terminals.

3.1.3 Circuit Breakers

- (a) Circuit breakers must have rating which is adequate for the required duty and, for distribution boards, must be supplied with chassis.
- (b) All circuit breakers must be of continuous current rating, and interrupting ratings must be selected to suit the circuit loads.

3.1.4 Current Transformers

- (a) Current transformers must be of the dry type complying with AS/NZS 60044.1.

3.1.5 Contactors

- (a) Contactors must be of the moulded block type construction complying with AS/NZS IEC 60947.4.1 and rated at 150% greater than the full load current.
- (b) Main contactors must have mechanical endurance complying with AS/NZS IEC 60947.2.

3.1.6 Busbars

- (a) Main busbars must be of copper, continuous current rated.

3.1.7 Wiring

- (a) All wiring within the switchboard must be multi-stranded copper conductors enclosed in polyvinyl chloride (PVC) sheathing with V-90HT insulation to AS/NZS 3808. Single strand wires must not be used.

3.1.8 Power Cables

- (a) Power cables must be stranded copper conductors of appropriate sizes to suit the circuit load but must not have cross-sectional area of less than 2.5 mm².

3.2 EQUIPMENT ENCLOSURES**3.2.1 Materials**

- (a) Materials for electrical board enclosures must be as shown in Table TS931.1.

Table TS931.1 – Materials for Enclosures

Enclosure Location	Material⁽¹⁾
Inside environmentally controlled equipment rooms	Painted mild steel or stainless steel Grade 316 ⁽²⁾
Outside equipment rooms but inside tunnels	Stainless steel Grade 316 ⁽²⁾

Notes:

- ⁽¹⁾ Alternative materials may be used with approval by the Principal. The Contractor must provide evidence that the materials will meet the specified design life and performance requirements.
- ⁽²⁾ To ASTM A240/A240M-18.

3.2.2 Type and Thickness

- (a) Enclosures for electrical boards must be manufactured from sheet steel, with the following minimum thickness:
 - (i) Main switchboard: 2.0 mm;
 - (ii) Control panels (panel width < 1.5 m): 1.6 mm;
 - (iii) Control panels (panel width > 1.5 m): 2.0 mm.

3.3 MISCELLANEOUS ITEMS

- (a) All plinths must be of steel and hot-dip galvanized. Plinths for electrical boards which are floor mounted must have predrilled holes to allow for fixing to the floor.

- (b) Plinths supporting enclosures which are constructed of stainless steel must have some means of isolation to prevent galvanic corrosion.
- (c) All door handles, hinges, bolts, screws, etc, whether used for assembling the equipment or fixing it in place, must be either electroplated, galvanized or made from corrosion resistant materials.
- (d) Gland plates must be of non-ferrous metal.

4 MANUFACTURE

4.1 EQUIPMENT ENCLOSURES

4.1.1 Enclosure Structures

- (a) Enclosures must be constructed from rigidly framed structures.
- (b) Enclosures must be suitably reinforced to prevent warping or buckling, with additional supporting members provided where necessary for heavier switchgear items.

4.1.2 Lifting Lugs or Beams

- (a) Lifting lugs or beams must be provided to the enclosures to prevent distortion when lifting or off-loading during transport.
- (b) Control panels exceeding 1.5 m in width must be fitted with a full length plinth (fabricated from C-channels) to facilitate lifting during transport.

4.1.3 Fixing Lugs for Wall Mounted Enclosures

- (a) Wall mounted control panels must be fitted with at least four fixing lugs, welded to the rear of the enclosure. The lugs must protrude past the sides of the enclosure to enable fixing without having to open the doors.
- (b) A 12 mm dia. hole must be provided in each lug.
- (c) The areas where the lugs are attached to the enclosures must be strengthened to withstand the weight of the fully fitted out control panel.

4.1.4 Ventilation Ports

- (a) Ventilation ports for enclosures and switchboards, where provided, must be vermin-proof, using non-corrosive screen material.

4.1.5 Enclosure Doors

- (a) Heavy duty neoprene dust seals must be provided for all doors including removable doors. The dust seals must not be susceptible to damage when the door is closed.
- (b) Door handles must be lockable.
- (c) Access doors must be fitted with hinges, and door stays.

- (d) Use of lift-off doors is to be avoided, and their use requires the approval of the Principal.

4.1.6 Covers

- (a) Covers, where used, must be fitted with a means of retaining the cover in position when the fastening bolts or nuts are removed.

4.1.7 Welds

- (a) All welds must be ground smooth, with all sharp edges or burrs removed.

4.1.8 Painting

- (a) The surfaces of metal must be coated by a paint system (unless otherwise specified in Clause 3.2.1 or directed by the Principal) which provides the durability/design life specified in the SWTC.
- (b) Before paint application, metal surfaces must be cleaned using an approved method, and then thoroughly dried, and be free of mill scale, grease, welding slag and spatter.
- (c) Paint colours for enclosures must be in accordance with the following:
 - (i) External surface: AS 2700 N42 Storm Grey
 - (ii) Internal surface: AS 2700 N14 White

4.2 CABLE ENTRY

4.2.1 Entry Location

- (a) Cable entries must be through either the bottom or top of the enclosure, depending on the electrical board design, location and installation requirements, with bottom entry the preferred means.
- (b) Cables must enter the electrical boards through gland plates or knockouts provided.
- (c) Suitable glands must be provided for cables at entry.

4.2.2 Gland Plates

- (a) Electrical boards must be fitted with removable gland plates at cable entries.
- (b) Gland plates provided must have sufficient spare capacity (in the form of clear space) for the required number of cables.
- (c) When gland plates are predrilled for site installation, all holes must be fitted with suitable glands to maintain ingress protection of the enclosure.
- (d) Where single core cables are used, they must still enter the electrical boards through gland plates.

4.3 CABLE ZONES

4.3.1 General

- (a) Vertical cable zones must be provided within each cubicle, extending the full height of the cubicle.
- (b) Where horizontal cable zones are provided, they must run the full length of the switchboard. The horizontal cable zone must be connected to vertical zones.
- (c) Cable zones must suit either top and bottom cable entry into the main switchboard.
- (d) The cable zones must allow front access via covers.
- (e) Provision must be made for supporting the cables in the cable zones.

4.3.2 Size

- (a) Cable zones must be of sufficient size:
 - (i) to accommodate the terminal blocks shown on the Design Documentation drawings;
 - (ii) such that the sum of the effective cross sectional area of the associated cables and wires in each cable zone will not exceed 40% of the minimum internal cross sectional area of the cable zone;
 - (iii) to allow outgoing power cables to be terminated while complying with the minimum bending radius of the cables recommended by the cable manufacturer.
 - (iv) with generous space for running and terminating the cables.

4.4 WIRING

- (a) All cables within the cubicles must be harnessed, and terminated using approved crimp lugs.
- (b) Sufficient cable lengths must be provided for re-termination of the cables, should the cables be damaged or broken.
- (c) Final sub-circuit wiring within the electrical boards must be combed out, harnessed and then fanned out in a neat manner.
- (d) Control wiring must comply with original equipment manufacturer or vendor requirements for the components to be connected.
- (e) Live circuits above extra low voltages (ELV), which are exposed when the panel door is opened, must be fully shrouded.

4.5 OTHER REQUIREMENTS

4.5.1 Mountings

- (a) Components within electrical boards must be mounted on removable mounting plates and must not be door or side mounted, except for devices such as push buttons, selector switches and pilot lights.
- (b) Contactors up to 15 kW rating must be mounted on DIN rails.

4.5.2 Terminals

- (a) All terminal blocks and device terminals must be accessible after the mounting plate is fully wired with factory and field connections.
- (b) A clearance of at least 40 mm must be provided between plastic trunking (slotted ducts) and terminal blocks to provide sufficient space for terminating and labelling.

4.6 COLOUR IDENTIFICATION AND LABELLING

4.6.1 Wiring

- (a) All electrical wiring and cable cores must be colour identified according to their intended functions, as detailed below:
 - (i) A Phase Red
 - (ii) B Phase White
 - (iii) C Phase Blue
 - (iv) Neutral Black
 - (v) Earth Green/Yellow
 - (vi) 230 V AC Control Active Red
 - (vii) 230 V AC Control Neutral Black
 - (viii) DC Control Positive Orange
 - (ix) DC Control Common Brown
 - (x) 4-20 mA Positive White
 - (xi) 4-20 mA Negative Black
- (b) Additional colours may be used as necessary to provide logical circuit identification. Use of additional or alternative colours requires the approval of the Principal.
- (c) Alternative colour coding may be used for the flexible connection to individual tunnel luminaires, but only with the approval of the Principal. Any alternative colour coding must be logical and consistent throughout the installation.
- (d) All devices or components within equipment enclosures must be clearly identified by the unique component identification shown on the relevant drawings.

4.6.2 Busbars

- (a) All busbars and droppers must be colour identified by colour code in a permanent manner.

4.6.3 Equipment

- (a) All electrical equipment and their components must be clearly marked with labels written in English.
- (b) Labels must be appropriately engraved on traffolyte material of the following colours:
 - (i) Warning (or Caution): Yellow/Black/Yellow (YBY);
 - (ii) Danger: Red/White/Red (RWR);

- (iii) All other labels: White/Black/White (WBW).
- (c) Main labels must be located on top of each item of equipment.
- (d) A label must be provided at the front of each electrical board and at each internal compartment, stating the associated equipment designation.
- (e) Each device installed at the front of panels must have a label describing the function of the device.
- (f) Circuit breakers connected to the live side of the main switch must have labels with the following message:

DANGER

CONNECTED TO LIVE SIDE OF MAIN SWITCH

- (g) Circuit breaker and fuse ratings (if approved by the Principal) must also be shown on the labels. These labels must be affixed adjacent to but separate from the devices.
- (h) Safety signage in accordance with AS 1319 must be provided on all equipment with safety risks generated from a risk assessment.

4.7 MATERIALS AND COMPONENT REVIEWS

- (a) Prior to their delivery to the Site and/or installation, complete information on all materials and components proposed for use in the electrical boards must be submitted to the Principal for review.
- (b) The submission must list the manufacturers, model numbers and all other information necessary for the Principal to identify the items and determine their compliance or otherwise.
- (c) The submission must include components which are specified in the Design Documentation using manufacturers' names, models or trade names, as well as materials proposed by you.
- (d) The submission must also include test certificates demonstrating compliance of equipment enclosures to ingress protection requirements, and for 40°C ambient temperature rating.

5 INSPECTION AND TESTING

5.1 INSPECTION DURING MANUFACTURE

- (a) At any time during manufacture, the Principal or Project Verifier may carry out inspection of the materials and equipment either at the manufacturer's premises, or that of a nominated subcontractor.
- (b) The Principal or Project Verifier will give a minimum of 5 working days notice of the intention to conduct the inspection.

5.2 FACTORY TESTING

- (a) All completed electrical boards must be tested at the manufacturer's premises prior to shipment for compliance with the requirements of the appropriate Australian Standards and/or this Specification.
- (b) The Project Verifier may witness these tests and the Contractor must give 10 working days notice of the intention to carry out the tests. Unless the Project Verifier has advised that it will not witness the test(s), the Contractor must not proceed with the tests in the absence of the Project Verifier.

WITNESS POINT

Process Witnessed: Materials and equipment testing.

Submission Details: Notification to the Nominated Authority at least 10 working days in advance, of the intention to carry out equipment testing.

- (c) Electronic copies of the test reports must be provided to the Project Verifier within 14 days of completion of the tests.

5.3 NONCONFORMITIES

- (a) All nonconformities identified during inspection or testing, or notified by the Project Verifier must be addressed to the satisfaction of the Project Verifier prior to delivery of the electrical boards to the Site.

6 ACCEPTANCE

6.1 ACCESSORIES FOR INSTALLATION

- (a) Accessories necessary for installation and removal of the electrical boards at the Site such as removable lifting eye bolts on top of the switchboard or alternative lifting arrangement, must be provided together with the electrical boards.

6.2 WORK-AS-EXECUTED DRAWINGS AND MANUALS

- (a) Prior to acceptance of the main switchboard and distribution boards, submit to the Principal electronic copies of Work-As-Executed (WAE) drawings and Manuals.
- (b) Submission of WAE drawings must comply with the requirements of the SWTC.
- (c) WAE drawings must show all information necessary to facilitate future operation and maintenance, including accurate details, enclosures etc, and any modifications carried out by the Supplier to facilitate satisfactory installation or operation.
- (d) Manuals must cover Installation, Operations and Maintenance instructions.

6.3 SPARE PARTS LIST

- (a) A list of recommended spare parts, prepared by your Suppliers, for 2 years normal operation of the electrical equipment under the Contract, must be provided together with WAE drawings and Manuals.
- (b) The list must contain part numbers, current prices and normal delivery time of the parts recommended for stocking.

6.4 ACCEPTANCE

- (a) Prior to acceptance of the main switchboard and distribution boards, submit to the Principal all required documentation, including test reports, certificates, WAE drawings and manuals in accordance with the SWTC and the Specifications.

HOLD POINT

Process Held:	Acceptance of main switchboard and distribution boards.
Submission Details:	All required documentation, including WAE drawings, test reports and certificates and manuals.
Release of Hold Point:	The Nominated Authority will consider the submitted documents prior to authorising the release of the Hold Point.

ANNEXURE TS931/A – (NOT USED)**ANNEXURE TS931/B – (NOT USED)****ANNEXURE TS931/C – SCHEDULES OF HOLD POINTS, WITNESS POINTS AND IDENTIFIED RECORDS**

Refer to Clause 1.3.3.

C1 SCHEDULE OF HOLD POINTS AND WITNESS POINTS

Clause	Type	Description
5.2	Witness	Materials and equipment testing
6.4	Hold	Submission of documentation, including WAE drawings, test reports and certificates and manuals

C2 SCHEDULE OF IDENTIFIED RECORDS

The records listed below are Identified Records for the purposes of TfNSW D&C Q6 Annexure Q/E.

Clause	Description of Identified Record
2.4	Design Documentation, including drawings and engineering data
4.7	Information on equipment and components, and certificates of compliance
5.2	Inspection and test reports
6.2	WAE drawings of electrical boards and manuals for Installation, Operations and Maintenance
6.3	List of spare parts

ANNEXURES TS931/D TO TS931/L – (NOT USED)

ANNEXURE TS931/M – REFERENCED DOCUMENTS

Refer to Clause 1.3.4.

TfNSW Specifications

TfNSW D&C Q6	Quality Management System (Type 6)
TfNSW D&C TS901	Motorway Systems Overview and General Requirements
TfNSW D&C TS911	Motorway Systems - Motorway Control Centre
TfNSW D&C TS912	Motorway Systems - Traffic Management and Control System
TfNSW D&C TS913	Motorway Systems - Plant Management and Control System
TfNSW D&C TS914	Motorway Systems - Electrical Power Supply and Distribution System
TfNSW D&C TS915	Motorway Systems - Motorway Network Communications System
TfNSW D&C TS916	Motorway Systems - Electronic Toll Collection System
TfNSW D&C TS917	Motorway Systems - C2C Interface for Motorways
TfNSW D&C TS918	Motorway Systems - Road Tunnel and Underpass Lighting
TfNSW D&C TS932	Tunnel and Underpass Electrical Services Works

Australian Standards

AS 1319	Safety signs for the occupational environment
AS 2700	Colour standards for general purposes
AS/NZS 3000	Electrical installations (known as the Australian/New Zealand Wiring Rules)
AS/NZS 3808	Insulating and sheathing materials for electric cables
AS/NZS 60044.1	Instrument transformers - Current transformers
AS/NZS IEC 60947	Low-voltage switchgear and controlgear
AS/NZS IEC 60947.2	Circuit-breakers
AS/NZS IEC 60947.4.1	Contactors and motor-starters – Electromechanical contactors and motor-starters
AS/NZS 61439	Low-voltage switchgear and controlgear assemblies
AS/NZS 61439.2	Power switchgear and controlgear assemblies
AS/NZS 61439.5	Assemblies for power distribution in public networks
AS 60529	Degrees of protection provided by enclosures (IP Code)

ASTM Standards

A240/A240M-18	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
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