



# ELECTRICAL SERVICES SPECIFICATION

Kondinin CRC Upgrade  
Lot 263, 49 Gordon Street, Kondinin  
AZ17029

Certificate of Design Compliance 11 January 2018  
Job No. J005433  
WA Building Certifiers & Assessors

Prepared for  
Kondinin CRC Committee & Shire

12 June 2017

WABCA Approved 11 January 2018 Job No. J005433

## Document Control

Certificate of Design Compliance				
Revision	Date	Description of Revision	Prepared By	Reviewed By
A	12/06/2017	Tender Issue	IFG	CA

## Contact Information

**Alphazeta Group Pty Ltd**  
ABN 95 130 835 479

Suite 22, 68 St Georges Terrace  
Perth WA 6000  
PO Z5483  
Perth WA 6831

Telephone: +61 8 6311 5577

## Document Information

Prepared for Kondinin CRC Committee & Shire  
Project Name Kondinin CRC Upgrade  
File Reference AZ17029\_ESPEC  
Job Reference AZ17029  
Date 12 June 2017

© Alphazeta Group 2016. Copyright in the whole and every part of this document belongs to Alphazeta Group and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person other than by agreement with Alphazeta Group.

This document is produced by Alphazeta Group solely for the benefit and use by the client in accordance with the terms of the engagement. Alphazeta Group does not assume any liability whatsoever to any third party arising out of any use or reliance on the content of this document.

## Table of Contents

Certificate of Design Compliance		
<b>PART A PROJECT SPECIFIC REQUIREMENTS</b>		<b>5</b>
<b>A1 PROJECT DESCRIPTION</b>		<b>5</b>
A1.1 General		5
A1.2 Site Address		5
A1.3 Project Team		5
A1.4 Drawing List		5
<b>A2 SCOPE OF WORKS</b>		<b>6</b>
A2.1 General		6
A2.2 Power Supply		6
A2.3 General Power and Reticulation		7
A2.4 Lighting & Lighting Control		7
A2.5 Data & Communications		7
A2.6 Emergency & Exit Lighting		8
A2.7 Fire Protection		8
A2.8 Commissioning and Labelling		8
<b>A3 WORKS BY OTHERS</b>		<b>9</b>
A3.1 By Builder		9
A3.2 By Workstation Manufacturer		9
A3.3 By Mechanical Contractor		9
A3.4 By Hydraulics Contractor		9
A3.5 By Client		10
<b>PART B PROJECT TECHNICAL REQUIREMENTS</b>		<b>11</b>
<b>B1 GENERAL REQUIREMENTS</b>		<b>11</b>
B1.1 Responsibilities		11
B1.2 Guarantees		11
B1.3 Australian Content		11
B1.4 Codes and Authorities		11
B1.5 Standards and Regulations		12
B1.6 Visit to Site		12
B1.7 Survey		12
B1.8 Variations		12
B1.9 Certification		12
B1.10 Spatial Requirements		12
B1.11 Authorities, permits fees and certificates		12
B1.12 Setting out		13
B1.13 Tender Submission		13
B1.14 Warranty		13
B1.15 Defects Liability		13
<b>B2 ELECTRICAL INSTALLATION</b>		<b>14</b>
B2.1 General		14
B2.2 Existing Installation		14
B2.3 Power		14
<b>B3 DISTRIBUTION BOARDS</b>		<b>16</b>
B3.1 Construction		16
B3.2 Equipment		17
B3.3 Circuit Schedules and Labelling		17
B3.4 Switchgear and Control gear		17
B3.5 Cascade Protection and Discrimination		18
B3.6 Moulded Case Circuit Breakers (10 kA Fault Level and Higher)		18
B3.7 Moulded Case Circuit Breakers (Under 10 kA Fault Level)		18
B3.8 Electrical Services – Miscellaneous Details		19
B3.9 Accessories		19
B3.10 Fastenings		19
B3.11 Penetrations		20
B3.12 Fireproofing of Penetrations		20

B3.13	Labelling and Identification	20
<b>B4</b>	<b>LIGHTING</b>	<b>21</b>
B4.1	Lighting Layout	21
B4.2	Lighting Control via Timer and Override Switch	21
B4.3	Lighting Control via Motion Detector (PIRs)	21
<b>B5</b>	<b>EMERGENCY EVACUATION LIGHTING</b>	<b>21</b>
B5.1	General	21
B5.2	Labelling Of Luminaires	22
<b>B6</b>	<b>TIME SWITCH CONTROL</b>	<b>22</b>
<b>B7</b>	<b>EARTHING</b>	<b>22</b>
B7.1	General Requirements	22
B7.2	Earthing of equipment	22
<b>B8</b>	<b>COMMUNICATIONS SERVICES</b>	<b>23</b>
B8.1	General	23
B8.2	Fees	23
B8.3	Diagrammatic Drawings	23
B8.4	Approved Manufacturer of System Equipment	23
B8.5	System Performance Requirement	23
B8.6	Workshop Drawings - Requirement	24
B8.7	Installation	24
B8.8	Equipment Cabinets	25
B8.9	Patch and Fly Leads	26
B8.10	Pin Out Assignment	26
B8.11	Earthing	26
B8.12	Labelling	27
B8.13	UTP Communication Information Outlets	27
B8.14	Testing	28
B8.15	Commissioning	29
B8.16	Performance Guarantees	29
B8.17	Operational Maintenance	30
<b>B9</b>	<b>MAINTENANCE AND SERVICING REQUIREMENTS</b>	<b>30</b>
B9.1	General - Electrical Services	30
B9.2	Operating and Maintenance Manuals	30
B9.3	As-built Drawings	31
B9.4	Procedures for Electrical Services Equipment Servicing	31
<b>PART C</b>	<b>TENDER SCHEDULES</b>	<b>32</b>
<b>C1</b>	<b>TENDER SUBMISSION</b>	<b>32</b>
<b>C2</b>	<b>SCHEDULE OF PRICES FOR ELECTRICAL SERVICES</b>	<b>33</b>
<b>C3</b>	<b>DETAILED COST SCHEDULES</b>	<b>34</b>
C3.1	Itemised Schedule of Prices for Power, Lighting and Lighting Control	34
C3.2	Itemised Schedule of Prices for Communications Services	35
<b>C4</b>	<b>TENDER FORM – SCHEDULE OF RATES</b>	<b>36</b>
C4.1	Schedule of Unit Rates for Electrical	36
C4.2	Schedule of Unit Labour Rates for Site Work	37
<b>C5</b>	<b>ALTERNATIVE SUBMISSIONS FOR ELECTRICAL SERVICES</b>	<b>37</b>

## PART A PROJECT SPECIFIC REQUIREMENTS

### A1 Project Description

#### A1.1 General

The work outlined in this specification shall include the design, the supply, the delivery to site, storing and installation and testing of the Electrical, Data, Communications listed below. All work shall comply with the requirements of the relevant authorities, Australian Standards and any additional performance requirements outlined within this document:

- Lighting & general power
- Power Distribution board and cable reticulation
- Data & Communications
- Emergency & Exit Lighting
- Smoke alarm

This section of the Specification shall be read in conjunction with the indicative electrical services drawing(s) all architectural drawings and specifications, and all other Sections of this Specification and all relevant section of the Building Specification.

#### A1.2 Site Address

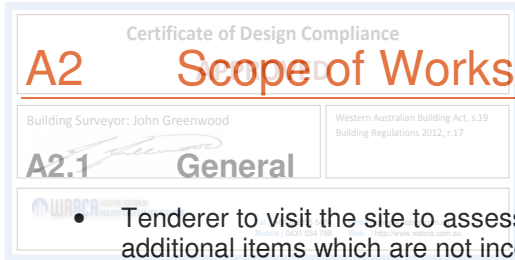
The proposed development is located at Lot 263, 49 Gordon Street, Kondinin.

#### A1.3 Project Team

Role	Company	Contact	Phone Number
Architect	Rosalie Pech Eva Architect	Rosalie Pech Eva	0429 421 287
Mechanical	Alphazeta Group	Jittu George	08 6311 5577
Electrical	Alphazeta Group	Ivy Feng Guan	08 6311 5577
Hydraulic	Alphazeta Group	Rachael McGowan	08 6311 5577

#### A1.4 Drawing List

Drawing Number	Drawing Name
AZ17029 -E00	COVER SHEET, LEGEND AND SPECIFICATION NOTES
AZ17029 -E01	FLOOR PLAN - LIGHTING, EMERGENCY LIGHTING AND SMOKE DETECTOR LAYOUT
AZ17029 -E02	FLOOR PLAN - POWER LAYOUT



- Tenderer to visit the site to assess the extent of the installation and identify on the Tender Price any additional items which are not incorporated on the drawings but are necessary for the complete installation and operation of the system.
- Removal of redundant cabling and equipment.
- Labelling and Identification
- Installation, Testing and Commissioning
- Provide performance guarantees and certification
- Provide 12 months defects liability period.
- Provide maintenance of all equipment and systems provided under this contract for the duration of the defects liability period of twelve (12) months.
- Provide a 24 hour "call out service" for all equipment and systems provided under this contract for the duration of the defects liability period of twelve (12) months.
- Supply three (3) copies of as-installed drawings on completion of the site works. Provide copies in hard format and electronic PDF format on CD.
- Supply three (3) copies of Operating and Manuals on completion of the site works. Provide copies in hard format and electronic PDF format on CD.
- Co-ordination of work with other trades
- The electrical services contractor shall allow to arrange and pay for the isolation and reinstatement of the buildings fire protection systems for the completion of any hot works or penetration works. The electrical services contractor shall engage the current base building fire services maintenance contractors to complete all such works.
- The electrical services contractor to obtain approval from the base building management on completion of the project and to rectify any defects.
- Coordinate new wall penetrations, core holes etc with the builder and obtain structural approvals. Allow to engage the base building structural engineer and pay all costs associated with the approval process.
- Provision of all required cable support systems for the existing and new electrical, data and communications services cables. All new and existing electrical services cables are to be independently supported from the structure over, no electrical services cable, existing or new, are permitted to be laying on the ceilings.
- Provision of type written distribution schedules.

## A2.2 Power Supply

The power and lighting systems are served from a new Distribution Board located in the store as per shown on the drawing. Alternatively, re-use the existing DB and modification of existing DB to accommodate new power requirements is permitted.

The Electrical Contractor shall carry out the following works related to the power supply:

- Conduct an electrical site investigation to confirm the existing submain cable can be re-used and provide cable joint to suit new power requirements
- Electrical contractor shall allow to provide a new submain cable, 4 x 1c 50mm<sup>2</sup> Cu XLPE + 16mm<sup>2</sup> ECC from existing switchboard to new distribution board if it is required.

- A new Distribution Board (72 poles, 3 phase, 100 A main switch) with a minimum 25% expansion space and complete with digital kWh meter, smoked sealed non-combustible enclosure and key lockable.
- Reuse existing equipment where possible
- when necessary and specified install new circuit breakers etc. to existing distribution boards to match the existing.
- Provide type written circuit breaker schedules within the Tenant Distribution Boards.
- Provide temporary lighting and power during fitout works.

### A2.3 General Power and Reticulation

The Electrical Sub-Contractor shall carry out the following works related to the power system:

- Supply and installation of power supplies to the new air conditioning units.
- Provision of socket outlets as shown on the drawings
- Supply and installation of an isolating switch and cabling adjacent each permanently connected appliances. All final connections to permanently connected appliances shall be by this contractor. The installation of the appliance will be by others as noted in the works by other trades.
- All power circuits, existing and new, shall be protected by a 30mA RCD combined circuit breakers. RCD protection shall not be provided to permanently connected appliances or unless noted otherwise.
- Coordination of all power socket outlets and the like with architectural documentation and joinery details.
- The electrical contractor shall allow to test and tag all permanently connected client supplied appliances including the following: kitchen appliances, dishwashers, photocopies, toasters etc to the requirements of AS3760 and leave plugged into the outlet ready for service.
- Final colour selection of the socket outlets will be as directed by the architect. The final colour for cleaner's outlets shall be confirmed with architect prior to installation and fit off.

### A2.4 Lighting & Lighting Control

The Electrical Sub-Contractor shall carry out the following works:

- Disconnect all redundant base building luminaires and hand over to Building Owner for safe storage.
- Supply and installation of new luminaries and controls as specified on drawings.
- Relocation, reinstatement and reconnection of existing luminaires noted to be retained.
- Supply and installation of new lighting control systems including switches and motion sensors, photo cell sensor and timer as nominated. Allow for all required contactors and associated cabling to for complete systems. All mechanisms shall be 15A type unless otherwise noted.
- Supply and install cable support systems and associated fixings as required.
- Supply and installation of all necessary mounting brackets, trimmings etc for the installation of all new luminaires and switch plates.
- Generally all switches shall be mounted 1100mm AFFL and in the approximate locations shown on the drawings. Final positioning and mounting heights shall be as directed by the architect.

### A2.5 Data & Communications

The Electrical Sub-Contractor shall supply and install the following items listed below and all details shown on the associated drawings:

- Supply and installation of RJ 45 communications outlets and associated plates and cabling as indicated on the drawings.
- Installation of Wireless Access Points (provided by client) at each WAP location indicated on drawings unless otherwise noted.



- Supply and installation of Cat 6 structured cabling system.
- Supply and installation of patch leads.

## A2.6 Emergency & Exit Lighting

Building Surveyor: John Greenwood

Western Australian Building Act, s.13

The Electrical Sub-Contractor shall carry out the following works:

- Supply and installation of new emergency luminaires and exit signs to comply with the AS2293 requirements.
- Removal of all redundant emergency luminaires including all associated wiring.
- All new emergency exit luminaires shall be the single point type with “Running Man” symbol and arrow in directions shown. Luminaires shall be Legrand or approved equal.
- Any existing exit signs nominated to be reused or retained that do not comply with the current standards shall be fitted with new diffusers or replaced entirely. The final installation for the floor shall utilise the current “Running Man” symbol.
- All emergency lighting control gear and assemblies are to be independently fixed to the slab over via chains. Supporting this equipment from other services or laying on the ceiling tiles is not acceptable.
- Supply and installation of a new emergency test facility located adjacent the existing electrical distribution board for the new emergency lighting system. New test facility to be clearly labelled with the tenants name.

## A2.7 Fire Protection

- Supply and install new smoke alarm as shown on the drawing
- Provision of all required cable support systems for the existing and new electrical fire services cables. All new and existing electrical fire services cables shall be independently supported from the structure over, no electrical fire services cable, existing or new, shall be permitted to be laying on the ceilings.

## A2.8 Commissioning and Labelling

- All socket outlets, switches and permanently connected equipment are to be provided with clear machine printed labels as specified. All “cleaners” socket outlets shall be provided with traffolyte type labels fixed to the front of each outlet with engraved lettering stating “CLEANERS USE ONLY”
- All new and existing emergency and exit lights shall be provided with clear machine printed labels as specified.
- The entire electrical installation for the project, including all new, existing and modified electrical systems shall be tested in accordance with AS3000 “Electrical Installations” , AS3017 “Electrical Installation – Testing Guidelines”.
- All test results shall be recorded and tabulated and included within the operation and maintenance manuals.
- Allow to return to site within the first two (2) months after practical completion to overcome all problems associated with the new installation. Visit site, as required, and at the direction of the engineer during this period to rectify all issues. Each visit to site shall be recorded including any details of adjustments made to the system. Forward a copy of this recorded information to the engineer.
- Provide electrical installers certificates for AS3000, AS2293 and as required for the electrical installation.
- Provide data systems commissioning, testing and manufacturers certificate of installation as specified within the communications section of this specification.



## A3 Works by Others



The following items are not intended to be a full specification of items provided by the Builder. They are provisional only and indicate the general extent of works. Where work is not shown in this Section, or not indicated on drawings as "Builder's Work", the Electrical Services Contractor shall allow to carry out such work.

It is the responsibility of the Electrical Services Contractor to provide information in sufficient time for their works, and works associated with the Electrical section to be completed so as not to delay the overall program.

The Builder (or their delegate) will furnish and install the following works associated with the Electrical Services installation:

- Cutting, patching, trimming and making good of the building structure and ceilings for the installation of light fittings and the like.
- Co-ordination of the integration of services with each other during all stages of the works.
- Provision of all access panels as shown on the drawing. Builder to coordinate with the Electrical Contractor the final location of the access panels.
- The supply and physical installation of appliances such as Fridges, Dishwashers, Ovens, Cooktops etc.
- Make good / patching of chasing of fire stair well & fire doors for installation of access control systems.

### A3.2 By Workstation Manufacturer

The following works are to be undertaken by the Workstation manufacturer/supplier:

- Supply starter sockets to Electrical Contractor for installation, unless specified on drawings for Electrical contractor to supply;
- Installation of soft wiring through workstations;

### A3.3 By Mechanical Contractor

The following works are to be undertaken by the Mechanical Contractor in co-ordination with the Electrical Contractor:

- Co-ordination with Electrical Services Sub-Contractor when positioning grilles, ductwork and pipework with electrical services such as lights and cable support systems etc.;
- Co-ordination with Electrical Services Sub-Contractor for correct location of the power for the new units;
- Connection from isolators to mechanical equipment;
- Fire trip cable to FIP on ground floor;
- Power and control cabling from outdoor condensers to indoor fan coil units;

### A3.4 By Hydraulics Contractor

The following works are to be undertaken by the Hydraulics Contractor in co-ordination with the Electrical Contractor:

- Connection from isolators to any specific hydraulics equipment;
- The supply and physical installation of appliances such as Boiling Water Units, Hot Water Units and Pump Out Systems.

### A3.5 By Client

The following works are to be undertaken by the Client in co-ordination with the Electrical Contractor:

- Relocation, supply, testing and commissioning of the active equipment including phone systems, PABX systems, switches and servers;
- Supply and installation of the phone system handsets complete with telephone fly leads;
- Supply and installation of the clients active network equipment and servers;
- Supply and installation of required cabling between the clients active network equipment and servers;
- Supply and installation of the client's workstation computer terminals;
- Final patching and fly lead schedules;

APPROVED  
Building Surveyor  
Building Regulations 2012, r.17  
WA Building Certifiers & Assessors - Job No. J005433  
Certificate of Design Compliance 11 January 2018

## PART B PROJECT TECHNICAL REQUIREMENTS

### B1 General Requirements

#### B1.1 Responsibilities

Generally the Sub Contractor shall be responsible for the coordination, installation and certification of the systems listed in the scope of works, to the satisfaction of the applicable standards, codes, authorities and the Project Manager. The Sub Contractor shall obtain approval from the relevant authorities, and the Project Manager for the electrical services listed in clause 1.1

Listed below are some general items of responsibility. These items are intended in no way to limit the generality of the above paragraph or the Sub Contractor's responsibility.

The Sub Contractor shall;

- Prior to making or forming any penetration obtain both structural and architectural approval prior to installation.
- Be responsible for the coordination of his service with all other trades including any structural and building elements.
- Disconnect and seal all disused services.
- Prior to installation of any service, check and confirm on site all dimensions and locations of existing services, conduits cables etc., which may affect his work.
- make applications to all relevant Authorities and pay all fees and charges associated with the installation and approval of the services
- Procure from the relevant Authorities certificates indicating a satisfactory installation of the relevant service.
- Provide working and as built drawings. Working drawings shall be submitted to the Project Manager for approval 4 week prior to the required installation date.

#### B1.2 Guarantees

The Sub Contractor shall obtain all guarantees and certificates, etc., for the work specified. The guarantee or certificate shall be satisfactorily completed, and lodged with the Project Manager on completion of the works. The guarantee or certificate shall also cover all existing services and equipment that is to remain in the completed project.

Manufacturers guarantees shall be supplied for the individual items of equipment as listed below:

- Lighting
- Power Systems
- Data & Communications

The guarantees required by this clause are separate from, and additional to, any other assurances, warranties or guarantees required elsewhere on the documentation for other matters (e.g. materials and workmanship).

#### B1.3 Australian Content

Tenders are required to use their best endeavours to incorporate the maximum practicable Australian content, unless noted otherwise.

#### B1.4 Codes and Authorities

The works shall comply in every way with the requirements of any Authority having jurisdiction over them.

The services shall include all equipment necessary for their satisfactory operation, control, maintenance and safety.

Work not covered by the requirements of statutory authorities shall comply with the appropriate publication from the Standards Association of Australia.

All materials, fittings, accessories and apparatus shall be new and of first grade design and manufacture, and shall comply with relevant Australian Standards Association specifications.

Building Surveyor: John Greenwood

Western Australian Building Act, s.19  
Building Regulations 2012, r.17

### **B1.5 Standards and Regulations**

The design and construction shall be in accordance with the current issues and amendments of the Building Code of Australia and all relevant Australian Standards and the requirements of all Authorities having jurisdiction over the project.

The design and documentation shall be referenced to the following:

- Architectural Drawings.
- The Building Code of Australia.
- Relevant Australian Standards, particularly:

### **B1.6 Visit to Site**

Tenderers should visit the site before submitting a tender to familiarise themselves with all existing conditions and take all notes and measurements necessary to provide a detailed and comprehensive tender for the works specified herein. No claim based on lack of knowledge of the site conditions or the like will be entertained after submission of tender.

### **B1.7 Survey**

Survey existing site and take all notes and measurements necessary to provide a detailed and comprehensive tender for the works specified.

Claims for extra costs based on the lack of knowledge of necessary installation methods will not be entertained after submission of the Tender.

### **B1.8 Variations**

The Tenderer must allow for all costs associated with the completion of the project as resulting from the construction circumstances, coordination with others or conditions of approvals of all relevant authorities.

The sub-contractor will be entitled to his contract price variation only if specific request for changes comes directly in writing from the Principal.

### **B1.9 Certification**

Following completion of the project, the sub-contractor shall issue all the necessary certificates associated with the services within the sub-contract.

### **B1.10 Spatial Requirements**

Electrical tenderers shall confirm at the time of submitting a tender price that the space allocated for their services is adequate.

No claim based on inadequate space for their services or the like will be entertained after submission of tender.

### **B1.11 Authorities, permits fees and certificates**

All work shall be carried out in accordance with the Local Authorities regulations and to the satisfaction of the Project Manager / Engineer.

The Sub Contractor shall pay all fees relevant to his work and due to Local Authorities.

## B1.12 Setting out

### B1.12.1 Core Holes & Penetrations

The Sub Contractor shall set out all core holes and openings as required necessary for the passage of pipes and/or conduits throughout the building and structure.

Should additional holes or openings be required due to the failure to fulfil the conditions of this clause, then arrange approval to drill, at no extra charge, such holes or openings and pay all costs involved.

Do not cut any holes, openings, chases or otherwise with the work of other trades without the specific approval of the Project Manager. Any damage done to other trades shall be made good without extra charge.

### B1.12.2 Accessibility

The set-out of piping, wiring and equipment shall be arranged in conjunction with other trades so as to be readily accessible for operating, servicing, maintaining and repairing same.

In no circumstances shall the Sub Contractor conceal any pipework, valves, or fittings before inspection and approval by the authorities and/or Project Manager.

Piping, valves, etc., which are installed in unsuitable locations, shall be removed and relocated as directed by the Project Manager. All expenses caused by this action shall be made good without extra charge.

## B1.13 Tender Submission

A fixed lump sum tender offer not subject to rise and fall and fully compliant with this specification and the associated drawings shall be submitted.

All schedules **shall and must** be completed by the tenderer and returned with the bid. Non completion of these schedules will not be accepted and will be deemed to be non-compliant with this specification.

## B1.14 Warranty

All plant, equipment and materials supplied under this Contract shall be covered by twelve (12) months warranty against faulty manufacture, workmanship and/or materials. The Contractor shall be responsible for the rectification and/or replacement of any portion of the installation which fails under warranty.

The warranty period shall commence as from the date of practical completion or replacement, as applicable, but extension of the period shall be made in respect of replaced portions only.

## B1.15 Defects Liability

The Contractor shall be responsible for rectification of all defects in the work due to faulty materials and/or workmanship, for a period of twelve (12) months after all work is completed and handed over. Such defects shall be made good immediately on receipt by the Contractor of advice from the Superintendent.

Any defects discovered during the defects liability period which is due to default or negligence of the Contractor in the performance or observance of any of his obligations shall extend the period to enable such defects to be made good by the Contractor, and to allow the whole work after being made good in every respect to be proved satisfactory.

Should the Contractor fail to commence to rectify defects within seven (7) days of written notice to do so, the Superintendent will have the right to have all such defects rectified by others at the risk and expense of the Contractor.

If any defect requiring attention under this clause is of such a nature as to endanger or prevent the operation of any service, the Contractor shall, on telephone advice from the Superintendent, Proprietor, Architects or Consulting Engineers, arrange for the necessary work to be carried out immediately. If the Contractor is unable so to do, the Superintendent will have the right to have such defects rectified by others at the risk and expense of the Contractor.

## B2 Electrical Installation

Certificate of Design Compliance

### B2.1 **APPROVED** General

Building Surveyor: John Greenwood Western Australian Building Act, s.139

The electrical services works are to be undertaken within an occupied building. As such all noisy works, core hole drilling etc. are to be completed outside of normal building operating hours. Refer to building fitout guidelines for approved times to undertake works.

Any damage to new or existing surfaces, wall finishes, ceiling, carpets and the like resultant by the completion of the nominated works are to be made good to a similar or near match to the existing conditions at the contractors cost.

All penetration approvals by the base building structural engineers are to be allowed for in the electrical services tender.

Any costs associated with the requirement for independent security personnel are to be allowed for in the electrical services tender.

### B2.2 Existing Installation

The electrical services drawing have been developed from available base building drawings and visual inspections on site. The electrical services contractor shall at the commencement on site undertake their own assessment and survey of the existing installation and review the proposed design. Any anomalies shall be immediately reported to the engineer for direction.

All existing systems not shown to be retained or relocated within the tenancy area's shall be completely removed back to its point of supply and made good.

### B2.3 Power

#### B2.3.1 Distribution Boards

Electrical contractor shall provide and install a new submain cable, 4 x 1c 50mm<sup>2</sup> Cu XLPE + 16mm<sup>2</sup> ECC for connection from existing switchboard to new distribution board

Provide a new Distribution Board, 60 poles, 3 phase, 100A main switch with a minimum 25% expansion space and complete with tenant metering, smoked sealed non-combustible enclosure and key lockable to suit the new requirements of the power and lighting systems.

The new tenant DB shall be provided with:-

- Provide new 16A and 20A (single phase and three phase) RCBOs and MCBs
- Provide additional 16A and 20A (single phase and 3 phase) circuit breakers to suit fitout requirements.
- Provide type written circuit breaker schedules

Alternatively, the existing Tenants Distribution Boards can be retained and modified to suit the new requirements.

- Provide RCD protection as specified.
- Additional circuit breakers to suit fitout requirements.
- Modification and rearrangement of the tenant metering.

#### B2.3.2 Power Outlets

The scope of works covered by this specification includes, but is not limited to, the following principal items:

- Supply and installation general power outlets to the positions indicated on drawings.
- Modifications and additions to the existing distribution board to accommodate the proposed electrical layout.
- Supply and Installation of permanent wiring to items such as HWU and BWU.
- Labelling of all equipment.

- Labelling of power outlets shall be 'traffolyte' type engraved or Brother Printed labels clearly indicating the DB and CB numbers. The labels shall be 10mm high with 5mm high lettering. The colour sequence shall be white background with black lettering.
- Soft wired workstation power outlets shall be supplied and installed by the workstation contractor. The electrical contractor is to install starter sockets as specified on drawings.
- Supply and installation of cable support infrastructure.
- Contractor shall allow for temporary builders light and power during the entire construction period.
- Contractor shall allow for disconnection and removal of any redundant electrical and communications equipment and cabling.
- Contractor shall allow for disconnection and removal of any redundant electrical and communications equipment and cabling. Redundant communications, electrical and security cabling and equipment shall be removed back to the respective source such as the electrical distribution board or data gathering panel.

### B2.3.3 Power Subcircuits

- All power subcircuits shall be new
- All general power circuits shall utilise 20A circuit breakers. Otherwise the circuit breaker shall match the rating of the outlet.
- A maximum of ten (10) double GPOs shall be connected on any one circuit.
- Each soft wired starter socket and outlets greater than 15A shall be fed from dedicated circuits.
- Items within tenancies requiring dedicated power circuits shall include:
  - Dishwasher
  - Coffee Machine
  - Fridges
  - Security Control Panel
  - Communication Rack
  - Captive outlets & isolators.
  - Supplementary Air Conditioning units
- Where required by AS3000, existing circuit breakers are to be replaced with RCD protected type.
- Provide RCD protection to all socket outlets unless otherwise noted.

### B2.3.4 Service Poles (Power Blades)

- Where service poles/umbilicals/power blades are installed, these shall be supplied and installed by the workstation manufacturer;
- Refer to the architectural drawings for details and locations of all workstation service poles;
- Co-ordinate the locations of service poles on site in conjunction with the work-station manufacturer;
- Relocate light fittings or others services as necessary to avoid the service pole;

### B2.3.5 Cable Support

- All power cabling shall be supported independently of the false ceiling
- Cable support is to be in accordance with the electrical drawings. Where the electrical drawings do not highlight a specific method, then cable support can be achieved via one of the following methods:
  - cable basket
  - catenaries
- No more than three power circuits shall be laid in trefoil configuration.



- Where cables branch off the cable basket / catenaries they shall do so at angles parallel to the building lines and shall be fixed directly to the underside of the slab (Christmas tree fixings or equal shall be used) at intervals not exceeding 500mm.

APPROVED

Building Surveyor: John Greenwood

**B2.3.6** ConduitsWestern Australian Building Act, s.19  
Building Regulations 2012, r.17

Conduit shall be high impact grey PVC according to AS 2053.

The minimum size of conduit shall be 20mm. Unless otherwise specified, conduit shall be one size larger than required by regulations for the number of conductors to be drawn in.

Conduit shall be delivered to Site in manufacturers standard lengths each with a coupling on one end.

Exposed conduits shall not be used unless authorised by the Superintendent. If authorised, the following conditions apply.

- Shall be rigid galvanised screwed steel conduit.
- All fittings, draw boxes, bends and couplings are to be purpose made.
- Shall be joined using an approved solvent cement.
- Shall be secured using single-sided metal saddles spaced at 600 mm (maximum) centres and within 150 mm of all fittings.
- Shall be installed so that cables can be drawn in at draw boxes only. Inspection elbows shall not be used.
- Shall be minimum 20 mm diameter.
- Shall be filled with cables to not more than 60% of its capacity.

**B2.3.7** Skirting trunking

Skirting trunking shall be a minimum of two compartment (CAT6 capable), hard wearing powder coated aluminium with chamfer front.

**B2.3.8** Segregation

Ensure that all cables are sufficiently segregated from harmful and hazardous services. Cables shall be segregated 1500mm (minimum) from electrical submains and 300mm (minimum) from electrical sub-circuits and light fittings in ceiling spaces.

Where these clearances cannot be maintained, the cables shall be shielded from Electromagnetic Interference.

Skirting Duct is acceptable where the local power circuit and communications conductors are separated by an earthed metallic barrier and the maximum length of parallel run is 10m.

Slack above outlets or racks should be avoided. Where unavoidable, excess cabling shall be left in a 'goose neck' not coiled.

## B3 Distribution boards

**B3.1** Construction**B3.1.1** Generally,

Distribution board (DB) shall be wall mounted, sheet steel cubicle type suitable for accommodation in the cupboards or spaces provided or surface wall mounted or recessed in walls as shown on the drawings or schedules.

**B3.1.2** Standard

The Distribution board shall conform to Form1 to AS 3439.1

**B3.1.3 Degree of Protection**

The degree of protection shall be IP20 according to AS1939.

**B3.1.4 Manufacture**

Assemblies shall be supplied by an approved, experienced switchboard manufacturer.

**B3.1.5 Construction**

All steelwork shall be thoroughly degreased and treated with rustproofing primer and undercoat prior to finishing with approved finish, semi-gloss acrylic lacquer or equal. Provide spare space within enclosure for future relays, etc., specified or as shown.

**B3.1.6 Colour**

The distribution board shall be electrical orange externally and gloss white internally.

**B3.2 Equipment****B3.2.1 Generally**

Equipment requirements are shown and scheduled on drawings.

**B3.2.2 Busbars**

Insulated, phase colour coded, copper busbars with stalks ready for connection of moulded case air circuit breakers in all pole spaces. The busbar system shall permit interchangeable use of 1, 2 or 3 phase circuit breakers. The busbar system shall be type tested to a minimum fault level of 25 kA for 0.5 sec (Series D type) and 20 kA for 0.1 sec (Series E type).

**B3.2.3 Protective Devices**

Protective devices shall be moulded case circuit breakers (MCCB's) and miniature circuit breakers (MCBs) complying with AS 2184 and AS 3111 of approved manufacture and interchangeable 1, 2 or 3 pole type in ratings from 8 A to 100 A where the minimum fault capacity is 6 kA /second symmetrical at 415 Volts.

**B3.2.4 RCD Protected Circuits.**

MCB's (single pole type) incorporating earth leakage (EL) protection with a sensitivity setting of 30 mA RCD Type II to AS 3190 or RCBOs shall be fitted to protect SOCKET OUTLET circuits in domestic premises and the like and otherwise as required by regulations or shown. EL protection shall not be provided for drinking fountains and refrigerators which shall be supplied by dedicated circuits.

**B3.3 Circuit Schedules and Labelling****B3.3.1 Generally**

See Clause "Labelling and Identification". A typed Circuit Schedule shall be provided in a suitable holder either inside the switchboard door when doors are fitted or adjacent to the switchboard.

**B3.3.2 Information**

Circuit schedules shall identify equipment, number of items and relevant room identification codes.

**B3.3.3 Submains Switches**

Where a switchboard has a circuit breaker controlling submains to another switchboard, that circuit breaker shall be identified with a label indicating the switchboard number and its location.

**B3.4 Switchgear and Control gear****B3.4.1 Scope**

Switchgear and control gear equipment in switchboards, distribution boards and the like shall comply with the general requirements of this sub-section.

**B3.4.2 Particular Requirements**

Requirements shown on drawings or detailed elsewhere in the specification shall take precedence over and are additional to the requirements of this sub-section.

**B3.5 Cascade Protection and Discrimination****B3.5.1 Requirement**

The entire mains and emergency distribution system shall incorporate circuit breakers of the same manufacture selected to achieve required prospective fault level both by inherent fault capacity and in the case of downstream equipment by applying the principles of cascade protection.

Discrimination: In addition, discrimination under overload and short circuit fault conditions shall be achieved throughout.

**B3.5.2 Selection**

The type, rating and trip unit settings of all circuit breakers shall be determined by the manufacturer. A schedule listing all equipment and associated characteristics shall be prepared and this shall be incorporated in the Operating Manual.

**B3.5.3 Warranty**

Provide a warranty that all equipment installed is in accordance with manufacturer's recommendations and provide a statement from manufacturer and signed by their manager certifying that the equipment selected as nominated in their schedule complies with the protection and discrimination principles outlined above.

**B3.5.4 Application**

The principles and requirements outlined above shall apply irrespective of other requirements included in this Specification.

**B3.6 Moulded Case Circuit Breakers (10 kA Fault Level and Higher)****B3.6.1 Standard**

Moulded case circuit breakers shall conform to AS 3858 and AS 3858.

**B3.6.2 Rated Short Circuit Breaking Capacity**

Not less than the switchboard fault level or circuit location where current limiters are fitted, or as required by manufacturer's selection table where cascade protection is used.

**B3.6.3 Status**

Status (ON/OFF/TRIPPED) shall be positively indicated.

**B3.6.4 Mounting**

Mount the circuit breakers so that the 'ON/OFF' and current rating indications are clearly visible with the cover or escutcheon in position, and so that arc discharges from the circuit breakers are directed away from live metal and insulation. Align operating toggles in the same plane.

**B3.6.5 Trip Unit**

Provide fixed or adjustable instantaneous overcurrent trip and adjustable inverse time trip curve settings.

**B3.7 Moulded Case Circuit Breakers (Under 10 kA Fault Level)****B3.7.1 Rated Short Circuit Breaking Capacity**

Not less than the switchboard fault level and 6 kA minimum, or as required by manufacturer's selection table where cascade protection is used.

**B3.7.2 Status**

Status (ON/OFF/TRIPPED) shall be positively indicated.

**B3.7.3**      Mounting

Mount the circuit breakers so that the 'ON/OFF' and current rating indications are clearly visible with the cover or escutcheon in position, and so that arc discharges from the circuit breakers are directed away from live metal and insulation. Align operating toggles in the same plane.

Building Surveyor: John Greenwood

Western Australian Building Act, s.19  
Building Regulations 2012, r.17

**B3.8**      Electrical Services – Miscellaneous Details**B3.8.1**      Mounting and Location of Outlets**(a)**      Light Switches

Liaise with designer for the mounting height of the light switches during construction phase.

**(b)**      Location

Electrical services drawings shows indicative location only. Liaise with designer for the mounting height of the socket outlets during construction phase

Dedicated power outlets for equipment: Locate to suit equipment served. Seek directions on site with respective trade (i.e. mechanical, hydraulic, joinery installer, steam and sauna installer etc.) concerning precise locations and termination requirements.

**(c)**      Alignment

Align outlets vertically or horizontally as applicable, and where practical, with tile courses and room features. Locate outlets symmetrically in relation to other features including air grilles, ceiling tiles and beams.

**(d)**      Damp or wet Areas

Socket outlets located in damp or wet areas shall comply with AS3000. Where locations shown appear to contradict rules, seek advice from Designer and Engineer prior to installation.

**B3.9**      Accessories**B3.9.1**      General

Provide impact resistant plastic with standard size white flush mounted cover plate for socket outlets that are hidden in ceiling spaces.

**B3.9.2**      Light Switches

Light switches shall be a minimum 15A rated, 250 V to AS 3133.

**B3.9.3**      Socket Outlet's

Socket outlets shall be 10A rated except where 15A or 20A is indicated, 250V to AS 3112.

Final colour selection of the socket outlets shall be Clipsal 'Saturn Range' as directed by the Designer. The electrical contractor shall allow for standard white outlets for all back of house areas and outlets not visible to the public.

**B3.10**      Fastenings**B3.10.1**      Requirement

All equipment including switchboards, luminaires etc., shall be firmly fixed in position.

**B3.10.2**      Type

Use threaded fasteners to allow removal and replacement. Galvanised expanded metal anchor type generally in masonry and concrete. Material shall be selected which will avoid corrosion. Select fastener appropriate for duty and loading.

**B3.10.3**      Explosive Powered Fastenings

Use with prior approval only. Do not use explosive powered tools.

## B3.11 Penetrations

### B3.11.1 Fire Walls, Floors and Structural Members

Do not penetrate without approval. Penetrations will be provided by other trades.

### B3.11.2 Damp Courses

Do not penetrate.

### B3.11.3 Existing Structures

Obtain approval for penetrations through existing structures.

### B3.11.4 Sleeves

Fit a UPVC sleeve for each penetration through ground floor slabs, ground floor beams and external walls for cables not enclosed in conduit. In addition, for MIMS cables fit a sleeve for each masonry penetration.

### B3.11.5 Penetration Size

Provide a penetration of diameter 10 mm greater than the pipe or sleeve diameter for pipes and sleeves penetrating existing external walls, ground slab, or ground floor beams.

### B3.11.6 Sealing

Seal penetrations around conduits and sleeves with weak sand, cement mix, or similar sealing compound approved by the Superintendent. Seal the space between cables within sleeves with a pliable waterproof compound.

## B3.12 Fireproofing of Penetrations

### B3.12.1 Requirement

Fireproof penetrations for cables, conduits, ducts and busways through fire rated floors and walls in accordance with BCA regulations. All reinstatement of fire rating associated with these works shall be carried out by this trade.

Locations of fire rated walls are as shown on architectural drawings.

Fire rated boxes shall be provided for all outlets installed in fire rated walls.

### B3.12.2 Material

The fireproofing shall be provided by means of an approved fire rated material with a certified fire resistance rating. Provide a cable transit system of approved manufacture and certified fire rating where shown.

## B3.13 Labelling and Identification

### B3.13.1 General

Label equipment to facilitate operation and maintenance. Function labels shall be direct engraved on switches and similar items.

### B3.13.2 Control Wiring

Identify at terminations with engraved, interlocking ferrule type labels. Identification shall correspond with associated wiring diagrams. An approved numbering system shall be used.

### B3.13.3 Switchgear

Provide:

- Name labels in accordance with following and as shown. The name label on the front of each DB shall be in 20 mm high letters fastened with double sided tape.
- Main isolator, submain switch and special equipment (time switch, contactor, etc.) labels.
- Pole space phase and number identification, e.g. R1, W1, B1, R2, W2 etc.

- Terminal strip labels to indicate function.

Submains Protective Devices: Label with name of switchboard or equipment served, location, submains cable size/type and rating of protection (HRC fuse cartridge or CB protection setting).

Supply Information Label: Fit label to each switchboard, Tee-off box, control panel, etc., stating name and location of switchboard supplying submain and identification details of the protective device.

Labels for wiring shall be "Brady" type printed labels. All other equipment labels shall be plastic laminate traffolyte type.

#### B3.13.4 Accessories

Provide switchboard and circuit identification labels on all socket outlets, light switches and isolating switches

## B4 Lighting

### B4.1 Lighting Layout

The existing luminaires are to be retained and reused as indicated. All existing lighting circuits shall be modified to confirm with the documented switching layout.

The contractor is to make allowance for the relocation of existing troffers to suit the proposed lighting layout.

Allow for all existing & relocated luminaires to be tested for normal operation. Any lamps/fittings which are not operating correctly shall be repaired and/or replaced as necessary.

The contractor shall allow for the removal of all redundant cabling provided within the ceiling space as part of the works associated with this contract.

The building contractor will remove, modify, relocate and replace ceiling tiles related to lighting and general cabling works as required on instruction from this contractor. The contractor shall provide a marked up ceiling plan outlining the intended route for cabling and lighting works to provide to the building contractor.

Damaged ceiling tiles in the course of these works shall be replaced by this contractor at his own cost.

Test and commission the revised lighting layout.

### B4.2 Lighting Control via Timer and Override Switch

The Electrical Contractor shall supply and install a programmable time clock (24 hours, 365 days) with associated control wiring for time clock control of the lighting in the tenancy.

Lighting to the open plan work areas shall be controlled via a time clock for normal business hours (nominally 7 am until 6pm Monday to Friday). During after hours, the open plan work areas shall be controlled via an After Hours button.

### B4.3 Lighting Control via Motion Detector (PIRs)

Lighting in the small rooms shall be controlled via motion detector. Motion detectors shall be of the passive infrared type and shall be surface mounted or recessed and enclosed in a high impact PVC enclosure. Each motion detector shall be installed in a position designed to ensure that the motion caused by people within the respective area is clearly detected.

This detector shall switch on and off the lighting to this area automatically on detection of any movement. When no movement has been detected for an adjustable time of 30 mins the lights to this room shall switch off. When presence is detected, the lights will automatically switch on.

## B5 Emergency Evacuation Lighting

### B5.1 General

Luminaire types are given on the drawing legend.



Emergency luminaires shall be non-maintained self-contained purpose made units or battery inverter units installed to convert fluorescent luminaires into emergency types.

Exit signs shall be maintained types with exit legend and direction arrows where shown on the drawings.

All emergency lights shall be connected to the local essential services lighting circuit unless shown otherwise.

The location of the luminaires shall be approximately as shown on the drawings and shall be wall or ceiling mounted as indicated. Exit lights shall be suspended from the ceiling as necessary to comply with AS 2293. Submit for approval suitable support bracket details.

All units shall be connected to unswitched active circuits derived from the local services distribution boards.

Mains cabling to each luminaire shall be TPS, installed together with other mains TPS cabling.

## B5.2 Labelling Of Luminaires

All luminaires shall be labelled in accordance with the building/floor level and luminaire number. This labelling shall be reflected in the log book. The contractor shall provide a full list of labels for approval.

Each emergency light fitting is to be fitted with an approved label similar to the following:

G-EX-07

G	=	Ground Floor (1 = Level 1 etc.)
EX	=	EXIT Light (EM = Emergency Light)
07	=	Unit number on that floor.

Additionally, the contractor shall provide a full schedule of all emergency lighting codes with a description of its location. A prototype schedule is to be provided for approval by the superintendent.

The above codes shall be submitted in a format similar to that required for operation and maintenance manuals.

## B6 Time switch control

Power outlets to lunchroom area including hot water units and boiling and chilled water units to be wired with time clock control such that these units are automatically isolated when not in use.

## B7 Earthing

### B7.1 General Requirements

Supply, install and terminate a complete earthing system for the entire works including equipotential bonding to the work station and associated equipment.

### B7.2 Earthing of equipment

Provide and connect to each and every outlet (including lighting outlets), permanently connected appliance or luminaire, main switch board enclosure, metallic wiring enclosure (including conduits, trays, ladders and ducts), metallic cable supports (where they are in an earthed situation) an earthing conductor of a size not less than that required by AS 3000, shown on the drawings or specified herein, whichever is the greater requirement.

All exposed structural metalwork, cladding and other conductive building materials (whether internal or external) where they are in an earthed situation (or are electrically continuous with other metalwork, cladding, conductive building material or appliance in an earthed situation) shall be earthed. This clause shall apply comprehensively and shall specifically include:

- Metallic equipment mounting frames
- All stainless steel benches, hoods and cupboards and the like
- Metallic sheeting to acoustic lining or treatments



- Metallic sinks

Minimum Resistance: Where additional earth conductors need to be installed to maintain the minimum resistance requirements laid down in AS 3000, then such additional earth conductors shall each be equal in size to the minimum specified in AS 3000.

Equipotential bonding: The Electrical Subcontractor shall provide equipotential bonding conductors as required by AS 3000, as specified herein or as shown on the drawings, whichever is the greater requirement.

WATER HEATERS: All water heaters, including gas water heaters, shall have equipotential bonds installed between the inlet and outlet piping. The minimum size of bonding conductor shall be 6mm<sup>2</sup> Cu PVC.

## B8 Communications Services

### B8.1 General

The structured cabling system shall be a fully certified Category 6 compliant for voice, data and multimedia services over the entire link using RJ-45 type termination systems for twisted pair cables.

### B8.2 Fees

Pay all lawfully imposed fees for connection and testing imposed by the relevant authority.

### B8.3 Diagrammatic Drawings

All drawings are diagrammatic and therefore the final position of equipment is to be verified before installation. Where necessary refer to the architectural drawings for elevations and co-ordination with furniture, kitchen equipment and joinery.

Contractors must submit frame, rack and cabinet layouts in accordance with the specification prior to installation for review.

### B8.4 Approved Manufacturer of System Equipment

A fully certified Category 6 structured cabling system conforming to the requirements of this specification shall be supplied and installed to this site.

The following are approved manufacturers:

- Krone
- AMP
- Avaya
- Seimon
- Molex

### B8.5 System Performance Requirement

The system is to be fully compliant Category 6 to Manufacturer's requirements and as defined in AS 3080

The system shall be tested, verified, and certified as meeting this requirement.

The system must be 100% tested for full LINK compliance (ie. Every link shall be fully & comprehensively tested regardless of Manufacturer's requirements), directly to Work Area Information Outlets (if the "Link" does not continue beyond this point).

The completed communications system will be required to support at least the following:

- IEEE 802.3 10 Base-T Ethernet @ 10 Mbps.
- 100Base-T Ethernet @100Mbps.
- 1000Base-T Ethernet @1Gbps.

- RS 232 Asynchronous Communications @ 19.2 Kbps.

<ul style="list-style-type: none"> <li>• Modbus of Design Compliance</li> <li>• Call Centre Applications</li> </ul>
<ul style="list-style-type: none"> <li>• Dealing Room Applications</li> <li>• ISDN</li> </ul>
<ul style="list-style-type: none"> <li>• Multimedia Applications</li> </ul>

- Picture Archiving Communication Systems (PAC's)
- Analogue TV
- Digital TV
- Digital PABX System Integrated Handsets
- Analogue Voice Telephony.
- Voice over IP (VoIP)
- Video Conferencing

## B8.6 Workshop Drawings - Requirement

All frame designs shall be documented on "Workshop Drawings" and submitted for approval. The "Workshop Drawings" shall contain the following details:

- Number and size of frame verticals/patch panels/cabinets.
- Identify all functional areas on the frame/patch panel, indicating position and size. The functional areas shall include incoming and outgoing cables.
- Number and location of jumper-ring verticals.
- Number and location of horizontal and vertical cable managers.
- Details of cabinets.

The appearance of all communications outlets on the wiring frames shall be in sequential order with respect to the labels.

## B8.7 Installation

### B8.7.1 Compliance

The installation shall comply with the ACA, Structured Cabling System Manufacturer, and AS 3080 requirements and shall only be undertaken by personnel licensed under the ACA regulations. Documentary evidence is required to be submitted before commencement.

### B8.7.2 Cable Reticulation

Supply and install all cable baskets/chimneys/ducts/catenaries and associated accessories necessary within the Communications Room and to marshal the cables in a neat and orderly manner. Provide cable grommets with cable chimneys.

All vertical cable baskets associated with riser cabling shall be fully enclosed with removable, galvanised, metallic cover.

Supply and install all cable baskets or catenaries and associated accessories necessary for horizontal distribution to the work area outlets, as shown on the drawings. Cable baskets / catenaries shall be supported from the soffit above.

Installation of cable basket shall conform to the following:

- There must be a minimum of 150mm clearance from the highest point of the tray to the ceiling or other obstructions
- There are to be no bolts or other sharp objects protruding through the cable bearing surface.

- All ends of tray shall be smooth or protected.
- All cable baskets are to be suitably attached to the building PE.
- Cable on basket shall be tied at intervals not exceeding 600mm where the cable is on top of the basket. If the cable is suspended under the tray the cable ties shall be placed every 300mm

All vertical cable tray runs shall have ties at 600mm intervals or less.

Reticulation to flush floor boxes shall be from the ceiling space of the floor below. Cabling within the ceiling space below shall be run in metallic conduit fixed to the underside of the slab.

### **B8.7.3**      Segregation

The following segregation requirements shall be implemented:

Ensure that all cables are segregated 1500mm (minimum) from electrical submains and 300mm (minimum) from electrical subcircuits and light fittings in ceiling spaces. Where crossovers between power and communications cabling are required, this will only be permitted at right angles.

Where these clearances cannot be maintained, the cables shall be shielded from Electromagnetic Interference.

Skirting Duct is acceptable where the local power circuit and communications conductors are separated by an earthed metallic barrier and the maximum length of parallel run is 10m.

### **B8.7.4**      Co-ordination

Co-ordinate with all of the planned services and structure.

Co-ordinate with the other services and trades.

### **B8.7.5**      Cable Management

A complete cable management system shall be provided. In particular, conduits, chimneys, ducts and cable baskets shall be provided for cable reticulation and cables shall be supported independent of the structural supports at all times.

If catenary wires are proposed, then a maximum of thirty two (32), UTP cables may be supported on one (1) catenary. Support the cable at a maximum of 300mm using wide, reusable, "Velcro" cable ties. Cable ties shall be staggered along the entire length of the cable including within the cabinet to the point of termination. Care shall be taken to ensure that cable ties are not pulled too tight. Any other type of cable tie is not permitted.

Supply and install a catenary wire support infrastructure from the end of the cable basket to around the core tenancy area within the false ceiling space to support the major cable routes. Where cables branch off the catenary wire they shall do so at angles parallel to the building lines and shall be fixed directly to the underside of the slab (Christmas tree fixings or equal shall be used) at intervals not exceeding 1500mm.

Catenary wires shall be connected to the PE.

To provide an organised patching facility in the new Equipment Cabinet, horizontal and vertical cable rings shall be provided to route patch leads around the front of the patch panels.

The spacers between the equipment cabinets shall be used for mounting vertical cable rings. The vertical ring supports the patch leads and provides adequate room for storing slack in the patch leads. The rings shall be internal within the cabinet, allowing for side panels to be installed.

Manufacturer published cable bending radii shall be observed at all times, kinks and tight bends will not be accepted.

## **B8.8**      **Equipment Cabinets**

### **B8.8.1**      Enclosures

New equipment cabinets shall be provided to house the communications cabling infrastructure.

**B8.8.2** Wall Mounting

Where wall mounting of Communications Structured Cabling System and Test Point Frames (TPF) is implemented, a 100mm deep, full height, Melamine backing board shall be installed behind the frames for cable reticulation and management. Removable panels shall be provided for access to cabling.

Building Surveyor: John Greenwood  
**B8.8.3** Cabling

Western Australian Building Act, s.19  
Building Regulations 2012, r.17

Where cable slack is unavoidable above the equipment cabinet in the Communications Room, cabling shall be left in a 'goose neck' not coiled within the ceiling space.

**B8.8.4** Installation

Unless otherwise directed, the Electrical contractor shall allow for installation of wireless access points at each WAP location indicated on drawings within the tender pricing.

**B8.9** Patch and Fly Leads**B8.9.1** Copper

The patch leads within the Communications Room and fly leads at the works areas will comprise of factory terminated RJ45 plugs at each end suited/matched to the patch panels/frames/equipment proposed. These patch leads shall be factory tested and terminated with RJ45 modular plugs and shall be suitable for use with the Structured Cabling System proposed.

- All cross connect panels and patching facilities shall be provided with cable management and the leads shall be marshalled in a neat and orderly manner.
- Provide patch leads in lengths as specified in schedules.
- Patch & Fly Leads shall be as per Manufacturer's requirements and made of non-PVC insulation
- Patch leads shall not have slack of more than 20% of the patch lead length.
- Allow to patch all live active data sections to passive outlets within the Communications Room.

**B8.10** Pin Out Assignment**B8.10.1** Communications Outlets

The pin out assignment is to be in accordance with AS3080 and in accordance with TIA/EIA 568A standards.

**B8.10.2** Cross Connect Panels

Outlet cables are to be terminated on patch panels working sequentially from left to right.

**B8.11** Earthing**B8.11.1** Standard

To ACA customer premises cabling manual and AS 3000.

**B8.11.2** Requirements

Install an earthing distribution system exclusive to the communication system. Maximum Earth Resistance 10Ω to the mass of earth.

Extend the existing communication protective earth (PE) system to each length of cable basket/tray, communications catenary wire and equipment cabinet and frame within the Communications Room.

Provide individual 2.5mm<sup>2</sup> earth cabling from the PE bar to the cabinet. Ensure earth point makes contact with bare metal and spray contact surface with electrolyte before bonding.

Provide a PE bar within the Communications Room with associated traffolyte label. Bond the TPF to the PE.

**B8.11.3** Bonding

Bond the earthing system to the building power supply earth using 6mm<sup>2</sup> (minimum) multistrand green/yellow PVC insulated copper cable.

**B8.11.4 Accessibility**

The electrode/earth cable connection is to be accessible for maintenance, inspection and testing purposes.

**B8.11.5 Telecommunications Reference Conductor**

A Telecommunications Reference Conductor (TRC) shall be installed in accordance with the ACA requirements in accordance with AS/ACIF S009.

The TRC shall be extended to the TPF, each interconnect panel and Communications Room.

Provide a TRC bar within the Communications Room adjacent the PE bar with associated traffolyte labelling.

**B8.11.6 Route Length**

The maximum length of any run of twisted pair cable from the patch panel to the final outlet is to be in accordance with the Manufacturer's requirements and in strict accordance with AS 3080 for horizontal cable runs direct to the work area outlets.

The maximum work area subsystem cable, (fly lead) is five metres (5 m).

**B8.12 Labelling**

The following scheme is to be used for the labelling of the entire system.

**B8.12.1 Telecommunication Equipment Cabinets**

The following scheme is to be used for the labelling of the equipment cabinet from the front and back;

Cabinets shall be identified by the following methods;

Traffolyte label fixed to the exposed frame with black letters on white background.

**B8.12.2 Test Point Frame**

Provide a traffolyte label, black 75mm lettering with white background, above each vertical. The labels shall be "A", "B" etc and state "Test Point Frame" centrally above the frames.

**B8.12.3 Cross Connect Panels**

The identification labels for the frames shall be used to identify each cable that is terminated on the panel.

Labels shall be traffolyte and located immediately above or below the patching/termination location giving a unique identification to the cable, which is the same as that appearing at the information outlet plate.

The cross connect panels shall have the appropriate identifier according to function i.e active voice, passive etc.

**B8.13 UTP Communication Information Outlets**

Outlets shall be labelled by;

- (a) Traffolyte label immediately above the outlet and fixed to the outlet plate

The labelling system uses the following scheme with black lettering on a white background Traffolyte label.

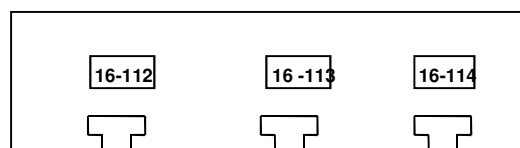
L-S

L - Refers to the Floor level (use 16 for Level 16)

S - Refers to the Sequential UTP Outlet Number on the respective floor

Labels using the identification scheme above shall be placed directly above each 8-way modular socket (RJ-45) on the wall plate with the following scheme;

For example, the triple (C3) communications work area outlet on Level 16, with sequential numbers 112, 113, and 114 respectively shall have the following labels placed each outlet.

**C3 Example:**



**Note:** There is no differentiation between Voice or Data outlets. They are all generic and can be used for either Voice or Data purposes.

#### B8.13.1 Passive UTP Patching Field

All outlets shall be individually numbered. Each entry in the relative record book shall correspond to the label appearing at the work area outlet UTP information outlet.

All outlets shall be labelled sequentially from left to right and from the top down with white lettering on black background.

#### B8.13.2 Cable Supports

Cable baskets and catenary wires shall be clearly labelled at 2 m intervals, with **TELECOMMUNICATION CABLES**, engraved on a traffolyte label 200mm x 40mm and fixed with ratchet type cable ties.

#### B8.13.3 Active Voice Field

All active voice outlets shall be individually numbered. Each entry in the relative record book shall correspond to the extension number supplied from the PABX via the tie cable pairs. The entry in the relative record book shall also outline the place of termination of the other end of the cable.

All outlets shall be labelled sequentially from left to right and from the top down with white lettering on black background.

#### B8.13.4 Outlet Cables

In all cases the wall outlets shall be clearly labelled as specified in this section and the UTP outlet cables should be marked with a "Brady" or "Brother" type adhesive label. Labels shall be fixed at both ends within 150mm of the termination.

The labelling shall adhere to the numbering scheme as outlined above.

#### B8.13.5 Accessories

Install all accessories necessary to complete the Structured Cabling System, as specified on the associated drawings and herein.

### B8.14 Testing

#### B8.14.1 Horizontal UTP Cabling

The following checks are to be undertaken by the installer on every pair of every cable. The test results shall be for the **LINK as defined by AS 3080**. The minimum acceptable results are defined in AS 3080. Cables shall at least meet the tests for Category 5e cables and in accordance with the test parameters specified by the Manufacturer's. However, all cables and associated pairs must be fully tested for at least the following.

- Signal to Noise Ratio (SNR)
- Near End Cross Talk (NEXT)
- Far End Cross Talk (FEXT)
- Equal Level Far End Cross Talk (ELFEXT)
- Attenuation to Cross Talk Ration (ACR)
- Propagation Delay
- Delay Skew
- Attenuation
- Noise



- Return Loss
- Cable Route Length
- Continuity

- Pin Assignment
- Power Sum

The testing instrument shall be a Fluke DSP 4300 or equivalent, and calibration and new heads are required before use.

Where cables are voice grade, they shall only be tested for the following:

- Cable Route Length
- Continuity
- Pin Assignment
- Correct sequence
- Reversed pairs
- Transpositions and split pairs

#### B8.14.2 Records

The following records shall be kept on site and written in a hard cover bound book designed for the purpose within the Communications Room.

The contractor shall update all records to reflect the installation.

#### B8.14.3 Communications Cabinet Area

- Notes on the drawings specify the overall system and the physical location of every Communication outlet within the tenancy shall be provided.
- The drawings referred to shall be at A1 size, laminated, and attached to the wall adjacent to the racks/cabinets/frames within the Communications Cabinet Area.
- All entries in the cable/patch record book shall be made in pencil.

#### B8.15 Commissioning

The complete system shall be finally commissioned with all power equipment operational and at an operating transmission rate of 1Gbps at least, for UTP cables.

In the event of the failure of the system to meet the specification, then the installing contractor is required to rectify all faults immediately.

All arrangements for testing shall be the responsibility of the contractor. The contractor shall provide all necessary personnel and equipment for the commissioning. Authorities having jurisdiction shall have the right to check any aspect of the work, using equipment other than those provided by the contractor.

The contractor shall supply commissioning and preliminary test figures not less than seven (7) days before acceptance tests are scheduled to commence.

#### B8.16 Performance Guarantees

The installing contractor is required to certify that the system is complete and operating satisfactorily to meet the requirements of the systems defined in this specification. The installing contractor is required to guarantee the performance of the system as installed for a minimum of twenty (20) years.

The guarantee is to cover materials and workmanship.

In the event of failure of any part of the originally installed system, the installing contractor is required to rectify the fault within 24 hours at no cost to the client.



## B8.17 Operational Maintenance

Provide twelve (12) months operational maintenance commencing from the date of final acceptance of the commissioning tests for the complete system.

Building Surveyor: John Greenwood

Western Australian Building Act, s.19  
Building Regulations 2012, r.17

## B9 Maintenance and Servicing Requirements

### B9.1 General - Electrical Services

Maintenance procedures shall be as appropriate to ensure the safe and proper operation of all systems and shall be in accordance with the schedule provided in the Operations and Maintenance Manual as outlined in the Section "Testing & Commissioning" of this Specification.

### B9.2 Operating and Maintenance Manuals

Operating and maintenance instruction manuals shall be submitted as drafts for examination prior to final issue and shall be ready for issue prior to Practical Completion. The manuals shall be submitted in hard copy format for review.

Practical Completion will not be given until the Operating and Maintenance Instruction Manuals have been completed.

Three (3) copies of each Operating and Maintenance Manual shall be supplied by the Electrical Services Contractor to the Builder who will retain two copies and deliver the other to the Consultant.

Operating and Maintenance Instruction Manuals shall generally take the following form:

#### B9.2.1 Cover

The manuals shall have a hard cover with name and title of the installation clearly marked on it. They shall contain all material in A4 size pages in loose-leaf form and shall be of sufficient size to prevent cramping or binding. The manuals shall be properly indexed and shall contain dividers with tabs between each section. All data shall be organised in a neat and concise manner. The sections shall consist of:

#### B9.2.2 General Description of Systems and Equipment

Include brief overall description of systems, design references, and description of each individual system and equipment involved.

#### B9.2.3 Operation of System and Equipment

Include general operation of plant, operation of each system and the equipment involved, starting and shutting down procedures of all systems, location of starting gear, etc.

#### B9.2.4 Trouble Shooting

Include specific instructions on steps to be taken to check and restart the system following a malfunction prior to calling for specialist advice.

#### B9.2.5 Maintenance of Systems and Equipment

Include maintenance duties in general, daily and all other periodic maintenance, lubrication chart, and spare parts list.

#### B9.2.6 Equipment Schedules

Include schedules of equipment showing quantity, location, make, type, supplier, etc., a valve schedule and a schedule of all suppliers with addresses and telephone numbers.

#### B9.2.7 Manufacturers Literature

Include manufacturer's data on maintenance and operation of all equipment installed. Do not include irrelevant data or data that does not pertain to the model of equipment actually installed.

**B9.2.8** Miscellaneous

Include any miscellaneous charts, graphs, descriptions, data, etc., needed for completed maintenance and operating instructions of all systems and equipment installed.

**B9.2.9** As-Installed Drawings

Include a full set of all drawings showing the installation as-installed including plans, sections, schematics, wiring diagrams and control schematics.

**B9.2.10** Commissioning and Test Data

All commissioning and test data shall be neatly and accurately documented and bound into the Operating and Maintenance Manuals in a separate section at the rear of the Manuals.

**B9.3** As-built Drawings

Keep a complete set of Contract Drawings and Specifications on site with all latest amendments, revisions and the like.

As the work progresses, it is the responsibility of the Electrical Contractor to note all deviations and changes from the Contract Drawings thereon, due to site conditions, variations, and other reasons, keeping an accurate record of work as actually installed in order to complete the final As-built drawings.

After consultation with the Builder for correct presentation and contents of As-Built drawings, the Electrical Services Contractor shall supply three full sets of prints of these documents as part of the Operating and Maintenance Instructions to the Builder for approval, on completion of each relevant section. The prints shall show in detail, the full extent of the installations in a logical sequence.

As Built drawings shall be provided in PDF, AutoCAD Version 2010 or newer and in hard copies as part of the Operational and Maintenance Manuals.

Provide a complete copy of the Operational and Maintenance Manuals to the Electrical Consultant on CD/DVD/thumb drive at completion.

**B9.4** Procedures for Electrical Services Equipment Servicing

The following procedures shall be adopted for the maintenance and defects rectification of Electrical Services Equipment during the defects/warranty period.

The occupants shall be advised and provided with the following:

- Programme to be prepared for routine maintenance and servicing.
- Advance notification required of when any maintenance/defects rectification is to take place due to access/security reasons.
- Detailed inspection reports of work carried out shall be submitted to the occupants following all routine maintenance and defects rectification.

The format of the above shall be to the approval of the Builder. Details to be submitted

**PART C TENDER SCHEDULES**

**C1 Tender Submission**

Tender for the Supply, Delivery, Installation, Testing & Maintenance of Electrical Services.

I/We \_\_\_\_\_

Hereby tender for the supply, installation, testing and maintenance of all work exactly in accordance with Alphazeta Group Pty Limited Specification, Reference AZ17029 \_ESPEC

LUMP SUM TENDER PRICE FIXED TO \_\_\_\_\_ (DATE)

(in words)

\_\_\_\_\_ \$ \_\_\_\_\_

*Certificate of Design Compliance 11 January 2018  
WA Building Certifiers & Assessors - Job No. J005433*

Tenderer: \_\_\_\_\_

Signature: \_\_\_\_\_

Dated: \_\_\_\_\_

Witness: \_\_\_\_\_

## C2 Schedule of Prices for Electrical Services

Description		Fixed Lump Sum Tender
Preparation of Operation and Maintenance Manuals		\$
Electrical Services Costs		\$
Communications Services Costs		\$
Other		\$
PC Sum		N/A
<b>Sub-total:</b>		\$
<b>10% GST:</b>		\$
<b>TOTAL:</b>		\$

Tenderer: \_\_\_\_\_

Signed: \_\_\_\_\_

Dated: \_\_\_\_\_

Witness: \_\_\_\_\_

Certificate of Design Compliance 11 January 2018  
WA Building Certifiers & Assessors - Job No. J005433

## C3 Detailed Cost Schedules

Certificate of Design Compliance

### C3.1 Itemised Schedule of Prices for Power, Lighting and Lighting Control

For the supply, installation, testing and maintenance in accordance with Alphazeta Group Pty Limited drawings and specification.

Description	Cost
Distribution board works	\$
Power systems supply	\$
Power Systems Installations	\$
Lighting system supply	\$
Lighting Installation	\$
Emergency Light System Supply	\$
Emergency Light System Installation	\$
Cable tray installation and cable support	\$
Testing and Commissioning	\$
"As Built" Drawings & Operation and Maintenance Manuals	\$
Coring, Penetrations, Chasing	\$
Removal of waste	\$
After Hours work	\$
Services Co-ordination	\$
Labelling	\$
Others (specify)	\$
Others (specify)	\$
<b>Sub-total:</b>	\$
<b>10% GST:</b>	\$
<b>TOTAL:</b>	\$

Certificate of Design Compliance 11 January 2018  
WA Building Certifiers & Assessors Job No. J005433

**C3.2 Itemised Schedule of Prices for Communications Services**

For the supply, installation, testing and maintenance in accordance with Alphazeta Group Pty Limited drawings and specification.

Description	Cost
Horizontal Cabling	\$
Data Equipment Cables	\$
Cable Support Infrastructure	\$
Patch & Fly Leads	\$
Labelling	\$
Cable Management	\$
Earthing & TRC cabling	\$
Training	\$
Testing & Commissioning	\$
Patch Schedules, Installation of Patch & Fly Leads	\$
"As Built" Drawings & Operation and Maintenance Manuals	\$
Coring, Penetrations, Chasing	\$
Removal of waste	\$
After Hours work	\$
Others (specify)	\$
Others (specify)	\$
<b>Sub-total:</b>	\$
<b>10% GST:</b>	\$
<b>TOTAL:</b>	\$

Certificate of Design Compliance 11 January 2018  
WA Building Certifiers & Assessors Job No. J005433

## C4 Tender Form – Schedule of Rates

Certificate of Design Compliance

APPROVED

The following rates will be used to price approved variations, and shall include all costs, profit and GST associated with the design, supply, installation, testing and commissioning, and defects liability associated with such works. The rates shall allow for all materials, workshop drawing alterations, labour, tools, painting, appliances etc.

Should the Tenderer require differing rates for variation additions as distinct from variation omissions or reductions or differing rates during the various phases of the construction and defect liability period, then those additional rates shall be provided in addition to the following:

### C4.1 Schedule of Unit Rates for Electrical

Description	Rate
<b>Power Services</b>	
Wall mounted DGPO with 20 metres of cabling - Standard	\$
Wall mounted DGPO with 20 metres of cabling – Stainless steel	\$
15A socket outlet isolator with 20 metres of cabling	\$
20A captive outlet chain suspended with 20 metres of cabling	\$
<b>Lighting Services</b>	
Type A light fitting supply and installation	\$
Type B light fitting supply and installation	\$
Type C light fitting supply and installation	\$
Type D light fitting supply and installation	\$
Type F light fitting supply and installation	\$
New Exit Light fitting supplied and installed	\$
New Emergency Light supplied and installed	\$
<b>Communications Services</b>	
Fly Lead – 1m	\$
Fly Lead – 2m	\$
Fly Lead – 3m	\$
Patch Lead – 1m	\$
Patch Lead – 2m	\$
Patch Lead – 3m	\$
Smoke alarm	\$



**C4.2 Schedule of Unit Labour Rates for Site Work**

Trade	Certificate of Design Compliance <b>APPROVED</b>	Normal Time \$ per Hour	Out of Hours \$ per Hour
Labourer	Greenwood Western Australian Building Act, s.19 Building Regulations 2017, r.17	\$	\$
Electrician		\$	\$
Commissioning Technician		\$	\$
Superintendent		\$	\$

The above rates should not include site allowances, travel time or other special allowances. The rates should reflect the cost of labour which is employed full-time on the site.

**C5 Alternative Submissions for Electrical Services****Alternative Submissions**

List alternative submissions below, together with the individual price adjustment to the base lump sum tender price and the individual time adjustment to the time required to complete the contract.

Submit full technical data for each substituted item of equipment.

Alternative Item	Adjustment to fixed Lump Sum Tender (+) or (-) \$	Time Adjustment (+) or (-) Days
1.		
2.		
3.		

Tenderer: \_\_\_\_\_

Signed: \_\_\_\_\_

Dated: \_\_\_\_\_

Witness: \_\_\_\_\_