

# **BETIO POWER HOUSE BUILDING SPECIFICATION**

**Rev A  
December 2022**

**Prepared for:**  
**The Public Utilities Board ( PUB)**

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## Issued and revision record

Revision	Date	Originator	Checker	Approver	Description
A	24/12/2022	Jim	Binh Dinh	Carl Gay	1 <sup>st</sup> Issue

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# 1 INTRODUCTION

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This document specifies the design of a prefabricated building to be used to house six (6) diesel power generation stations, each including a generator/alternator combination, transformer and switching unit, along with control room, workshop and equipment handling equipment, located in the Republic of Kiribati.

The remote location of the site severely restricts availability of the materials and labor required to permit conventional construction methods to be practically applied to this project, therefore all of the building components will be prefabricated offshore, shipped to the site and assembled.

Offshore remote prefabrication requires manufacturers to complete shop drawings to a level of detail that yield BOMs that assure all piece parts are accounted for when the manufacturing is complete, in order to assure that the delivered system can be fully assembled with no missing parts on site. To achieve this end, the building has been divided into four primary sub-assemblies:

## 1. Substructure

- a. Foundation
- b. Floor Slab

## 2. Superstructure with Building Services

- a. Building Frame, Siding and Roof
- b. Interior and Exterior Lighting
- c. Electrical and Data Transmission System
- d. Drainage

## 3. Control Room and Workshop Modules

- a. Individual modules fully complete for installation and connection on site
- b. Modules will also serve as a mezzanine-level storage area

## 4. Crane

- a. 25T overhead gantry crane that covers the full length of the building, including mezzanine storage

The sub-assemblies listed above shall be procured as a single assembly in order to ensure coordinated delivery times, shipment and to ensure arrival of the complete assembly kit on site. The assembly will support procurement under a single procurement contract by a “Main Supplier”.

In order to assure effective and complete prefabrication, the following requirements must be passed on to all subcontractors that manufacture any component of the substructure and superstructure:

1. All manufactured components will be based on the detailed design referred to in this specification.

2. Each subcontractor is required to prepare a complete set of shop drawings that include all details necessary to assemble the building in its entirety on site using the first delivery of components only. Details include but are not limited to:
  - a. Cable and pipes, cut to required lengths and sizes
  - b. Connectors, joints, junction boxes and all components necessary to complete the sub-assembly
  - c. Attachment points for all components to the building, including locations of all mounting points, bracketry, mounting requirements and sequences
  - d. All consumables necessary to complete assembly of the prefabricated components
3. All shop drawings must include an associated Bill of Materials (BOM), which can be used to confirm the inclusion of all materials required to assemble the prefabricated building before shipment.
  - a. The BOM must include quantities and all material specifications
4. All shop drawings must be taken from an accurate 3D model using the Autodesk Revit system. Accuracy of fit, form and function of all parts in the prefabricated sub-assembly must be checked by each manufacturer as part of the quality assurance inspection process.
5. All sub-assemblies will be inspected to the piece-part level before packing for shipment
  - a. Manufacturers will be required to demonstrate checking of 3D model, shop drawings and BOMs prior to acceptance and shipment of the sub-assembly

**BETIO POWER HOUSE**  
**MEP SPECIFICATION**  
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### Issued and revision record

Revision	Date	Originator	Checker	Approver	Description
A	19/12/2022	Thu Ho	Binh Dinh	Carl Gay	1 <sup>st</sup> Issue

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# 1 GENERAL REQUIREMENTS

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## 1.1 GENERAL

### 1.1.1 APPLICABILITY

#### 1.1.1.1 General

Requirement: Conform to *General requirements*, as appropriate, in all work sections.

### 1.1.2 PERFORMANCE

#### 1.1.2.1 Energy efficiency

Provide equipment with energy efficient ratings to a recognised international standard, with Australian Standards as a general benchmark.

#### 1.1.2.2 Structural design actions

Standard: To the AS/NZS 1170 series and AS 4055 as appropriate.

### 1.1.3 STANDARDS

#### 1.1.3.1 Current editions

General: Use referenced Australian or other standards (including amendments), and the BCA including state and territory variations which are current three months before the date of the contract except where other editions or amendments are required by statutory authorities. Any local authority requirements take precedence.

### 1.1.4 QUALITY

#### 1.1.4.1 General

Implement a quality management system for project delivery.

Technical submissions: Submit technical submissions for all equipment and materials to demonstrate compliance.

Samples: Submit samples for approval for all visible items.

Working drawings: Prepare and submit working drawings showing actual equipment to be installed, actual working methods (conduits, hangers etc).

Inspection & Test Plans: Implement a system of ITPs for installation and testing & commissioning.

Records: Provide weekly reports including photographic evidence.

Testing & commissioning: Implement a T&C system and regime from early on in the installation process until completion.

### 1.1.5 INTERPRETATION

#### 1.1.5.1 Definitions:

General: For the purposes of this document the definitions given below apply:

- Owner: Owner has the same meaning as client, principal or proprietor and is the party to whom the contractor is legally bound to construct the works.
  - Contractor: Means the same as builder.
  - Metallic-coated: Steel coated with zinc or aluminium-zinc alloy via a continuous hot-dip process.
  - Hot-dip galvanized: Zinc coated to AS/NZS 4680 after fabrication.
  - Professional engineer: As defined by the BCA.
  - In some states and territories, additional or alternative criteria may apply e.g., Registered Professional Engineer, Queensland (RPEQ).
  - Proprietary: Proprietary means identifiable by naming manufacturer, supplier, installer, trade name, brand name, catalogue or reference number.
  - Provide: Provide and similar expressions mean supply and install and include development of the design beyond that documented.
  - Required: Means required by the contract documents, the local council or statutory authorities.
  - Supply: Supply, furnish and similar expressions mean supply only.
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## 1.2 PRODUCTS

### 1.2.1 GENERAL

#### 1.2.1.1 Manufacturers' or suppliers' recommendations

General: Provide and select, if no selection is given, transport, deliver, store, handle, protect, finish, adjust and prepare for use the manufactured items in accordance with the current written recommendations and instructions of the manufacturer or supplier.

Proprietary items/systems/assemblies: Assemble, install or fix to substrate in accordance with the current written recommendations and instructions of the manufacturer or supplier.

#### 1.2.1.2 Sealed containers

General: If materials or products are supplied by the manufacturer in closed or sealed containers or packages, bring the material or products to point of use in the original containers or packages.

#### 1.2.1.3 Substitution

Identified proprietary items: Identification of a proprietary item does not necessarily imply exclusive preference for the item so identified, but indicates the necessary properties of the item.

Alternatives: If alternatives to the documented products, methods or systems are proposed, submit sufficient information to permit evaluation of the proposed alternatives.

### 1.2.2 STEEL

#### 1.2.2.1 Durability

General: Provide steel products protected from corrosion to suit the conditions of use.

Internal engineer designed steel members: Remove mill scale, rust, moisture and oil. Coat with a zinc phosphate primer to the manufacturer's instructions.

#### 1.2.2.2 Corrosion resistance

General: Conform to the following atmospheric corrosivity category as defined in AS/NZS 2312.

Atmospheric corrosivity category: C for more than 500m from sea, and D for less than 500m

Compliance: Conform to the **Corrosion resistance table** or provide proprietary products with metallic and/or organic coatings of equivalent corrosion resistance and as follows:

- Built-in products below damp proof course: Stainless steel 316 or engineered polymer.

#### 1.2.2.3 Corrosion resistance table

Atmospheric corrosivity category to AS/NZS 2312	Below ground supportss	Above ground supports
A and B (Low)	Galvanize after fabrication 600g/m <sup>2</sup>	Metallic-coated sheet AZ150
C (Medium)	Galvanize after fabrication 600g/m <sup>2</sup>	Metallic-coated sheet AZ200
D and F (High)	Stainless steel 316 or 316L or galvanize after fabrication 600g/m <sup>2</sup> plus organic coating	Metallic-coated sheet AZ200 plus organic coating

#### 1.2.2.4 Preparation and pre-treatment

Standard: To AS 1627 series.

#### 1.2.2.5 Galvanizing

General: Galvanize mild steel components (including fasteners) to AS 1214 or AS/NZS 4680, as appropriate, if:

- Exposed to weather.
- Embedded in masonry.
- Exposed to or in air spaces behind external leaves of masonry walls.
- In contact with chemically treated timber.

### 1.2.3 PROTECTIVE COATINGS

#### 1.2.3.1 General

Environment: To AS/NZS 2312 clause 2.3.

Coating designation: To AS/NZS 2312 Table 6.3.

#### 1.2.3.2 CCA (copper chrome arsenic) treated timber

Greasing: Before placing bolts or other metal components in contact with CCA-treated timber, paint contact surfaces or coat in grease or a bituminous coating.

#### 1.2.3.3 Unseasoned timber

General: Do not fix in contact with steel framing without fully painting the contact surfaces of timber and steel.

### 1.2.4 FASTENERS

Use fasteners with appropriate load bearing capacity and with appropriate corrosion

protection

## 1.3 EXECUTION

### 1.3.1 WALL CHASING

#### 1.3.1.1 Holes and chases

General: Make holes and chases required in masonry walls so that the structural integrity of the wall is maintained. Do not chase walls nominated as fire or acoustic rated.

Parallel chases or recesses on opposite faces of a wall: Not closer than 600 mm to each other.

Chasing of blockwork: Chase only core-filled hollow blocks or solid blocks not designated as structural and to the **Concrete blockwork chasing table**.

#### 1.3.1.2 Concrete blockwork chasing table

Block thickness (mm)	Maximum depth of chase (mm)
190	35
140	25
90	20

### 1.3.2 FIXING

#### 1.3.2.1 General

Suitability: If equipment is not suitable for fixing to non-structural building elements, fix directly to structure and trim around penetrations in non-structural elements.

#### 1.3.2.2 Fasteners

Sufficiency: Use proprietary fasteners capable of transmitting the loads imposed, and sufficient for the rigidity of the assembly.

### 1.3.3 OWNER PROVIDED EQUIPMENT

Where the owner elects to provide materials and/or equipment directly eg sanitaryware, lighting or home automation, the contractor is assumed to have included the following in their labour pricing, or is to nominate a percentage at tender to cover for the following:

- \* unloading of materials/ equipment on site
- \* acceptance of responsibility for materials/ equipment up to handover
- \* storage of materials/ equipment on site
- \* security and protection of materials/equipment up to hand over
- \* installation of materials/ equipment as per the specification and manufacturer's recommendation and including all ITPs and quality control system
- \* T&C of all materials/ equipment
- \* Repair and/or replacement, or compensation for the cost to the Client, required by damage, theft or other loss of materials/ equipment
- \* Protection of materials/ equipment as deemed necessary (including timber covers for baths) after installation and up until hand over
- \* Handover procedures

### **1.3.4 COMPLETION**

#### **1.3.4.1 General**

Removal of temporary work, services and plant: Remove temporary work services and construction plant within 10 working days after occupation of the works.

Final cleaning: Remove rubbish and surplus material from the site and clean the works throughout including interior and exterior surfaces exposed to view. Vacuum clean carpeted and soft surfaces. Clean debris from the site, roofs, gutters, downpipes and drainage systems.

Samples: Remove non-incorporated samples, sample panels and prototypes.

Warranties: Register with manufacturers, as necessary, and provide copies of manufacturers' warranties.

Instruction manuals: Provide the manufacturers' instruction manuals, one set per dwelling in an appropriate quality folder, plus soft copies on disk.

As-built drawings: Provide as-built drawings in hard copy per dwelling plus soft copy.

Operation: Make sure systems and moving parts operate safely and smoothly.

Services layout: Provide a plan which shows the location of underground services.

Authorities' approvals: Provide evidence of approval of the local authority or principal accredited certifier and statutory authorities whose requirements apply to the work.

## 2 MECHANICAL

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### 2.1 GENERAL

#### 2.1.1 STANDARDS

##### 2.1.1.1 General

Mechanical ventilation: To AS/NZS 1668.1 and AS 1668.2, as required by the BCA.

### 2.2 PRODUCTS

#### 2.2.1 WINDOW/WALL FANS

##### 2.2.1.1 Standard

British Standard.

##### 2.2.1.2 Impeller

Propeller type.

##### 2.2.1.3 Housing

Characteristics:

- Isolating mountings.
- Discharge cowls with birdmesh guards.
- Backdraft shutters constructed from lightweight nylon or aluminium blades, arranged to gravity close when fans are not operating.
- Provide industrial fan for plant room and selecting fan to suit the room working temperature

## 3 HYDRAULIC

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### 3.1 GENERAL

#### 3.1.1 STANDARDS

##### 3.1.1.1 General

Plumbing and drainage: To the AS/NZS 3500 Series.

Authorised products: Use products with recognised water usage listing..

### 3.2 PRODUCTS

#### 3.2.1 SANITARYWARE AND TAPWARE

Provide sanitaryware and tapware as scheduled.

Note that usually this specified by the Architect, and demonstrates the desired properties of the intended items, though alternatives may be offered at tender with supporting product data; samples may be required.

#### 3.2.2 PLUMBING PIPEWORK

##### 3.2.2.1 Standards

General: To AS/NZS 3500.1, AS/NZS 3500.4 or AS/NZS 3500.5.

##### 3.2.2.2 Pipe material

General:

- Cold water: **Stainless steel pipe** internally, HDPE externally and underground.
- Heated Water: **Stainless steel pipe with insulation**

#### 3.2.3 STORMWATER

##### 3.2.3.1 Standards

General: To AS/NZS 3500.2 or AS/NZS 3500.5.

Pipe material For stormwater, HDPE pipe is used.

#### 3.2.4 WASTEWATER

##### 3.2.4.1 Standards

General: To AS/NZS 3500.2 or AS/NZS 3500.5.

For wastewater, provide pipework from a range designed for soil and waste application, for example by Snow or Wavin, complete with matching fittings, eg bends at 88 degrees rather than 90 degrees, and appropriate access points.

#### 3.2.5 WATER HEATERS

##### 3.2.5.1 Standards:

- Electric water heaters: To AS/NZS 4692.1.
  - . Energy performance: To AS/NZS 4692.2.

### 3.3 EXECUTION

#### 3.3.1 INSTALLATION

##### 3.3.1.1 Connections to Network Utility Operator mains

General: Excavate to locate and expose the connection points and connect to the Network Utility Operator mains. On completion, backfill and compact the excavation and reinstate surfaces and elements which have been disturbed such as roads, pavements, kerbs, footpaths and nature strips.

##### 3.3.1.2 Piping

General: Install piping in straight lines and to uniform grades. Arrange and support the piping so that it remains free from vibration and water hammer, while permitting thermal movement. Keep the number of joints to a minimum. Prevent direct contact between incompatible metals. Embedded pipes: Do not embed pipes that operate under pressure in concrete or surfacing material.

Concealment: If practicable, conceal piping and fittings requiring maintenance or servicing so that they are accessible within non-habitable enclosed spaces such as roof spaces, subfloor spaces and ducts. Keep pipelines in subfloor spaces at least 150 mm above ground and make sure access can be provided throughout for inspection. Provide at least 25 mm clearance between adjacent pipelines (measured from the piping insulation where applicable).

Building penetrations: If piping or conduit penetrates building elements, provide metal or PVC-U sleeves formed from oversized pipe sections.

Cover plates: If exposed piping emerges from wall, floor or ceiling finishes, provide cover plates of non-ferrous metal, finished to match the piping, or of stainless steel.

Pipe support materials: The same as the piping, or galvanized or non-ferrous metals, with bonded PVC-U or glass fibre woven tape sleeves where needed to separate dissimilar metals.

#### 3.3.2 FINISHES

##### 3.3.2.1 General

General: Finish exposed piping, including fittings and supports as follows:

- In internal locations such as toilet and kitchen areas: Chrome plate copper piping to AS 1192 service condition 2, bright.
- Externally and steel piping or worn fittings internally: Paint.
- In concealed but accessible spaces (including cupboards and non-habitable enclosed spaces): Leave copper and plastic unpainted except for required identification marking. Prime steel piping and iron fittings.
- Valves: Finish valves to match connected piping.

#### 3.3.3 COLD AND HEATED WATER

##### 3.3.3.1 Standards

General: To AS/NZS 3500.1, AS/NZS 3500.4 or AS/NZS 3500.5.

##### 3.3.3.2 Pipework

Insulation in addition to that required by AS/NZS 3500: insulate all pipework within walls



and cast into slabs, with neoprene and polythene wrap.

### **3.3.3.3 Tap positions**

Requirement: Locate hot tap to the left of, or above, the cold water tap.

### **3.3.3.4 Fittings and accessories**

General: Provide the accessories and fittings necessary for the proper functioning of the plumbing systems, including taps, valves, outlets, pressure and temperature control devices, strainers.

### **3.3.3.5 Water heaters**

Location: Locate water heaters where they can be maintained or replaced without damaging adjacent structures, fixtures, or finishes.

Isolating valves: Provide isolation valves to water heaters.

### **3.3.3.6 Heated water temperature**

Standard: To AS/NZS 3500.4.

Maximum temperature at ablution outlets: 50°C.

### **3.3.3.7 Cleaning**

General: On completion, disinfect, and flush the pipelines using water and chlorine and leave pipelines clean.

## **3.3.4 STORMWATER**

### **3.3.4.1 Standard**

General: To AS/NZS 3500.3 or AS/NZS 3500.5.

Rainwater outlets: Provide rainwater outlets 150% of the size of the downpipe with domed grilles to reduce the impact of blockages.

Ensure that secondary overflows are provided/ installed.

### **3.3.4.2 Cleaning**

General: During construction, use temporary covers to openings and keep the system free of debris. On completion, clean and flush the system.

### **3.3.4.3 Pipe laying**

General: Lay pipelines with the spigot ends in the direction of flow.

### **3.3.4.4 Downpipe connections**

General: Turn up drain branch pipelines to finish 50 mm above finished ground or pavement level.

## **3.3.5 WASTEWATER**

### **3.3.5.1 Standards**

General: To AS/NZS 3500.2 or AS/NZS 3500.5.

### **3.3.5.2 Installation**

Use cleaning solvent with a dye for cleaning pipework.

Use glue/ joint solvent as recommended by the manufacturer.

For underslab drains, either support pipework with hangers and remove any fill from around the pipework, or install pipework in trenches, suitable over excavated, backfilled, with blinding layer, and all reasonable measures to avoid problems from future settlement.

Consider means to access pipework in the future to rectify.

### **3.3.5.3 Cleaning**

During construction: Use temporary covers to openings and keep the system free of debris.

On completion: Clean and flush the system.

### **3.3.5.4 Vent pipes**

Staying to roof: If fixings for stays penetrate the roof covering, seal the penetrations and make watertight.

Terminations: Provide bird-proof vent cowls made of the same material and colour as the vent pipe.

On completion check for system operability, investigate and rectify all smells and odors.

## 4 ELECTRICAL

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### 4.1 GENERAL

#### 4.1.1 STANDARDS

##### 4.1.1.1 General

Electrical installation: To AS/NZS 3008.1.1 and SAA HB 301.

Telecommunications cabling: To AS/CA S008, AS/CA S009, AS/NZS 3080, \*\*\* and SAA HB 252.

##### Installation methods

Install cable using one of the following methods:

- Underground conduit, use HDPVC
- Masonry walls - Concealed chased in conduit
- Ceiling voids – PVC conduit.

#### 4.1.2 INTERPRETATION

##### 4.1.2.1 Abbreviations

General: For the purposes of this worksection the following abbreviations apply:

- RCD: Residual Current Device. 30mA type

##### 4.1.2.2 Definition

General: For the purposes of this worksection the following definitions apply:

- Telephony: Speech and low band frequencies (= 100 kHz).

### 4.2 PRODUCTS

#### 4.2.1 ELECTRICAL GENERAL REQUIREMENTS

##### 4.2.1.1 General

All accessories located in close proximity are to be the same manufacture, size and material if available.

Exact locations of all items shall be determined using Architectural Drawings and from inspection on site.

Variations in location of outlets, etc. up to 3m from the positions shown on the tender drawings shall be allowed for in the tender price.

IP level in accordance with installed location (eg IP56 external).

Allow for accessories that conform to the functional requirements, and the aesthetic requirements of the architect.

##### 4.2.1.2 Lighting Switches

Minimum rating 230 V a.c.

Commercial areas use minimum 16A or 20A

##### 4.2.1.3 General Purpose Outlets

General; 13A, 250 V a.c

Pin arrangement; Switchable type, universal with earth

#### **4.2.1.4 Isolators**

Minimum rating 250 V a.c.

Standard AS 3947.3.

Poles: 1+N+Earth and 3+N+Earth

Independent manual operation including positive “ON/OFF” indicator.

Provide for padlocking in the “OFF” position.

### **4.2.2 MV SWITCHGEAR**

#### **4.2.2.1 General**

MV switchgear to be provided by PUB’s contractor.

The Medium Voltage Switchboards shall comply with the latest issues of the following IEC recommendations:

IEC 60056, High Voltage Alternating Current Circuit Breakers

IEC 60129, High Voltage A.C. Switchgear and controlgear disconnectors (isolators) and earthing switches. Main Substation MV Switchboard

#### **4.2.2.2 Electrical Authority**

Provide equipment that conforms with the electrical authority requirements.

### **4.2.3 TRANSFORMER**

#### **4.2.3.1 General**

Transformers to be provided by PUB’s contractor

IEC 60076 Power Transformers

#### **4.2.3.2 Electrical Authority**

Provide equipment that conforms with the electrical authority requirements.

### **4.2.4 CABLING**

#### **4.2.4.1 General**

General: To AS/NZS 3000 and the recommendations of SAA HB301.

Fire and mechanical performance classification: To AS/NZS 3013.

Selection of cables: To AS/NZS 3008.1.1.

AS 3000 Wiring Rules

AS 3008 Cable Selection

AS 3147 Building wire and PVC/PVC cables. Min Temp V75

AS 1125 Conductors in cables

AS 3013 Fire rated cables

AS/NZS 4961 Distribution cables

IEC1034 High voltage cabling

#### **4.2.4.2 Sources Policy**

Wiring manufactured locally in Vietnam will be considered if it can be shown that such products have been **typed tested successfully in an internationally recognised laboratory**, against a recognised international standard.

## **4.2.5 CONDUITS AND CABLEWAYS**

### **4.2.5.1 General**

AS 3000 Wiring Rules

AS 3008.1 Cable Selection

AS 1735.2 Electrical work within lift shaft

NEMA VE 1 Metal cable trays systems.

NEMA VE 2 Metal cable tray installation guidelines.

Conduits and fittings for electrical installations: AS/NZS 2053.

#### **General**

Provide the following systems:

- Cast concrete slabs: Unsheathed cable in heavy duty cast in UPVC conduit.
- Plant rooms: Thermoplastic insulated and sheathed cables on cable tray, or unsheathed in trunking or cast-in heavy duty UPVC conduit.
- If conduit needs to be run exposed for any reason then this shall be GI type.
- External: provide insulated, sheathed and armoured cable directly buried, or sheathed cable within HDPE conduit, all complete with marker bricks and tape.

Provide a minimum of 30% spare capacity for future requirements for all support systems.

Ladders and trays are to be laid out as per the cable stacking requirements of AS/NZS3008. – Unless otherwise indicated cable ladders /ladder trays shall be sized for “spaced from surface” cable installation.

### **4.2.5.2 Conduit**

Minimum size: 20 mm.

Plastic conduit: medium or heavy gauge.

Galvanized steel conduit: Medium or heavy, to AS 1074.

Complete with manufacturer’s recommended fittings.

### **4.2.5.3 Cable tray/ ladder**

Galvanised steel and powder coated, with adequate spare capacity and adequately supported.

## **4.2.6 GENERATOR**

### **4.2.6.1 General**

Generators to be provided by PUB’s contractor.

## **4.2.7 AUTO TRANSFER FACILITY**

### **4.2.7.1 Standard**

To IEC 60947.1 and AS 3947.6.1.

### **4.2.7.2 Type**

To be provided by PUB ‘s contractor.

## 4.2.8 SWITCHBOARDS

Standard: To AS/NZS 3439.3.

Construction: Enclosed type with a hinged lid, enclosures

Provide circuit breakers and RCDs.

Location: Verify that the location selected is compliant before proceeding.

### Distribution Boards

Provide all polycarbonate type with hinged cover. Select from ABB, Schneider, Siemen or approved equal. Submit data sheet and sample.

### 4.2.8.1 Molded case and miniature circuit breakers

MCCB Fault capacity  $\geq 10$  kA: To: IEC 947-2.

MCB Fault capacity  $< 10$  kA: Miniature overcurrent circuit breakers.

Moulded case breakers: To IEC 60947.1, IEC 60947.2.

Miniature circuit breakers: To IEC 60898.1, IEC 3111.

$I_{cs} = 75\%$  of  $I_{cu}$ .

### 4.2.8.2 Mounting

Mount circuit breakers so that the “ON/OFF” and current rating indications are clearly visible with covers or escutcheons in position. Align operating toggles of each circuit breaker in the same plane.

### 4.2.8.3 Adjustable current settings

General: If trip current adjustment control is exposed with covers in position, provide for sealing to prevent tampering.

Labels: Provide labels indicating trip settings.

### 4.2.8.4 Trip settings

Adjustable short circuit trip settings: Set to the low position.

### 4.2.8.5 Trip units

Circuit breakers with interchangeable and integrally fused trip units: Connect so that trip units are not live when circuit breaker contacts are open.

### 4.2.8.6 Multifunction meters

Multifunction meters, unless otherwise specified, shall be provided with the following functions: 3 phase monitoring of volts, amps, power factor, kVA kilowatts and resettable maximum demand indicator. Meters shall be provided with backlight LCD displays and pushbutton mode selection.

### 4.2.8.7 Maximum demand and spare capacity

General: Calculate the maximum demand of the installation in accordance with AS/NZS 3000 and provide a copy of the calculations.

Spare capacity: Provide the following:

- $> 10\%$  spare capacity in mains and submains.
- $> 25\%$  spare capacity in final subcircuits.

Load balancing: Spread electrical load equally across circuits to prevent overloading and inadvertent circuit breaker operation.

Fixed and stationary appliances: Treat socket outlets supplying fixed or stationary appliances likely to cause an RCD to trip due to earth leakage currents in accordance with AS/NZS 3000. Do not connect to circuits that supply socket outlets intended for hand held or portable appliances.

Spare spaces: Provide switchboards with  $\geq 25\%$  spare positions for future single phase circuit breakers.

#### **4.2.8.8 Accessories**

General: Provide accessories necessary for a complete installation including but not limited to switches, dimmers, socket outlets, and telecommunications outlets. Provide accessories located in close proximity of the same size and material and from the same manufacture.

Mounting: Flush mount accessories to the wall (or ceiling) unless noted otherwise. Provide proprietary wall boxes in masonry and wall brackets in stud walls.

Wet areas: Position accessories in locations containing baths showers or other fixed water containers to comply with the requirements of AS/NZS 3000.

#### **4.2.9 LUMINAIRES**

Standard: to AS/NZS 60598.1.

EMC compliance: To AS/NZS CISPR 15.

Minimum energy performance standards:

- General: To AS/NZS 4783.2 and AS/NZS 4782.2.

Provide lighting fittings as scheduled, though alternatives with the same properties offering better value are welcome. Provide spare lamps for 12 months of operation.

### **4.3 EXECUTION**

#### **4.3.1 GENERAL**

##### **4.3.1.1 Applications and compliance**

##### **4.3.1.2 Wiring**

Installation: Do not penetrate damp-proof courses. Arrange wiring such that it does not bridge the cavity in external masonry.

Conduit sizes: Provide conduits of sufficient internal diameter and arranged so that cables are not subject to undue mechanical stress during installation.

Minimum conduit diameter: 20 mm.

Conduits for future use: Provide a non-metallic drawstring having a breaking strain  $> 100$  kg.

##### **4.3.1.3 Appliances**

General: Provide final subcircuits and terminate at fixed appliances, hot water units, packaged air conditioning and other plant and equipment.

Isolation switch: Provide isolating switch adjacent to equipment.

##### **4.3.1.4 Telecommunications**

Installations requiring telephony only: To AS/CA S009.

Small office/home office installations: Category 6, to AS/CA S009 and AS/NZS ISO/IEC 15018.

#### **4.3.1.5 Labelling**

General: Provide labels including control and circuit equipment ratings, functional units, notices for operational and maintenance personnel, incoming and outgoing circuit rating, sizes and origin of supply.

Telecommunications cables: Label telecommunications cables, cross connects and outlets in accordance with the requirements of AS/NZS 3080.

#### **4.3.1.6 Label colours**

Generally: Black lettering on white background except as follows:

- Main switch and caution labels: Red lettering on white background.
- Danger, warning labels: White lettering on red background.

### **4.3.2 COMPLETION**

#### **4.3.2.1 Testing and certification**

Electrical installations: Test to AS/NZS 3017. Provide a certificate showing test results and certifying compliance with AS/NZS 3000.

Telecommunications cabling: To AS/NZS ISO/IEC 15018. Test the cable link performance at the maximum frequency and data rate for the cable class, and the cable category. Provide a certificate showing test results and certifying compliance with AS/NZS ISO/IEC 15018.

Submission: Provide Telecommunications Cabling Advice (TCA1).