ELECTRICAL SERVICES

Electrical Specification

BOQ - POINT LONSDALE ELECTRICAL



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2 GENERAL

This Specification is generally written in the plural. Where only one item is scheduled or nominated then the singular shall be inferred.

2.1 SCOPE

Supply and install the complete electrical installation and associated services for the project, including but not limited to the following:

- removal of redundant electrical wiring, equipment, fixtures and fittings;
- negotiation as necessary with local Electricity Supply Authority;
- underground consumer mains;
- meter panel;
- underground conduits and pits;
- main switchboard;
- modification to existing switchboards;
- switchboards;
- mains and sub mains;
- as-built drawings;
- operation and maintenance manuals;
- testing, commissioning and putting into service.
- Certificate of Compliance for all systems and electrical work.
- maintenance during Defects Liability Period.

2.2 REGULATIONS

Supply and install all works described for this project in accordance with all the relevant authorities having jurisdiction over the works, including the following:

- Building Code of Australia.
- Local Electricity Supply Authority.
- Current relevant Australian Standards, especially;
- AS 3000 - Wiring Rules.
- AS 3008 - Electrical Installation - Selection of Cables.
- AS 4836 - Safe Working on low-voltage electrical installations.
- AS NZS 61439 Low-voltage switchgear and control gear assemblies
- AS 1428 – Design for Access and Mobility.
- Victorian Service and Installation Rules.
- AS 3013 - Electrical Installations - Classification of the Fire and Mechanical Performance of Wiring Systems.

2.3 BUILDERS WORK

Undertake all builders work as necessary to carry out the project. This includes but is not limited to making all penetrations, providing access as necessary, patching, making good and painting.

Care shall be taken at all times to protect the building from damage. Cover sheets, planking over flooring and other surfaces, shall be provided where necessary or where requested by the Engineer. Any damage shall be repaired at the Contractor's expense.

2.4 UNDERGROUND SURVEYING OF EXISTING SERVICES

The contractor shall allow to locate all existing services on the site including details such as size, depths, condition, material and offsets to notable landmarks such as buildings. A record shall be kept of these surveys and included in the as-built documentation to be handed over at the completion of the project.

The survey shall be conducted before any works commence and the information shall be submitted by the contractor to the Superintendent once completed with any proposed alterations to the design intent or alternative options proposed to fulfil the intent of the work scope.

The underground locating service shall be conducted by a skilled contractor experienced in such work.

2.5 WORKMANSHIP

It is expected that all work shall be carried out in a workmanlike manner and to an acceptable tradesman's standard to meet the requirements of all relevant Statutory Authorities. Any work not reaching this standard in the opinion of the Consultant or Statutory Authority will be rejected and rectified by the Contractor at their expense.

In addition to this, all workmanship, systems, equipment, materials and devices, including cable type and installation shall be installed in accordance with best practice and the Manufacturer's recommendations.

In the case of a conflict between the requirements of this specification and a nominated standard or Manufacturer's recommendations, the most stringent requirement shall prevail.

2.6 DEMOLITION WORK

Disconnect and remove all redundant electrical cabling as part of the demolition part of this project. Redundant cabling shall become the property of the Contractor to be disposed of as they see fit.

Equipment to be retained that becomes disconnected during the contract, shall be reconnected at no cost to the Client.

The contractor shall visit site during the tender period to satisfy themselves with the extent of existing services on site.

2.7 STAGING

The Contractor will note that the project will be staged.

It is essential that those areas occupied by the Client remain fully operational. This shall comprise all services including, but not limited to, power, lighting, telecommunications, security, etc.

The Contractor will stage their work to ensure this occurs and where necessary make allowance for temporary connections as required.

Cut-overs as required shall be carried out at a time agreed to with the Client.

2.8 ALTERNATIVE EQUIPMENT

The Tenderer is also advised that a conforming tender, comprising the equipment specified, is required. Failure to do this may render the tender informal.

2.8.1 Documentation Discrepancies

Any discrepancies found in the Tender documents shall be referred to the Superintendent during the Tender period, with the allowed scope of works confirmed by the Contractor in their Tender submission for review and approval by Superintendent.

2.8.2 Superseded Equipment

In the event of a specified equipment being superseded and/or removed from the market, the Contractor shall notify the Superintendent and shall allow for the manufacturer's equivalent model and provide for superintendent approval as part of the tender submission.

2.8.3 Alternative Equipment – Tender Stage

Alternative equipment may be offered with the tender, but only as a Tender Option and must include details such as model numbers, performance data and any constraints that may affect the system performance, construction program or building layout or structure.

2.8.4 Alternative Equipment – Construction Stage

During the construction phase alternative equipment and systems may not be offered.

2.9 SHOP DRAWINGS

Shop drawings shall be prepared before purchase and installation of equipment, to show details of the work, explain the relationship of all components to one another, the manner of installation of same and to facilitate co-ordination of all services.

Work on site shall not commence until shop drawings have been reviewed by the Superintendent and are not required to be resubmitted. Allow up to 14 days for the shop drawing review process.

Equipment to include:

- switchboards;

The Superintendent shall make available 'AutoCAD' drawing files to assist the contractor. However, it remains the Contractor's responsibility to verify all dimensions on site.

The contractor shall email pdf versions of shop drawings to the relevant parties.

3 ELECTRICITY SUPPLY

3.1 UPGRADED ELECTRICAL SUPPLY

The existing connection and metering shall be upgraded as documented.

The Electrical Contractor shall contact the Local Supply Authority, and shall co-ordinate all works, to ensure that all their requirements are met, and that supply is made available when required.

The contractor shall include all works as shown on the drawing and as follows.

3.1.1 Authority Application

An application to the Authority has not been made. The contractor shall make application for the following supply.

- 100ATP

The Electrical Contractor shall allow the following to enable power to be connected to the facility.

1. Seek permission from the client to contact the local Power Authority
2. Make application with the local Power Authority for a new/upgraded connection to the facility
3. Supply and install service protection device in line with Table 7.2-1 of the Victorian Service and Installation Rules (SIR's)

This shall be carried out to ensure that all authority requirements are met, and that supply is made available to enable commissioning prior to practical completion.

3.1.2 Costs

All Costs associated with physically making the supply available shall be allowed for in the tender. This shall include but not be limited to:

- Preparation of program
- Site coordination
- All requirements in the supply offer for site preparation
- Attendance at all site visits by authority and their representatives.
- Truck appointments, including any subsequent appointments, if authority cannot not complete works at appointed time, for any reason
- Road closures or changes
- Metering installation.

The following costs are not required to be included in the tender.

- Authority Contribution Charges

3.1.3 Underground Supply

An underground service line is proposed for the facility. All works are to be completed in accordance with Section 7.3 of the Victorian Service and Installation Rules (SIR's).

Supply and install a Service Connection Facility (MSB) where shown on the drawings for the new consumer mains in accordance with the Local Supply Authority's requirements, including the installation of a Service Protection Device in accordance with Cl. 7.3.2.5 of the SIR's.

Provide all conduits, pits etc as required by the Supply Authority to enable them to provide a connection to the property.

Labels shall be screwed engraved 'Traffolyte'.

3.2 SUPPLY AUTHORITY CO-ORDINATION

The Electrical Contractor shall contact the Local Supply Authority, and shall co-ordinate all works, to ensure that all their requirements are met, and that supply is made available when required.

3.3 REVIEW BY ELECTRICAL INSPECTOR & SUPPLY AUTHORITY

The Contractor shall obtain approval of the Main Switchboard, supply arrangement and metering arrangement from the electrical inspector and the Supply Authority prior to manufacture and installation.

The contractor shall also engage a licenced electrical inspector to carry out a detailed review of the proposed prescribed electrical works and electrical works relating to the Victorian Service and Installation Rules (SIR's) prior to commencing the construction of any switchboards in order to determine whether the proposed works comply with the regulations.

The contractor shall pay all costs associated with the review and approval process including any follow up reviews/approvals required.

A copy of the electrical inspector's findings from the above review/s shall be submitted to the Superintendent prior to works commencing.

3.4 CONDUITS

3.4.1 General

Supply and install conduits for cabling where required and as shown on the drawings. Conduits shall be run concealed in roof or ceiling space, partitions, columns and masonry walls where possible, when conduits are surface mounted they shall be run parallel to walls, doors and structural members.

All conduits installed shall be symmetrical and evenly spaced. Allow to install easy draw-in and replacement of cables. Draw-in boxes shall be at maximum 20m centres when used for long runs.

Conduits which will be used by others or installed as spares shall be installed complete with suitable draw wire. Draw wires shall be a minimum 1.1mm diameter galvanised steel or other approved material. Spare conduits shall be installed complete with capped ends.

All conduit supplied shall be coloured and constructed of a material in accordance with relevant standards and regulations.

Conduits shall be filled with expanding foam to stop water and pest ingress.

Conduits for authority services shall be size and grade required by the authority.

3.4.2 Conduit Supports

Supply and install conduit supports to ensure all conduits are saddled firmly in place so that no sagging occurs between fixings. Where parallel multiple runs occur, have all saddles, joints, expansion couplings etc. together in line.

3.4.3 Buried Conduits

Excavate all trenches true to line and of suitable minimum width for the conduits to be laid. Excavations shall be made to the depth as required by relevant regulations. Trenching shall be run clear as much as possible of existing trees and shrubs which are to be retained, so as to cause the minimum disturbance to them. Provide saw cuts through concrete or asphalt paving where encountered.

Prior to any excavation existing services such as underground electrical cables, telecommunications cables, gas and storm water drains, etc. shall be accurately located and temporary means employed if necessary to maintain these services at all times. Any damage to existing services shall be made good by the Contractor without delay.

No excavation shall commence until a substantial quantity of conduits and jointing material is on site and trenches shall only be opened sufficiently in advance of conduit laying to enable work to proceed without delay. Provide all pumps and appliances required to keep the excavations free of water at all times whilst open. Divert all surface water and waterways from the excavation.

The Contractor shall bear full responsibility for the security of all excavations and where necessary properly timber and shore it up against collapse, provide temporary bridges, barricades, warning signals and lights.

Where unsuitable materials are encountered in the trench bottom, such materials shall be removed and replaced with compacted 6mm fine crushed rock to approval. All excavations below required depth shall also be back filled with compacted 6mm fine crushed rock to the level required.

All existing trees shall be protected from damage during the inground services works in accordance with AS4970-2009. The contractor shall allow to locate services outside the tree protection zone as required.

3.5 CABLE PITS

Supply and install cable pits where required and as shown on the drawings.

Cable pits shall be pre-fabricated units, with separate pits for 'power' and 'communication', and shall be of 'ACO' Cablemate polymer concrete pits, complete with cast iron unfilled unit covers, frames and concrete surrounds. Pit covers shall finish flush with finished surface level and match the level and filled with material of adjacent surface.

All pits shall have a minimum rating suitable for the surrounding area as per the following table. Where a greater rating is required in other contract documents the greater class shall be allowed.

Class rating	Area use	Nominal wheel load (kg) as3996
B	Footways that may be mounted by a vehicle or livestock, and light tracker paths	2670
C	Malls and pedestrian areas open to slow moving commercial vehicles	5000
D	Carriageways of roads and areas open to commercial vehicles	8000

The pit shall be of sufficient size to provide a safe work environment. The dimensions of a cable pit shall be suitable for works under this contract and future provisions. These works special allowance include, but not limited to the following requirements:

- Minimum bending radius consideration, including those for possible future cable installation utilising the spare ducts;
- Space requirements for installation and maintenance of cable joints;
- Allowance for future cable joints for repairs to the cable installation.

The contractor shall ensure pits are appropriate for the number and sized of cables and conduits to be installed, the minimum dimensions of each pit shall be as follows.

Communications 600 x 600

Power Up to 25mm² 600 x 600

Power Greater than 25mm² 900 x 900

Power High Voltage To local authority standard

Where the pit is for an authority asset such as Telstra or NBN the pit shall be the type approved by the asset owner.

3.5.1 Drainage

Conduits shall be installed with slope allowing water to drain into cable pits. Provide drainage from the bottom of cable pits, either to a suitable soakaway/absorption trenches filled with rubble or to the stormwater drainage system. Absorption trenches shall drain away from the building and be a minimum of 300 x 300 x 2000 mm.

For landscape applications, where only foot traffic is anticipated, a gravel compact base of minimum 150mm thickness is recommended at the bottom of the pit.

All cable pits shall be installed as per manufacturer recommendation including the general drainage provisions.

3.6 POWER POLE CONNECTION

Provide power supply connection to power pole in street where indicated on drawing and as follows:

- unmetered mains to run up pole to the height nominated by the Supply Authority, or where not nominated, 4m above ground, in galvanized steel conduit on side of pole opposite approaching traffic;
- provide 1.2m long tails for connection by Supply Authority;
- provide approved pole mounted fuse box where required by Supply Authority.

3.7 METER PANEL

Supply and install a meter panel of suitable size for the Local Supply Authority to mount their meters in accordance with their requirements. Panel to be of BR manufacture.

The new meter is to be a “Smart” meter capable of being read remotely, unless specifically nominated otherwise and the Contractor will make the necessary arrangements for this to be provided.

Provide space and mount in the panel the Local Supply Authority’s CTs for their meters, in accordance with their requirements.

Provide dust seals on the door.

3.8 MAIN METER AND DISTRIBUTION BOARD

Supply and install a main meter and distribution board where shown on the drawings, in accordance with the local Supply Authority’s requirements.

The board shall be provided with sufficient space to mount all required meters as necessary. Space will be provided to run all incoming and outgoing cables in a neat and orderly manner. Provide all necessary conduits, trays or duct connections.

3.9 SURVEY OF EXISTING SWITCHBOARDS AND CABLES

The contractor shall allow to survey the existing switchboards, as nominated below, and provide a detailed report or single line diagram, which includes the following information;

Switchboard Designation	Board details	Board sub circuit details	Inspection Comments
Main switchboard for the Board Riders Building (MSB.1)	Main switch capacity and setting: Upstream cable size and capacity: Number of ways (used/total)	All sub board switch capacities and settings: All submain cable sizes and capacities:	Manufacture date Manufacture Standard RCD protected circuits in accordance with AS3000: General condition report & comments
Main switchboard for the Pier (MSB.2)	Switch capacity and setting: Upstream cable size and capacity: Number of ways (used/total):	All sub board switch capacities and settings: All submain cable sizes and capacities:	Manufacture date Manufacture Standard RCD protected circuits in accordance with AS3000: General condition report & comments
Switchboard for Lighthouse (MSB.3)	Switch capacity and setting: Upstream cable size and capacity: Number of ways (used/total):	All sub board switch capacities and settings: All submain cable sizes and capacities:	Manufacture date Manufacture Standard RCD protected circuits in accordance with AS3000: General condition report & comments

The survey shall be conducted before any significant works commence on site and the information shall be submitted by the contractor to the Superintendent once completed, and with a minimum of two weeks to enable the project team sufficient time to review and provide further direction.

3.10 MODIFICATION TO EXISTING SWITCHBOARDS

The existing boards shall be modified as follows:

- Connect the new consumer mains to the existing main switch of the Board Riders MSB.
- Relocate existing authority meters to the new MSB as agreed with the local power authority.
- Provide new or upgrade legends to suit new arrangement.
- The shut down of the switchboard can only occur at times agreed to with the client beforehand. If this needs to be done out of hours then the cost shall be included in the tender.

3.11 SWITCHBOARDS

Supply and install the following switchboards where shown on the drawings and/or as scheduled.

Boards shall be fabricated, and design verified strictly in accordance with the AS/NZS 61439 Series. The IP rating nominated be as per AS60529.

All metal boards shall be finished with primer, undercoat and 2 coats of epoxy polyester of colour schedule.

Circuit breakers shall be in accordance with AS/NZS 60947 Series and shall be approved and fault rated as required by the Local Supply Authority.

Residual current devices shall be in accordance with AS 3100, AS 3190 and AS/NZS 60898 Series as well as the requirements of the Local Supply Authority and/or other Authority having jurisdiction in their use.

Provide earthing in accordance with the Local Supply Authority's requirements and AS/NZS 3000.

Upon request contractor shall submit design verification certificates to AS/NZS 61439 for all switchboards.

For an MSB, the contractor shall include the relevant verification certificates and a Design Verification Report (DVR) including the switchboard assembler’s design response addressing each of the items and requirements in AS/NZS 61439. This shall be submitted with the final submission.

All boards shall be supplied complete including;

- Lift-off hinges for removeable hanging doors, panels and covers with stainless steel pins; each pair of hinges to have unequal length pins.
- Where panels and doors are to be removed, provide with chromium-plated D type handle, provide a minimum three points of latching for doors longer than 1000mm.
- Provide hinged escutcheon, provide a continuous 20mm wide support frame for the fixing of each escutcheon plate, including additional support where necessary to prevent panel distortion.
- Clip-in mounting chassis (where applicable), typed circuit identification card and holder, cable duct, earth and neutral bars and lockable doors with smoke sealing.
- Provide fixings in the supporting structure, and removable attachments for lifting Switchboard with dimensions greater than 1200 x 600
- Provide a switchboard legend within the door of the Switchboard. The legend shall include the cable size feeding the board, the origin of the cable and details of the areas that the circuits serve. Each circuit shall have the following labelled: Room Name/Area Description, Room Number and Circuit Designation. Provide an A3 laminated copy of the plan of the switchboard area served.
- Provide nameplate/compliance plate on Switchboard front door noting with minimum information of Switchboard rating, designed fault level, manufacturing date and the standards applicable.
- Provide engraved labels for all Air Circuit Breakers, Moulded Case Circuit Breakers, timeclocks, control switches, isolators, automatic transfer switches etc.

The MSB shall be an external board made from marine grade aluminium with IP 54 rating.

The board shall be mounted on a 150mm high concrete plinth.

The board shall comprise the following components:

- incoming unmetered mains connection.
- meters.
- distribution section.

3.11.1 Manufacture & Construction – MSB

The main switchboard shall be fabricated and design verified in accordance with the AS/NZS61439.2 Specification for Modular Switchboard Systems

Characteristics	Reference clause or sub clause	Default arrangement	Options listed in standard	User requirement
Electrical system				
Earthing system	5.6, 8.4.3.1, 8.4.3.2.3, 8.6.2, 10.5, 11.4	Manufacturer's standard, selected to suit local requirements	TT / TN-C / TN-C-S / IT, TN-S	TN-C-S
Nominal voltage (V)	3.8.9.1, 5.2.1 8.5.3	Local, according to installation conditions	Max. 1000 VAC or 1500 VDC.	400V AC
Transient overvoltages	5.2.4, 8.5.3, 9.1, Annex G	Determined by the electrical system	Overvoltage category I / II / III / IV	III
Temporary overvoltages	9.1	Nominal system voltage 1 200 V	None	NONE
Rated frequency fn (Hz)	3.8.12, 5.5, 8.5.3, 10.10.2.3, 10.11.5.4	According to local installation conditions	d.c. / 50 Hz / 60 Hz	50 Hz
Additional on site testing requirementswiring, operational performance and function	11.10	Manufacturer's standard, according to application	None	
Short-circuit withstand capability				
Prospective short-circuit current at supply terminals Icp (kA)	3.8.7	Determined by the electrical system	None	18kA
Prospective short-circuit current in the neutral	10.11.5.3.5	Max. 60 % of phase values	None	
Prospective short-circuit current in the protective circuit	10.11.5.6	Max. 60 % of phase values	None	
SCPD in the incoming functional unit	9.3.2	According to local installation conditions	Yes / No	In MSB
Co-ordination of short-circuit protective devices including external short-circuit protective device details.	9.3.4	According to local installation conditions	None	
Data associated with loads likely to contribute to the short-circuit current	9.3.2	No loads likely to make a significant	None	

		contribution allowed for		
Protection of persons against electric shock in accordance with **IEC 60364-4-41**				
Type of protection against electric shock – Basic protection (protection against direct contact)	8.4.2	Basic protection	According to local installation regulations	
Type of protection against electric shock – Fault protection (protection against indirect contact)	8.4.3	According to local installation conditions	Automatic disconnection of supply / Electrical separation / Total insulation	

Characteristics	Reference clause	Default arrangement	Options listed in standard	User requirement
Installation environment				
Location type	3.5, 8.1.4, 8.2	Manufacturer's standard, according to application	Indoor / outdoor	Outdoor
Protection against ingress of solid foreign bodies and ingress of water	8.2.2, 8.2.3	Indoor (enclosed)IP 2X Outdoor (min.)IP 23	IP 00, 2X, 3X, 4X, 5X, 6X	Refer drawings
Protection after removal of withdrawable part	8.2.101	Manufacturer's standard	As for connected position / reduced protection to manufacturer's standard	
External mechanical impact (IK) NOTE IEC 61439-1 does not nominate specific IK codes.	8.2.1, 10.2.6	None	None	
Resistance to UV radiation (applies for outdoor assemblies only unless specified otherwise)	10.2.4	Indoornot applicable. Outdoortemperate climate	None	
Resistance to corrosion	10.2.2	Normal Indoor/Outdoor arrangements	None	
Ambient air temperature – Lower limit	7.1.1	Indoor–5 °C Outdoor–25 °C	None	

Ambient air temperature – Upper limit	7.1.1	40 °C	None	50°C
Ambient air temperature – Daily average maximum	7.1.1, 9.2	35 °C	None	
Maximum relative humidity	7.1.2	Indoor50 % at 40 °C Outdoor100 % at 25 °C	None	
Pollution degree (of the installation environment)	7.1.3	Industrial3	1 / 2 / 3 / 4	
Altitude	7.1.4	2000 m	None	500m
EMC environment (A or B)	9.4, 10.12, Annex J	A or B according to the application	A / B	
Special service conditions (e.g. vibration, exceptional condensation, heavy pollution, corrosive environment, strong electric or magnetic fields, fungus, small creatures, explosion hazards, heavy vibration and shocks, earthquakes)	7.2, 8.5.4, 9.3.3 Table 7	No special service conditions	None	Condensation

Characteristics	**Reference clause**	**Default arrangement**	**Options listed in standard**	**User requirement**
Installation method				
Type	3.3, 5.6	Manufacturer's standard	Various e.g. floor standing / wall mounted	Floor standing
Stationary/Movable	3.5	Stationary	Stationary / movable	
Maximum overall dimensions and weight	5.6, 6.2.1	Manufacturer's standard, according to application	None	
External conductor type(s)	8.8	Manufacturer's standard	Cable / busbar trunking system	
Direction(s) of external conductors	8.8	Manufacturer's standard	None	
External conductor material	8.8	Copper	Copper / aluminium	Copper
External phase conductor, cross-sections, and terminations	8.8	As defined within the standard	None	
External PE, N, PEN conductors cross- sections, and terminations	8.8	As defined within the standard	None	

Special terminal identification requirements	8.8	Manufacturer's standard	None	
Storage and handling				
Maximum dimensions and weight of transport units	6.2.2, 10.2.5	Manufacturer's standard	None	
Methods of transport (e.g. forklift, crane)	6.2.2, 8.1.6	Manufacturer's standard	None	
Environmental conditions different from the service conditions	7.3	As service conditions	None	
Packing details	6.2.2	Manufacturer's standard	None	
Operating arrangements				
Access to manually operated devices	8.4		Authorised persons / ordinary persons	Ordinary Persons (lockable)
Location of manually operated devices	8.5.5	Easily accessible	None	
Isolation of load installation equipment items.	8.4.2, 8.4.3.3, 8.4.6.2	Manufacturer's standard	Individual / groups / all	Individual

Characteristics	Reference clause	Default arrangement	Options listed in standard	User requirement
Maintenance and upgrade capabilities				
Requirements related to accessibility for inspection and similar operations	8.4.6.2.2	No requirements for accessibility	None	Authority Standard
Requirements related to accessibility for maintenance in service by authorized persons	8.4.6.2.3	No requirements for accessibility	None	Authority Standard
Requirements related to extension under voltage	8.4.6.2.4	No requirements for accessibility	None	
Method of functional units connection	8.5.1, 8.5.2		F = fixed connections D = disconnectable connection W = withdrawable connections	F
Protection against direct contact with hazardous live internal parts during maintenance or upgrade (e.g.	8.4	No requirements for protection	None	All live parts to be shielded to allow

functional units, main busbars, distribution busbars)		during maintenance or upgrade		installation of submains on spare circuits and access to circuit breakers
Gangways	8.5.101	Basic protection	None	
Form of separation	8.101		Form 1, 2, 3, 4	Refer drawings
Capability to test individual operation of the auxiliary circuits relating to specified circuits while the functional unit is isolated.	3.1.102, 3.2.102, 3.2.103, 8.5.101, Table 103	Manufacturer's standard	None	
Current carrying capability				
Rated current of the ASSEMBLY I nA (A)	3.8.9.1, 5.3, 8.4.3.2.3, 8.5.3 8.8, 10.10.2, 10.10.3, 10.11.5, Annex E	Manufacturer's standard, according to application	None	Refer drawings
Rated current of circuits I NC (A)	5.3.2	Manufacturer's standard, according to application	None	Refer Drawings
Rated diversity factor	5.4, 10.10.2.3, Annex E	As defined within the standard	RDF for groups of circuits / RDF for whole ASSEMBLY	
Ratio of cross-section of the neutral conductor to phase conductorsphase conductors up to and including 16 mm2	8.6.1	100 %	None	
Ratio of cross-section of the neutral conductor to phase conductorsphase conductors above 16 mm2	8.6.1	50 % (min. 16 mm2)	None	
a For exceptionally onerous applications, the user may need to specify more stringent requirements to those in the standard.				

3.11.2 Manufacture & Construction

Designation	MSB
Manufacture	NHP
Type	Custom
Mounting	Floor
Fault rating (kA)	Refer drawings
Phases	3
Bus-bar rating (amps)	Refer drawings
Min. Circuit Ways	36
Spare circuit ways required	Yes - 35% spare on each chassis
Lock	Yes
Colour	Grey N12
Installed in path of egress	No
Installed in architectural cupboard	No
Construction	Marine grade Aluminium
IP Rating	54
Max Temperature Rise	20°C
Form of Segregation	2

3.11.3 Equipment List

3.11.3.1 Main Switch or Isolators

Non-Auto MCB – Terasaki

Refer drawings

3.11.3.2 Sub-main Protection

Up to 100 amp – Terasaki Din T MCB.

Greater than 100 amp – Terasaki Tembreak MCCB.

Refer drawings

3.11.3.3 Sub Circuit Protection

Up to 100 amp – Terasaki Din T MCB.

Greater than 100 amp – Terasaki Tembreak MCCB.

RCD type circuit breakers shall be provided for all circuits where required in AS 3000.

Circuit Breakers shall generally be rated as follows; or otherwise as nominated on the drawings

Lighting - 16 amp

General Power - 20 amp

3 phase Power - 20 amp

3.11.3.4 Surge Protection

Supply and install NHP Cirprotec surge protection devices. The surge protection devices shall be in accordance with the appropriate category, class and/or type as per AS/NZS 1768, IEC 61643-11 and/or UL 1449 when connecting to main switchboard, distribution board and end circuit levels.

Surge protection devices shall be labelled and rated as per the requirements of the surge product standards IEC 61643-11 and/or UL 1449 3rd.

The surge diverter shall feature DIN mounting, replaceable modules and remote end of life monitoring via 250V/1A volt free contacts. Flag indication shall be provided whereby green flag indicates module is ok, and red flag means the module requires replacement.

Surge protection devices are to be installed with suitable upstream protection via fuses or circuit breakers in accordance with the manufacturer's recommendation.

Installation of the surge protection devices shall be in accordance with AS/NZS 3000 Wiring Rules and manufacturer's requirements

SWITCHBOARD	CATEGORY	SURGE CURRENT	PHASES	COMMENTS
MSB	Class 1+2	100kA Imax, 25kA Iimp, In 20kA	3	Main switchboard Surge Protection

3.12 METERS

Provide space in the switchboard and/or separate meter panel for the Local Authority to mount all required meters to their requirements. The contractor shall make all necessary arrangements for the any metering requirements to be provided.

3.12.1 Direct Connected Meter

Supply and install connection to Smart direct consumption meter to all the Local Authority and Local Service and installation rules.

The design and location of the meter panel shall ensure the temperature limits of the Direct Connected Meter shall be within -10°C to +60°C

To comply with local authority requirements the Main Circuit breakers size shall limit the maximum current drawn by the site to 100A for 2 hours. This can be done by either method.

i. 63A MCB
ii. An MCCB set to 80A. The MCCB shall be set to 80A and sealed with a supply authority seal.

Examples of MCCB's that can be set to 80A and comply with the 100A requirements are:

a) Terasaki E250NJ3100
b) Terasaki S250NJ3100
c) Terasaki S160NJ3100
d) Use of any different MCCBs shall be confirmed with the supplier that they comply with the installation rules requirements.

Supply and install a Fuse Current Limiter FCL to protect system from rating fault.

3.13 DISCRIMINATION OF POWER CIRCUITS

Circuit breakers and/or fuses shall be selected to ensure that the discrimination requirements of AS 3000 are met and a fault on any one circuit does not affect any other circuits on the same or higher level in the electrical circuit configuration.

3.14 EARTHING

The electrical contractor shall provide a complete earthing system to AS3000 Wiring Rules, this includes but is not limited to, an earth stake, men connections to sub switchboards, earthing of telephone MDF, earthing to conducting piping and earthing to structures including concrete slabs in shower and bathrooms, steel structures.

The earthing system is to be tested to ensure compliance with the standard.

3.15 MAINS AND SUB-MAINS

Supply and install the following mains and/or sub-mains. All shall be of the phases nominated and unless nominated otherwise contain earthing conductor of appropriate size in accordance with AS/NZS 3000.

Cable shall comply with AS 3008 and single core cables shall be run in trefoil. All cabling shall be spaced in accordance with AS/NZS 3008 so that de-rating factors need not be applied.

Where cables are installed in a manner that introduces a de-rating factor, then the cable sizes shall be increased to maintain the de-rated current rating of the specified cable.

All cables shall have a suitable mechanical and fire protection to comply with AS3013 and where nominated or otherwise required have a minimum fire rating of WS52W.

3.15.1 Schedule of Mains and Sub-Mains

Refer drawings.

4 PAINTING & EQUIPMENT IDENTIFICATION

4.1 SCOPE

The Contractor shall paint all parts of the work forming part of the Contract. All painting shall be carried out by a competent Tradesman Painter using first class materials of approved manufacture. The finishing coats shall be to colour nominated by the Superintendent.

4.2 IDENTIFICATION

All pipelines, conduits, and the like shall be provided with identification bands and arrows in accordance with AS 1345 and where applicable AS 5601.

Preformed adhesive pipe markers such as ‘Seton’ may be used in lieu of painting on pipes.

4.3 PAINTWORK

In general, all work shall be given two priming and two finishing coats of oil base paint. The following particular requirements shall also be met:

a) All metal surfaces subject to oxidisation shall be first treated with an approved phosphating agent applied to the maker’s directions.
b) All Apparatus Enclosures shall be painted internally with 2 coats of “Anodite” or other approved anti-corrosive paint. Externally two priming and two finishing coats of paint shall be applied.

5 MAINTENANCE & SERVICING

5.1 GENERAL

The contractor shall maintain the whole of the equipment in a proper and efficient working order for a period of twelve (12) months, from the time of final satisfactory inspection

5.2 DEFECT RECTIFICATION

All defective parts during the defect liability period shall be replaced without cost to the Client. This includes all electronic, electrical and mechanical components falling within the maintenance period, unless failure is due to improper use of the equipment by persons other than employees of the Installer.

5.3 PREVENTATIVE MAINTENANCE

For the duration of the defects liability period the contractor shall allow for and carry out routine preventative maintenance on all equipment including during the defects liability period.

The contractor will conduct programmed maintenance and provide service reports to the client, superintendent and engineer in accordance with the following table.

SYSTEM	1 Monthly	3 Monthly	6 Monthly	12 Months
Switchboards			✓	✓

5.4 MAINTENANCE RECORDS

Up-to-date maintenance reports and log books shall be provided for all plant, equipment and systems installed.

Maintenance records shall contain at least the following information:

- Date, item of plant, equipment or system and nature of service performed.
- Details of defects found and rectification procedure undertaken.
- The name of the person and company performing the service.

5.4.1 Availability of manuals and records

Operating and maintenance manuals and maintenance service records shall be readily available at the site for inspection by the client, superintendent or regulatory authority upon request. For the purpose of maintenance management the maintenance service records shall be handed over to the client at the completion of the maintenance period for their on-going maintenance program and retained for a period as required by the regulatory authority. Defects identified in service or inspection reports shall be notified to the plant owner/occupier, manager or their nominated representative in a timely way.

5.5 CONTRACTOR AVAILABILITY AND RESPONSE TIME

From the date of commissioning the system, the contractor shall deem to be available twenty-four (24) hours a day, seven (7) days a week. The Installer shall respond to a system fault within two (2) hours at the request of the Client.

6 TESTING AND COMMISSIONING

6.1 SCOPE

The contractor shall allow to test and commission all Electrical Services systems installed as part of this project.

For all systems installed the contractor shall carry out preliminary testing, checking, control setting, etc. prior to the Superintendent being notified that the work has reached the state of Practical Completion.

Provide all necessary testing apparatus and be responsible for all costs associated with the testing.

Test, demonstrate and report on operational readiness of the following systems :

- Electrical Main Switchbaord

Each system shall be tested as specified in the respective section for the system herein and the associated Standards. All electrical Installation testing shall be carried out in accordance with AS/NZS 3017.

Where interfaces with systems of other trades are involved, the Electrical Sub-Contractor shall attend to the combined commissioning of these systems when instructed by the Superintendent.

The results of the commissioning shall be included in the Operation and Maintenance Manuals.

6.2 INSTRUCTION OF OPERATORS

Provide a skilled technician to instruct and advise the Proprietor's Operator in matters of operation, maintenance and taking records relating to the Electrical Services. The agreed date shall be determined with the Superintendent.

6.3 COMMISSIONING

Provide a skilled operator to completely and properly commission all equipment and controls specified herein in this Specification. All equipment shall be checked and adjusted and shall be operated from full load to minimum. After 300 hours operation after the handover date the contractor shall clean all filters, clean strainers, check drives, check mountings and clean down equipment etc. and ensure that everything is operating properly.

6.4 COMMISSIONING REPORT

Provide a final commissioning report documenting commissioning methods and test results of each system or feature within the contract documents. The report must also include a documented list of outstanding commissioning issues, records of all functional/commissioning testing undertaken and list any seasonal testing required in the future.

6.5 CERTIFICATION

Upon completion the Contractor shall provide “Certificates of Compliance” for all individual systems and the project in general.

The certificates shall be signed by the relevant Contractor/Sub Contractor and shall state that the whole system has been installed, commissioned and tested in accordance with the relevant Australian Standards and Regulations.

This includes but is not limited to:

- Certificate of Electrical Safety

All certificates shall be included in the Operation and Maintenance Manuals.

7 CONTRACT COMPLETION DOCUMENTATION

Final progress payment and practical completion will not be made until the following has been completed.

7.1 CERTIFICATE OF COMPLIANCE

All works under the testing and commissioning section of this specification is completed.

7.2 MAINTENANCE MANUALS & AS BUILTS

Provide to the Superintendent three (3) copies of a properly bound Instruction Manual which they shall prepare, giving full details of the construction, maintenance and operation of all equipment purchased by the Contractor forming part of this Contract. These manuals shall be provided at the time of handing over the work and shall be a condition of issuance of Practical Completion. The maintenance period shall not commence until satisfactory Manuals have been received.

7.2.1 Objectives

The objectives the Operations and Maintenance Manuals shall achieve are:

a) To be of sufficient detail to enable the Principal to take over any maintenance, operation or use of the new facility and to do so in a safe, effective and efficient manner.
b) To provide information on where replacement parts and equipment can be sourced and the capacity type and identification of each item, so they can be properly ordered or replaced.
c) Provide names and contact details of the installing contractors/sub-contractors for future reference.
d) To be fully completed and finalised prior to the Principals occupation, use or acceptance of the new facility.

7.2.2 Maintenance Manual Format

The format of the Operation and Maintenance manuals is to be as follows;

Maintenance manuals shall be provided into hard covered, durable 3 or 4 ring binders with durable labels on the front cover and spine and coloured section identifiers with labels.

Manuals shall be provided in both hard copy format and digital format as follows;

7.2.2.1 Hard Copies

- “As built/as installed” drawings shall be folded into transparent A4 sized plastic sleeves.
- The remainder of the manual including general description, operating instructions, maintenance instructions, equipment lists, suppliers and installing contractors shall be printed on heavy A4 paper and inserted into plastic sleeves and arranged with 2 pages (back to back) per sleeve.

7.2.2.2 Digital Copies

- “As built/as installed” drawings shall be provided in both AutoCAD 2014 format or higher version and PDF format.
- The remainder of the manual shall be provided in PDF format.
- Digital copies shall be provided on a memory stick in plastic folders inside the manual.
- A complete soft copy of the manual and As Built drawings shall be uploaded to a permanent cloud-based platform. The platform shall be as nominated by the client.

7.2.3 Maintenance Manual Sections

The manuals shall be segregated into the following sections;

a) **Introduction & Scope** – general description of plant or equipment, including capacities, purpose and intended mode of operation;
b) **Operation Instructions** - operating instructions, including method of starting and stopping plant, important data sheets and alternative modes of operation;

c) **Operation Description** - description of control systems, schematic diagrams and detailed functional description, including lists of symbols used;
d) **Maintenance** - maintenance instructions, including methods of carrying out the work, special precautions and recommended periodic attention;
e) **Commissioning Settings -** Adjustment of and correct settings for all control and safety devices;
f) **Commissioning Data –** final commissioning data pertinent to this installation.
g) **Equipment Details -** a spare parts list showing part numbers and description of all items and where necessary "exploded" views shall be used to assist in identifying the component;
h) **Warranty and Certificates** - descriptions of all warranties and (both contracted and procured through suppliers) for the assets and descriptions of any certificates issued as part of the works including uploaded copies of all relevant documents
i) **Drawings and Reference** - all 'as-installed' drawings and equipment catalogues;

7.2.4 Submission of Manuals

All manuals shall be submitted no later than three months before the practical completion to enable a preliminary review of the manuals. It is understood that the manuals may not contain elements such as as-built drawings and certificates. However, the manuals can be prepared to indicate the respective proposed layouts.

Should the Principal and or the Authorised Person identify any errors or omissions in the submitted data then within the time period stated in any approved Commissioning and Handover Plan or the issued Defect Notice the Contractor is required to rectify any items and to pay all such costs that may be incurred to update the final data.

NOTE: 1 No. copy of Instruction Manual only shall be provided for engineer's review and approval prior to the completion and submission of all 3 No. manuals.

7.2.5 As-Built Drawings

The Contractor will be required to mark up all new installation and existing connection locations with dimensioned offsets from existing buildings and/or survey markers during the currency of the project. Prior to the handing over of the job, As-Built dimensioned drawings shall be properly drawn up by the Contractor free of any superfluous markings and handed to the Superintendent for review and approval.

The Contractor shall also mark and dimension on the 'as-built' drawings the exact position and depth of all services as actually laid in the ground where applicable. Services to be included shall be all those associated with the Contract and including any existing services crossovers and/or connection locations for all services including water, gas, drains, services pipework, electrical mains and conduits.

Ensure the content, accuracy and level of detail of as-built drawings are equivalent to those in the detail design drawings used for construction and are sufficient to describe and to ensure the efficient operation of the assets created under the Contract. Where required to describe the Works, include digital photographs of specific aspects of the Works in as-built drawings or operations and maintenance manuals. The drawings shall include as installed circuit and data point numbering.

All work as executed and as-built documentation must be in accord with the Specification. Verify each drawing certifying accuracy, completeness, correctness and compliance with CAD conventions.

The Superintendent will make available 'AutoCAD' existing survey drawing files to assist the contractor. However, it remains the Contractor's responsibility to verify all dimensions on site.

7.2.6 Compliance with Laws, Standards and Specifications

The Contractor shall check and verify that all data and attached files and documents that form the completed O&M Manuals comply with the relevant Laws, Standards, Codes and Specifications applicable to the works to enable the proper operation and maintenance by the Principal and or its appointed agents of the completed works.

7.2.7 Preparation of Manuals

The Operation and Maintenance Manual shall be prepared by an independent suitably qualified person experienced in preparation of Operation and Maintenance Manuals.

7.3 THERMAL IMAGING

The Contractor shall have a thermal image of the switchboards carried out by an approved contractor with proper IR camera for this purpose. The thermal images and certification that the board meets acceptable temperature levels shall be included in the maintenance manuals.

This work shall be carried out within 1 month after hand-over and when the switchboard is operating at a relatively high load.

7.4 STAFF TRAINING

In addition to the training noted in the previous sections above the Contractor is to ensure all relevant staff, consultants and sub-contractors are suitably trained in the proper operation of the documented systems. Training shall include operator level and service levels to maintenance and servicing teams.

Provide records of training attendance including time, attendees, and subject matter.

Training is to occur following commissioning and testing, and approved maintenance manuals.

8 WARRANTY PERIOD

The Contractor shall warrant the performance, condition and operation of the whole installation for a period of 12 months from the date of Practical Completion of the works.

The contractors shall include all manufacturer's warranties as part of the Maintenance Manual.

9 MONETARY SUMS AND TENDER SCHEDULE

9.1 TENDER SCHEDULE

9.1.1 Section Costs

1.	Authority charges associated with making power supply available.	$…….
2.	Supply and installation of MSB	$…….
3.	Relocation of all the meters to the MSB	$…….
4.	Supply and installation of conduits and pits	$…….
5.	Removal of existing overhead line to the Board Riders building	$…….
6.	Commissioning and Testing	$…….
7.	Maintenance Manuals	$…….
8.	As-built drawings	$…….
9.	Defects Liability Maintenance	$…….
	Total Tender Price Ex GST	**$……**

9.1.2 Electrical Contractor Details

Electrical Contractors Company Name	……
Electrical Contractors Registration Number	……
Date	……
Signature	……