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Electrical Services Specification

SPECIFICATION
18-0677

ISSUE
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DATE
November 2018

ARCHITECT
Complete Urban

For **Penrith Childcares** 217 Evans Street, South Penrith

At **Penrith, NSW**

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Version: 1, Version Date: 01/03/2019

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QA System
Project Engineer: Towfiqul Islam
Verification: Clyde Maguire

Revision History

Issue	Date	Description	Initials
T	29 November 2018	Tender Issue	TI

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INSTRUCTIONS TO TENDERERS

Complete and submit the attached Tender Forms, including all schedules before the date and time nominated.

Submit a conforming offer as the base tender price.

Alternatives to specified items may be offered provided:

- the alternative is offered as a separate tender price from the base tender price
- the alternative is technically equal to, or better than the specified item, and data sheets with relevant calculations are submitted with the tender to support this.

The lowest or any Tender will not necessarily be accepted.

Tenders shall be on the Tenderer's Company letterhead and delivered to the Architect’s office by the time and date stated.

Any Tender received after the nominated closing time will not be considered.

Tenders received by telephone advice will not be considered.

Tenderers are advised to read the Architect's specification and drawings and to inspect the site before tendering, to fully inform themselves of all existing conditions affecting the contract and to include all works necessary for the proper completion of the works.

Advise the Consulting Engineer of any discrepancy or obvious omission in the drawings or specification prior to submission of the tender.

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1. PRELIMINARIES

1.1 Conditions of Contract

The Conditions of Contract are detailed in the Architect's or Client's Specification.

The successful tenderer will be required to enter into a contract agreement with the Contractor as a Nominated Sub-Contractor.

1.2 Tender Forms

The Tender Forms attached to this specification, including the forms nominated in Section 1.3, shall be completed and submitted as part of the Tender.

1.3 Schedules of Prices and Technical Details

The Schedule of Prices and Schedule of Technical Details attached to this specification shall be completed and submitted as part of the Tender.

1.4 Contingency, Provisional and Prime Cost Sums

The amounts stated in the Tender Form shall be included in the Contract Sum. Disbursement of the amounts shall be at the sole discretion of the Architect. Any part of the amounts not expended shall be deducted from the Contract Sum.

A Provisional Sum is for foreseeable work which is not detailed in the contract documents.

A Prime Cost Sum is for supply and/or installation of a foreseeable "off the shelf" item which is not detailed in the contract documents.

1.5 Site Visit

Visit the site to fully evaluate the extent of work and the conditions prevailing. No claim for additional charges will be accepted for failure to comply with this requirement.

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2. SCOPE

2.1 General

The work carried out shall comprise the manufacture, supply, delivery, installation, testing, commissioning and maintenance of the Electrical Services for this project.

All work shall be carried out in accordance with the Specification, Drawings and such details and instructions as are issued by the Architect or his representative during the progress of the work.

This Specification shall be read in conjunction with the Drawings, all of which are intended to be mutually explanatory. All work called for by the one even if not by the other, shall be fully executed.

The Drawings and Specification show the general intent and do not necessarily show all equipment required to complete the electrical works. Minor items as used in normally accepted trade practice with installations of this type and which are not specifically mentioned, shall be included in the Tender and installation.

2.2 Extent of Work

The work includes but is not limited to the following main elements:

- New Site Main Switchboard (MSB)/Meter Panel
- Coordinate with Supply Authority and Energy Retailer
- New Distribution Switchboards
- Submains Cables
- Earthing
- Cabling and cable support systems
- Accessories and appliances
- General and specific power systems
- Equipment supports and bracing
- Luminaires
- Lighting Control Systems
- Emergency Evacuation Lighting
- Liaise with Client IT and NBN (where mentioned) optical fibre connection
- Telecommunications cabling system and equipment
- MATV System
- Security system
- Liaison with other trades
- Maintenance Manuals
- As-Installed Drawings
- Testing
- Training
- Maintenance.

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2.3 Work In Other Trades

Related work in connection with the Electrical Services (performed by other trades) includes the following but coordinated by the Electrical contractor:

2.3.1 By Main Contractor/Builder

- Temporary services.
- Formed and trimmed openings for recess mounted electrical equipment.
- Formed and trimmed holes in ceilings for recessed luminaires.
- Equipment cupboards.
- Cutting, rendering and patching chases.
- Provision of equipment requiring electrical connection as detailed.
- Co-ordination with Electrical Services to allow installation of concealed conduits and wiring.

2.3.2 By Mechanical Services

- Provision of mechanical services equipment. Electrical contractor provides power supplies to isolators as documented.

2.3.3 By Hydraulic Services

- Provision of hydraulic services equipment. Electrical contractor provides power supplies to isolators as documented.

2.4 Drawings

The following drawings form part of this specification:

Drawing Number	Title
18-0677/E200	Tandara Site Plan

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Drawing Number	Title
18-0677/E201	Tandara Legends & Notes
18-0677/E202	Tandara Lighting Layout
18-0677/E203	Tandara Power Layout
18-0677/E204	Tandara Schematics

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3. GENERAL REQUIREMENTS

3.1 General

This section outlines general requirements which are applicable to all sections of this specification and the works.

3.2 Standards and Regulations

Conform to the latest editions of all standards and regulations. The following standards and regulations are always applicable:

BCA	Building Code of Australia – latest issue before commencement of the building design
AS/NZS3000	Wiring Rules
AS CCM	Communication Cabling Manual for Telecommunications Systems
AS3008.1	For Electrical Cables
AS3012	For Construction and Demolition Sites
AS60529	For Degrees of Protection of Enclosures
AS/NZS3017	For Testing for Safety of Low Voltage Electrical Systems
State Workplace/Occupational Health and Safety Legislation Electrical Safety Act and Regulations. All other relevant Acts and Regulations, Local Authority Requirements, Australian Standards and Codes having jurisdiction.	

3.3 Quality of Materials and Workmanship

All materials shall be new, of the best quality and of the class most suitable for the purpose specified.

All equipment shall have a verified history of successful use in the commercial environment. No prototype equipment will be accepted.

All work on the site shall be supervised by a competent tradesman supervisor who shall be present on site when requested by the Architect, for all phases of the project. A representative shall be nominated, who shall be present and responsible for the day to day running of the project.

The entire electrical installation shall be executed by licensed, experienced tradesmen, and shall be completed in a neat and first-class tradesman-like manner to the satisfaction of the Architect.

3.4 Uniformity

All fittings, accessories and equipment of the same type shall be of the same manufacture and catalogue number.

3.5 Manufacturer's Warranty

Provide manufacturer's warranty agreements where applicable.
Complete all necessary documentation on the Owner's behalf.
Include copies of warranties in the maintenance manuals.

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3.6 Submissions

3.6.1 General

Submit drawings, samples, technical data or other details as applicable for systems as specified prior to ordering or installation.

Allow sufficient time for checking and return of submissions.
Co-ordinate submissions of related items.

3.6.2 Drawings

Provide hard copies as follows:

- A1 size or larger – 3 sets
- A3 size – 1set
- Electronic - PDF

Drawings shall be submitted in original contact size, AutoCAD or REVIT format as applicable.

3.6.3 Samples

Provide samples labelled to indicate type, part or catalogue number as documented on drawings.

3.6.4 Technical Data

Provide manufacturers technical specifications, type test report, performance data, installation details etc. as required.

3.6.5 Co-ordination

Co-ordinate shop drawing design with other building and services elements.

3.7 Certification

Certify that the works have been installed to the requirements of all applicable rules and regulations.

Provide a Form 16 at completion of the works.

3.8 Quality Assurance

Provide a project specific quality assurance plan to cover the design, purchase, fabrication, installation and completion of the works.

Submit Company Quality System third party certification.

Submit, when requested, a copy of the Company Quality Manual.

3.9 Hazard Assessment and Risk Management

Comply with the requirements of the applicable State Occupational / Workplace Health and Safety Act and Regulations with respect to hazard identification and risk management.

Submit a hazard assessment and risk management plan for the construction phase of the works.

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3.10 Electromagnetic Compatibility

Ensure that the entire installation covered by this specification meets the Electromagnetic Compatibility requirements of the Australian Communications and Media Authority.

3.11 Site Conditions and Precautions

Carry out the work in such a manner as to interfere as little as possible with other trades and persons having access rights.

Check existing site services prior to commencing work. Plan work practices based on these exiting conditions to minimise risk and maximise workplace safety.

Locate all existing services prior to excavation or working on existing structures.

3.12 Access to Site

Generally access to the site, working hours and storage facilities shall be agreed with the Architect at the pre-contract site meeting. However, certain restrictions may be applicable to the project and the Contractor shall include within his tender for any restrictions on access.

3.13 Packing Storage and Protection

Plant equipment, apparatus, materials and parts shall be delivered to the site in as new condition and properly packed and protected against damage due to handling or adverse weather or other circumstances.

Arrange suitable storage areas for materials, plant and equipment. Storage shall be on purpose made racks, mounts, etc., to ensure no damage or deformation of items.

Any items suffering damage in transit or whilst on site shall be rejected and replaced without cost to the Contract.

3.14 Setting Out

The positioning of equipment as shown on the Drawings is approximate and diagrammatic only, and these Drawings shall not be used for exact setting out. Locations shall be confirmed prior to installation.

3.15 Work on Existing Electrical Services

Comply with the requirements of Clause 1.9.3 of AS/NZS 3000:2007 for interfacing to existing electrical services.

Amend existing electrical services as required during the construction to ensure continued operation and integrity of existing electrical services.

Comply with the AS 3012, the Workplace Health and Safety Act and Queensland Electricity Safety Regulation 2002 with respect to working on existing electrical systems.

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3.16 Installation

Install equipment and services square and in line with the building elements, plumb and at consistent mounting heights.

Where possible fix directly to the building structure.

Provide noggings, brackets, fixings and supports to manufacturer's recommendations and as required.

Where timber is used for supports or noggings, provide cyprus pine or similar termite resistant species.

Organise reticulated services neatly and with applicable segregation.

Provide separate cable support systems for each reticulated service and support all cables over their entire route length.

Provide all access equipment and temporary lighting necessary for the installation of electrical services.

Allow for supports suitable for seismic (earthquake) restraint to AS 1170.4 where applicable.

3.17 Building Penetrations

Maintain integrity of building systems such as waterproofing and termite management at building penetrations.

3.18 Maintenance Access

Locate all relevant equipment to ensure adequate maintenance access in accordance with Workplace Health and Safety regulations.

3.19 Corrosion Protection

All metallic materials and components shall be suitably protected against corrosion.

Bolts, screws, rivets, etc for external use shall be non-ferrous or stainless steel, or where approved galvanised steel.

Brackets, plinths, rods, etc shall be hot dip galvanised after fabrication.

All steel sheets shall be corrosion protected by means of degreasing, priming and painting as a minimum.

Where the application is in a highly corrosive environment such as in close proximity to the sea, provide suitable grade stainless steel or non-ferrous metallic components.

3.20 Finishes

All equipment shall be painted unless the equipment material is chromium, anodised aluminium, plastics, stainless steel or other non-ferrous metals.

Paint and paint application shall comply with AS/NZS 2311 and AS/NZS 2312.
Carry out all powder coating to AS3715.

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3.21 Adhesives

Provide adhesives and sealants capable of transmitting imposed loads, sufficient to ensure the rigidity of the assembly or the integrity of the joint and which will not cause discolouration or lack of adhesion of finished surfaces.

3.22 Fasteners

Provide masonry anchors, bolts, nuts, washers, screws, nails and plugs as required for installation of electrical services.

Fastener materials, finishes and physical sizes shall be as appropriate for the loads, the types of materials in contact with the fastener and the environment.

3.23 Metals

Provide metal sections and sheet as required for the electrical services.

Finish invisible joints by welding, brazing, soldering, grinding and buffing prior to application of finishes such as galvanising or painting.

Repair galvanised or electroplated metals using two pack organic primer to AS/NZS 3750.9.

3.24 Labelling

Provide labels to equipment as required for identification, operation and warnings.

Labels shall be non-ferrous metal, multi-coloured laminated plastic or pre-printed flexible plastic.

Labels shall be of proven longevity without significant deterioration.

Externally mounted labels shall be weather and corrosion resistant.

Fix labels using nuts and bolts, rivets or self-adhesive material for flexible plastic labels.

Externally mounted fixings shall be corrosion resistant.

Warning labels shall be white lettering on red background with minimum 10 mm high lettering.

Minimum letter heights shall be 3mm.

3.25 Fire Integrity

Where cables or cable support systems pass through a fire rated building element, seal around the penetration using fire sealant materials in accordance with AS 4072.1 and AS 1530.4 to ensure that the required Fire Resistance Level of the building element is maintained.

Comply with the Building Code of Australia statutory requirements.

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Label all penetrations through fire rated building elements and provide a penetration schedule in accordance with AS 1851 Section 17.

3.26 Smoke Barriers

Where cables or cable support systems penetrate smoke barriers, install and support this equipment to fully comply with all statutory requirements for smoke barrier building elements.

Label all smoke barrier penetrations and provide a penetration schedule in accordance with AS1851 Section 17.

3.27 Acoustic Integrity

Install electrical services to comply with acoustic isolation requirements of the Building Code of Australia, AS/NZS 3000 and statutory requirements.

Note in particular the requirements for residential units and buildings and provide acoustic rated wall boxes and light fitting covers as required to maintain the acoustic rating.

3.28 Operation and Maintenance Manuals

Provide Operation and Maintenance Manuals for all systems and components covered by this specification. Include As-Installed documentation for the entire installation in these manuals.

Provide two copies of manuals and drawings neatly bound into A4 size hard cover ring binders which are permanently labelled with the Project Name, Contract Description and Contractor's Name.

Include the following in each set of manuals:

- Index
- Copies of all test results, certificates and approvals.
- Manufacturer's operating instructions and details of model numbers, serial numbers, operating instructions, and manufacturer's guarantee certificate for equipment and appliances.
- Emergency Lighting Log Book to AS 2293 requirements, as published by General Lighting Services Pty Ltd or equal approved.
- Brief description of the Electrical installation and distribution network etc.
- A recommended maintenance programme for all equipment installed.
- A recommended list of spare parts.
- Paper prints of all As-Installed Drawings as follows:
  - Layout drawings in the same size and form as the original contract drawings, but modified to reflect all changes which occurred during construction.
  - System schematic diagrams and schedules.
  - The title block of each drawing amended to include the Contractor's name and contact details, Contractor's drawing number and date of issue.
- A CD Rom containing electronic copies of all As-Installed drawings in AutoCAD ".dwg"format.

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Provide a draft hard copy set of the Operation and Maintenance Manuals to the Architect not less than 2 weeks before the date of practical completion, for the purpose of review and comments.

Submit final sets of the Operation and Maintenance Manuals to the Architect not more than 2 weeks after the receipt of comments on the draft from the Architect.

Final contract payment will not be approved until satisfactory Operation and Maintenance Manuals have been received.

3.29 Clean Up

At completion clean all electrical equipment to as-new condition.

Remove all waste and debris on a continuous basis.

3.30 Testing and Commissioning

Fully test and commission the complete electrical installation prior to practical completion.

Provide project specific Inspection, Testing and commissioning Plans for all electrical systems. Only suitably qualified personnel shall carry out testing and commissioning. Provide evidence of qualifications when requested.

Record all test results and submit for inspection prior to practical completion.

3.31 Construction Phase Procedures

3.31.1 General

Comply in all respects with procedures established by the Superintendent for the construction phase of the project.

3.31.2 Line of Communication

Ensure compliance with formal transmission of emails, RFIs and submissions through the agreed line of communication.

Advice received by other avenues will not be considered as a formal instruction.

3.31.3 Variations

Variation price submissions shall be accompanied by a detailed description of the work involved. Provide supporting documentation where necessary and as requested.

All costs shall be submitted on a spreadsheet showing itemised break-ups of all materials and labour.

3.32 Practical Completion

Practical Completion will be granted after the following is provided:

- Finalisation of all testing and commissioning
- Certification that the installation complies with the specified requirements and all applicable Statutes and Standards
- Authorities approval obtained as required
- Preliminary instruction on safe plant operation has been provided

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- Critical defects have been rectified
- Operation and Maintenance Manuals and As-Installed drawings have been provided

3.33 Test Instrument Calibration

All test instruments shall have current calibration certificates. Certificates shall be shown to the Superintendent prior to commencement of each test. Certificate currency shall be 12 months maximum.

3.34 Inspection at Practical Completion

Arrange for a Practical Completion Inspection by the Architect. A minimum of 5 working days notice shall be given.

Ensure that the installation is fully operable and practically completed before requesting an inspection.

Should the inspection reveal that the installation is not fully operable or practically completed and require further inspections, these inspections will be charged to the Electrical Subcontractor.

3.35 Instructions and Training

Provide skilled operators to instruct such persons as may be nominated by the Architect in the effective operation of all of the electrical systems in the installation. Instructions shall not be given until completion of all tests and adjustments.

Conduct training at agreed times and locations and for durations commensurate with the complexity of the systems.

3.36 Maintenance and Warranty During Defects Liability Period

Carry out preventative maintenance on a regular schedule for systems as detailed in other sections of this specification.

Promptly rectify all defects during the defects liability period. Attend site within 1 working day of notification of defect. Critical system defects shall be rectified in the time schedule as detailed in other sections of this specification.

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4. SUPPLY

4.1 Supply

Supply will be to Network Standards 3 phase, 230/400V, 50Hz, 4 wire, MEN earth system.

4.2 Standards

Comply with all regulations, standards and requirements of the Supply Authority, local council and BCA.

4.3 Metering

Supply and install all equipment and enclosures as required for the provision of electricity metering. Carry out all works to Supply Authority and Energy Retailer requirements.

The general arrangement of metering facilities shall be as shown on the drawings.

Arrange for the installation of metering facilities with the Supply Authority and the Energy Retailer.

Liaise with the Customer and Architect for tariff and metering requirements.

4.4 Applications

Complete all necessary forms as required by the Supply Authority and Energy Retailer

Ensure that the Customer (Owner) has completed all forms and paid all contributions to enable completion of the supply and metering works.

4.5 Consumers Mains

Provide all necessary lugs, glands and terminations for connections at both ends.

4.6 Phase Rotation

Check phase rotation with the Supply Authority and provide uniform phase rotation in the project cabling system.

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5. CABLES AND CABLE SUPPORTS

5.1 General

Supply and install all required cables and cable support systems.

5.2 Quality

5.2.1 Standards

- Installation and selection to AS/NZS 3000, AS/NZS 3008.1, AS/NZS 3003 , AS/NZ 3013 and SAA HB301.
- Cables to AS/NZS 5000.1, 2 and AS/NZS 4961.
- Conduits to AS 2053 Series.
- Conduits for telecommunications to AS/ACIF S008 and S009.
- Fire and mechanical performance to AS/NZS 3013.
- Testing to AS/NZS 3017.

5.2.2 Submissions

5.2.2.1 Samples

Submit samples items if asked by the superintendent.

5.2.2.2 Shop Drawings

Submit shop drawings of:

- Trunk cable routes

5.2.2.3 Technical Data

Submit technical data for:

- Cable ladders
- Cable trays
- Submain cables:
  - XPLE
  - Fire Rated
- Skirting wiring duct

5.3 Products

5.3.1 Power Cables

Cables shall be multi-stranded copper conductor with PVC, XLPE and/or fire-rated insulation and sheath.

Cables shall be 0.6/1kV, V75 rated as a minimum standard.

Cables shall be colour coded as detailed in AS 3000:2007 Clause 3.8.

Minimum cables sizes shall be (unless noted elsewhere):

- Lighting sub-circuits: 1.5mm^2
- External Lighting sub-circuits: 2.5mm^2
- Power sub-circuits: 2.5mm^2
- Submains: 6mm^2

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Select cable sizes to comply with volt drop, short circuit and earth fault/touch voltage requirements of AS 3000.

Cable lugs shall be of the correct size and material for the conductor.

Cables for exterior lighting circuits shall be double insulated, external grade, suitable for use in underground conduit systems.

5.3.2 Conduits

Conduits shall generally be rigid non-metallic (UPVC or PVC), minimum 20mm diameter UNO. Provide metallic conduits where shown or specified.

Conduits shall be to AS/NZS 2053 series.

Conduits for telecommunications systems shall comply with AS/ACIF S008 and S009.

Conduits for underground low voltage cabling shall be heavy duty rigid PVC to AS 2053.

Non-metallic conduits and fittings shall be grey or orange PVC as appropriate.

Metallic conduits and fittings shall be galvanised steel with screwed connections.

Provide flexible conduit only as required for connection of cables to equipment which is subject to movement or vibration.

Conduit fittings shall be of the same material and finish as the conduit.

5.3.3 Ducted Wiring Enclosures (Cable Ducts)

Cable ducts shall be purpose made zinc coated steel or PVC complete with matching purpose made accessories, lids and covers as required for a complete enclosure system.

Lids or covers shall be screw fixed or clip on, removable only by means of tools.

Miniature wiring duct for final sub-circuits shall be rigid, white PVC with snap-on lid.

5.3.4 Cable Ladders and Trays

Cable ladders and trays shall be proprietary fabricated steel complete with all accessories and fittings for a complete tray system. Provide screw fixed lids as required.

Cable trays shall be perforated sheet steel folded and welded as required. Cable trays and accessories shall be zinc coated steel for internal use and hot dip galvanised for exterior use.

Cable ladders and accessories shall be welded steel construction, hot dip galvanised finish.
All Trays shall be be run parallel and plumb with building structure supported with unistrut brackets spaced at manufacturer's recommendation.
Trays may only be run inverted where access will be restricted and where approval is granted.

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5.3.5 Catenary Systems

Catenary wires shall be multi-stranded galvanised steel type.

Fittings such as hooks, eyes and turnbuckles shall be galvanised steel.

5.4 Installation

5.4.1 Cables and Cable Supports Generally

Install low voltage cables in accordance with AS/NZS 3000:2007 and in particular all of Section "Selection and Installation of Wiring Systems".

Install telecommunications cabling systems in accordance with AS/ACIF S009.

Maintain minimum installation clearances in accordance with AS/ACIF S009 and AS/NZS 3000.

Install all wiring systems (cables and their supports) concealed within the building fabric throughout unless in mechanical plant spaces, risers or as noted otherwise. Where it is proposed to run exposed wiring systems, obtain approval for the route and method before proceeding.

All wiring shall be fully supported along the entire route length.

Fix cable support systems to structural elements of the building only.

Cables run underground shall be installed in a conduit and pit system.

Cables and wiring for separate systems shall be run separately and on separate cable support systems or in segregated sections of the same support system.

Low voltage cable sizes shown on the drawings are based on installation methods to avoid derating in accordance with AS 3008.1 Table 26. Increase cable sizes as required when cables are installed in a manner requiring a derating factor to be applied.

All cables shall be installed in a manner which enables easy removal and rewiring.

Cables in ceiling spaces shall be supported above the top of recess mounted light fittings.

All wiring shall be installed on the loop-in system with connections made at equipment or accessories.

Wiring in chases shall be run in concealed conduit.

Ensure minimum bending radius requirements for all cable types are maintained at all times.

For cables run in conduit use draw wires to pull in cable groups from point to point. Fill conduit to a maximum of 75% of the capacity noted in AS/NZS 3000.

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Run all wiring systems grouped, tied or enclosed, square and parallel to the building structure.

Do not use adhesive fixing for cable support systems.

Run cables in external cavity walls in a manner which does not compromise the weather protective wall construction.

Support vertical cable runs to avoid damage due to cable mass.

Install cables in a manner that does not damage the cable during installation.

5.4.2 Submains

Run in conduits or on cable support systems such as cable ladder or tray in celling space.

Terminate using cable lugs and crimping tool.

Terminate submains to all switchboards.
Use suitable glands when entering equipment or assemblies.

Identify cables at both ends using stamped tags or similar.

5.4.3 Fire and Mechanical Protection

Where required, install cables and cable support systems with fire and mechanical protection (WS rating) to AS/NZS 3013.

Use stainless steel cable ties for all fire rated cables.

Provide fire rated wall boxes where required to maintain fire integrity.

5.4.4 Conduits

Conduits shall be rigid UPVC, PVC or metallic throughout except for short length final connections to direct connected equipment where smooth or corrugated flexible conduit may be used.

Install in straight, parallel runs, set at changes of direction, with maximum 90° bends, free of burrs and foreign materials. Provide draw-in boxes, expansion joints and saddles to ensure a conduit system free of visible sags and able to have cables pulled in after conduit installation. Draw in boxes shall not be located in inaccessible positions.

Conduit shall not be run against or in insulation.

Conduits run in reinforced concrete shall be run in the centre of the concrete slab or wall. Parallel runs of conduits shall have a minimum of 50 mm separation. Conduits cast into concrete shall be adequately secured to avoid movement of damage during pouring. Conduit ends shall be secured and capped to avoid damage and ingress of foreign material.

PVC conduits and fittings shall be joined using the recommended jointing adhesive.

Provide polypropylene draw cords or stranded and insulated draw cable (2.5 mm^2) for all unused conduits.

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For steel conduits paint ends and threads with zinc rich primer.

Use flexible conduit for connection to equipment subject to vibration.

All associated fittings shall be of the same material and colour as the conduit.

For telecommunications conduits:

- Inspection fittings shall not be used
- All bends shall be large radius type to ensure minimum bending radius conditions of cables are met
- Apply temperature derating to AS/NZS 3080 where conduit is run in roof spaces.

5.4.5 Cable Ducts, Trays, Ladders, Mesh and Skirting Duct Systems

Install completed systems with all necessary lids, brackets, supports, fixings, rods and hangers.

Light duty cable tray shall only be used in concealed spaces or risers to carry and support final sub-circuits and ELV cabling systems (data, security, fire and MATV etc.).

Cable trays where run exposed shall be medium or heavy duty trays or cable ladders.

Groups of mains or submains cables shall not be run on light duty cable trays.

Cable tray lid shall not be used to support any cables.

For telecommunication systems, install to AS/ACIF S009.

Fixings, brackets and supports shall be fabricated from steel of suitable strength and rigidity to provide support to AS 1170.4.

Separate low voltage power cables by distances sufficient to avoid derating in accordance with AS/NZS 3008.1 Table 23.

Comply with manufacturer's recommendations for support spacings based on maximum carrying capacity.

Size systems to ensure minimum cable bending radius requirements can be achieved at all times.

Provide clear space around cable support systems to enable installation of cables.

Provide segregation between cable supports for different wiring systems. Ensure minimum separation of wiring systems as required by applicable standards and regulations.

Fix cables in suitable groups using cable clamps, ties or straps.

Provide bends with a minimum inside radius of 12 times the outside diameter of the largest cable installed.

Install clear of hot or wet equipment or surfaces in accordance with AS/NZS 3000.

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Provide peaked galvanised steel lids over cable support systems where run exposed to sunlight andthe elements.

Provide cable protection where cables enter or leave cable support systems.

Provide separate conduit access between skirting wiring duct compartments and ceiling space. Run conduits into proprietary cable access boxes located behind the skirting duct.

Ensure that 25% minimum spare capacity remains in all cable support systems at completion. Size all cable support systems accordingly.

5.4.6 Catenary Systems

Install using turnbuckles and intermediate ties to provide adequate cable support with minimal sag. Maximum 15m spacing between anchors and turnbuckles.

Fix cables using nylon cable ties, Velcro straps or similar approved system.

Run low voltage electrical cables to avoid derating to AS 3008.1.

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6. EARTHING

6.1 General

Supply and install Protective and Functional earth systems to ensure safe operation of the electrical installation.

The protective earth system shall be multiple earthed neutral (MEN), or TN system to IEC60364.

6.2 Quality

6.2.1 Standards

AS/NZS 3000 Section 5 "Earthing Arrangements and Earthing Conductors" for electrical system earthing.

AS/ACIF S009 for telecommunications cabling functional earths and equipotential bonding.

6.3 Products

Provide earthing system components manufactured from copper, brass or copper clad steel for earthing electrodes.

Provide equipment as required for the protective earth system, functional earths, telecommunications system connection to earthing system and equipotential bonding.

Provide guards, covers, pits and enclosures as required to ensure mechanical protection of the complete earthing system.

Provide labels for earthing components as required.

6.4 Installation

Protect the complete earthing system from mechanical and environmental damage.

Ensure all earthing system components are sized to resist the electrical forces (fault currents). Provide calculations where required. Refer to AS/NZS 3000 Clause 5.3.3.1.2.

Earth all exposed conductive parts of the electrical system.

Earth all conductive building materials and structural metalwork, including reinforced concrete floors of bathrooms and similar wet areas.

Provide separate earth cables for each circuit.

Install earth electrodes in locations which ensure effective contact with moist soil and are separated from conductive enclosures of other buried services such as water, gas and telecommunications.

Provide accessible pits and lids for earth electrodes and label in accordance with AS/NZS 3000.

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Where high soil resistivity is encountered provide drilled cores with bentonite resistivity enhancer and multiple earth electrodes as required.

Bond incoming conductive enclosures of buried services such as water, gas and telecommunications to the protective earthing system. Refer to AS/NZS 3000 Clause 5.6.

Provide equipotential bonding as required for other systems or equipment as noted in AS/NZS 3000 Clause 5.6 and related standards for the particular systems.

Ensure continuity of earthing connections to all earthed systems and structures.

Provide telecommunications system earthing to AS/ACIF S009, related ACMA standards and AS 3080.

6.5 Specific Earthing Arrangements

Provide large cross-section earth conductors as required for specific installations such as UPS.

6.6 Completion

Inspect and test the earthing system in accordance with AS/NZS 3000 Section 8 "Verification" including all applicable mandatory tests (Clause 8.3.3), continuity of the earthing system (Clause 8.3.5) and earth fault loop impedance (Clause 8.3.9).

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7. SWITCHBOARDS

7.1 General

Supply and install new Main Switchboard and all Distribution Switchboards as documented on the drawings.

Switchboards shall be constructed by a specialist switchboard manufacturing company with proven capability and 10years minimum experience plus accreditation from the respective equipment manufacturers for installed switchgear and components to maintain the warranty. Switchboards shall be fully enclosed, metal cubicle, circuit breaker type unless shown otherwise.

7.2 Quality

7.2.1 Standards

AS 3439 Series for switchboard design and construction.

AS/NZS 60898.1 and AS 3111 for miniature circuit breakers.

AS 60947 Series for low voltage switchgear and controlgear.

AS/NZS 3190 for RCD circuit breakers.

AS 60269 series for HRC fuses.

AS 60044.1 for current transformers.

AS 4070 Category 11 for surge diverters (transient protection).

Supply Authority for metering provisions and general arrangement.

7.2.2 Submissions

7.2.2.1 Type Test Data

Submit type test certificates in the name of the switchboard manufacturer for assemblies and components when requested.

7.2.2.2 Shop Drawings

Submit shop drawings showing:

- Types, model numbers and ratings of assemblies.
- Component details, functional units and transient protection.
- Detailed dimensions.
- Type test certificate number.
- Shipping sections, general arrangement, plan view, front elevations and cross-section of each compartment.
- Projections from the assembly that may affect clearances or inadvertent operation, such as handles, knobs, arcing-fault venting flaps and withdrawable components.
- Fault level and rated short circuit capacity characteristics.
- IP rating.
- Fixing details for floor or wall mounting.

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- Front and back equipment connections and top and bottom cable entries.
- Door swings.
- External and internal paint colours and paint systems.
- Quantity, brand name, type and rating of control and protection equipment.
- Construction and plinth details, ventilation openings, internal arcing-fault venting and gland plate details.
- Terminal block layouts and control circuit identification.
- Single line power and circuit diagrams.
- Details of mains and submain routes within assemblies.
- Busbar arrangements, links and supports, spacing between busbar phases and spacing between assemblies, the enclosure and other equipment and clearances to earthed metals.
- Dimensions of busbars and interconnecting cables in sufficient detail for calculations to be performed.
- Form of separation and details of shrouding of terminals
- Labels and engraving schedules.

7.2.2.3 Calculations

Submit design calculations to verify design assumptions, to AS 3865 and AS 4388.

Submit design calculations to verify busbar ratings.

7.2.3 Design Criteria

Construct switchboards to comply with the following:

- Rated busbar current:
  - 250A (minimum) or as shown on drawings for distribution boards
  - Full size neutrals
- Rated prospective short circuit current:
  - Greater than calculated fault level at switchboard location
  - 10 kA (minimum), or as shown on drawings for distribution boards
- Degree of Protection:
  - IP42 to AS 60529 for internal switchboards
  - IP56 to AS 60529 for external switchboards
  - IP2X between adjacent compartments in switchboards (after cable installation)
- Form of Separation (unless noted otherwise):
  - Form 1 for Distribution Boards up to 400A
  - Form 2 for greater than 400A up to a maximum 800A
- Physical Size:
  - Designed for installation into the spaces allocated on the drawings
- Future Circuit Spare Capacity:
  - 25% or as shown on drawings, whichever is the greater
- Protection Grading:
  - Designed to ensure full co-ordination with calculated grading from Supply Authority protection through to sub-circuit protection i.e. full discrimination

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- Design protection grading for both Mains and Generator supplies where applicable.
- Busbar Temperature Rise Limits:
  - Maximum rated current – temperature rise 50°C, ambient temperature 40°C
  - Maximum short-circuit current – temperature rise 160°C
- Limitation of Internal Arcing Fault Currents:
  - Comply with AS/NZS3000 Section 2.5.5.
- Uniformity
  - Provide circuit breakers from one manufacturer to ensure complete protection grading.

7.3 Products

7.3.1 General

Switchboards shall be fully enclosed, metal cabinet type and either custom built or proprietary construction as required.

Front access assemblies with frontal area less than $2m^2$ shall be wall mounted. All other assemblies shall be floor mounted.

Design assembly cabinets to enable transportation to site and positioning into the available space during construction.

7.3.2 Assembly Cabinets

Provide rigid, square enclosure cabinets of fabricated sheet metal, folded and welded construction.

Indoor assemblies shall be 1.6mm (minimum) metallic coated sheet.

Machine fold sheet metal angles. Weld all joints and finish flush with adjacent surfaces. All bare edges shall be lipped with minimum return of 13mm. Provide stiffening members as required for rigid construction.

Support frames and structural members shall be cold rolled or extruded steel sections welded or bolted to the cabinet metalwork. Steel for outdoor assemblies shall be hot dip galvanised.

Provide degree of separation as specified by means of horizontal and vertical steel partitions.

In addition, provide panels in vertical compartment walls for controlled cable and busbar access between adjacent compartments. Busbars and cables shall penetrate the vertical panels at right angles. Provide adequate seals and cable glands to maintain the Degree of Protection and Form of Separation.

Ensure vermin proof construction throughout. Cover ventilation openings with non-ferrous 1mm mesh.

Fix equipment to panels or support frames using corrosion resistant bolts, studs, set screws or proprietary clips. Fixings shall be accessible after completion to enable future equipment changes.

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Lifting provisions shall be included for assemblies larger than 1800mm high x 600mm wide, or as required for transportation and installation.

Provide mounting structure and fixings which allow assemblies to be fixed in position without removing equipment.

Floor mounted assemblies shall be provided with hot dip galvanised steel plinth, minimum 75mm high, 40mm wide, 6mm thick, drilled and bolted to assembly base and floor or plinth.

7.3.3 Doors, Removable Panels and Escutcheons

Provide lockable doors, removable panels and escutcheons for complete assemblies.

Fabricate from the same material and construct as for the assembly cabinet.
Minimum door and escutcheon swing shall be 90°. Maximum cover and escutcheon and area 1.2m^2.

Doors and covers shall have right angle returns on all sides fitted with continuous sealing rubber gasket fixed on a metal retaining frame with industrial grade adhesive.

Provide stays to exterior mounted assembly doors.

Ensure door seal contact onto the assembly flat surface and for exterior mounted assemblies the door seal shall be outside a gutter formed around the full perimeter of the assembly opening.

Provide chrome plated non-ferrous door furniture of sufficient strength to withstand fault condition explosive forces within the assembly.

Provide doors, covers and escutcheons as follows:

- Doors
  - Lift off hinges with unequal pin lengths
  - 3 hinges for doors higher than 1000mm
  - Captive knuckled thumb screws
  - T or L type door handles activating wedge type latching mechanism or latching bar and guides.
  - Locking mechanism integral with the latching system, keyed alike, 2 keys per assembly, Lowe and Fletcher 92268 or as directed.
  - D handles for removal and replacement.
- Covers
  - Lift off hinges as for doors
  - Captive knurled thumb screws
  - D handles for removal and replacement
- Escutcheons
  - Hinged for area more than 1m^2
  - Knurled thumb screws with locating pins, minimum 4 fixings
  - D handles for removal and replacement

Maintain earth continuity to all doors, covers and escutcheons.

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Shroud terminals to all door mounted equipment.

7.3.4 Cable Entries

Provide cable entries Top/bottom (as shown on schematic) for incoming and outgoing cables.

Provide sufficient clear space to allow installation of cables, including cables for all future circuit provision, without undue bunching or sharp bends.

Provide removable non-ferrous gland plates as installed to maintain the degree of protection.

Provide cable glands at entry points for all submains cables.

Provide cable support systems within the cables zones for fixing of cables. Size cable supports to allow for future circuits to the capacity of the assembly.

7.3.5 Finishes (Amend colours as required)

Apply protective coatings to internal and external metal surfaces of assembly cabinets except for stainless steel, galvanised or anodised surfaces and ventilation mesh.

Paint finish shall be thermoset powder coating to AS3715 and APAS-0155/1 with finish colours as follows:

- Indoor Assemblies:
  - External surfaces – Orange
  - Internal surfaces – white
- Distribution Boards:
  - External surfaces – standard finish
  - Internal surfaces – white

7.3.6 Busbars

Provide solid busbars within assemblies from the incoming supply terminals to the line side of protective equipment for outgoing functional units, including future functional units.

Busbars shall be solid electrical grade hard drawn copper, rectangular section, tinned.

Use of flex busbar and cables in lieu of solid busbar is not acceptable unless specifically noted on the drawings.

Neutral busbars shall be of the same current carrying capacity as the active busbars.

Busbar ratings shall be as noted on the drawings or as detailed in the design requirements.

Support busbars on non-hygroscopic insulating material designed to withstand temperature rise and fault current parameters.

Busbars passing through slots shall be sleeved with plastic shrink type sleeving.

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Provide fully insulated and colour coded busbars for distribution boards.

Provide colour coded bands at least 50mm wide on uninsulated busbars in main switchboards. Locate on each busbar section in every compartment. Do not use adhesive tape.

Colour code busbars as follows:

Active: red, white, blue
Neutral: black
Earth and MEN link: green/yellow

Maintain phase sequence throughout the assembly.

Run neutral and earth busbars into each compartment containing functional units. Number all terminations. Provide terminals for all future circuits. For cables greater than 10mm^2 provide bolts or studs. Tunnel type terminations are acceptable for cables up to 10mm^2.

Where functional units of the switchboard are equal to or greater than 1000A, the neutral busbars shall follow the active busbar through the functional units via the same gland plates.

Join busbars using high tensile bolts and nuts, locked in position and tightened to the recommended torque using a tension wrench. Busbar joints shall be fully lapped to maintain adequate joint surface area.

Busbars marked by scribing will be rejected. All marking shall be pencil or ink.

Provide pre-drilled main circuit supply busbar for future extension where shown.

Extend busbar tee-offs to all future functional unit locations.

Provide removable busbar sections less than 400mm long for current transformers.

For MEN links greater than 10mm^2 provide bolted removable busbar link..

Provide busbar flags for equipment with terminals too small for cable lugs. Support busbar flags as required. Provide barriers where minimum clearance distances are not satisfied.

Distribution board busbar chassis pole quantities are based on 1 pole position for integral MCB/RCD's. Increase pole quantities if integral MCB's/RCD's take up more than 1 pole location.

7.3.7 Wiring

Provide all required internal wiring in switchboard assemblies with insulation grade appropriate to the design temperature at terminations.

Cables shall be sized for current rating based on the internal ambient temperature and also fault current withstand capability.

Run cables neatly and support clear of busbars and functional units.

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Identify cables at both ends.

Shroud terminals where exposed, particularly on hinged panels and doors.

Identify all internal instrumentation and control cable ends by clip on markers. Adhesive markers shall not be acceptable. Indicate numbering on "As Installed" circuit diagrams. No numbers shall be duplicated.

7.3.8 Equipment Layout

Arrange equipment in logical positions to provide a neat and simple design.

Locate equipment to minimise derating due to temperature rise and to ensure that the design temperature is not exceeded at each functional unit and inside the assembly.

7.3.9 Circuit Breakers

Provide circuit breakers of LG, NHP/Terasaki, Eaton or ABB manufacture.

For loads to 100A provide miniature circuit breakers.

For loads 100A to 1600A provide moulded case circuit breakers.

7.3.9.1 Miniature Circuit Breakers (MCBs)

Provide miniature circuit breakers of the specified fault and current rating complying with AS/NZS 60898.1 and AS 3111.

Miniature circuit breakers shall be of the same manufacture throughout.

Mount miniature circuit breakers to manufacturers requirements and to ensure that 1, 2 or 3 phase MCBs are interchangeable onto the same busbar chassis.

Align operating toggles in the same plane.

7.3.9.2 Residual Current Operated Circuit Breakers (RCD/MDBs)

Provide combined RCD/MCBs of the same manufacture as miniature circuit breakers, complying with AS/NZS 3190 and with a maximum RCD tripping current of 30mA.

Provide RCD/MCB's which use the same poles and pole spacing as MCBs.

7.3.9.3 Moulded Case Circuit Breakers (MCCBs)

Provide MCCBs of the specified fault and current rating complying with AS 60947.1 and AS 60947.2.

Derate MCCBs as required for installation conditions.

Use MCCBs of the same manufacture throughout.

Align operating toggles in the same plane.
Mount MCCBs in accordance with manufacturer's recommendations.
Provide terminal barriers and shrouds as required for the designed Form of Separation.

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Trip units for MCCBs rated at 160A or greater shall be adjustable electronic type.

7.3.10 Switches/Isolators and Fuse Switches

Provide units complying with AS 60947.1 and AS/NZS 3947.3 and rated to the enclosure installation conditions and anticipated loads.

Provide locking facilities in the OFF position.

7.3.11 Contactors

Provide contactors to AS 3947.4.1 rated for the enclosure conditions and anticipated loads.

Contactors shall be Sprecher & Schuh or approved equivalent manufacture.

7.3.12 Fuses with Enclosed Fuse Links

Provide HRC type fuses and fuse carriers to AS 60269 series.

7.3.13 Control Devices and Switches

7.3.13.1 Time switches

Provide time switches with:

- 7 day program.
- 100 hour minimum running reserve.
- Minimum contact rating of 16A.
- Clock face interface.

Provide readily accessible means of adjustment. Provide operational settings which are clearly visible when switch cover is fitted.

7.3.13.2 Control relays

Provide control relays as follows:

- Suitable for continuous operation. Provide relays selected in conformance with the load duty.
- Plug-in type with bases with captive clips which can be operated without using tools.
- Electrically separate, double break with silver alloy, non-welding contacts.
- With contact blocks readily convertible to either normally-open or normally-closed contacts.

7.3.13.3 Time delay relays

Provide time delay relays as follows:

- Adjustable over the full timing range with timing repeatability within ± 12.5% of nominal setting.
- Incorporate light emitting diodes indicating energisation states of relays.

7.3.13.4 Push-buttons

Provide push buttons as follows:

- Oil-tight, minimum 22mm diameter, or 22 x 22 mm.
- Rated operational current at least 4 A at 240 V a.c.

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- Emergency stop devices with mechanical latching to AS/NZS 3947.5.5.

Identify functions of each push-button. For latched STOP or EMERGENCY STOP push-buttons, provide label with instructions for releasing latches.

7.3.14 Marking and Labelling

7.3.14.1 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. Submit full details of proposed text plus manufacturer details for all labels on workshop drawings.

7.3.14.2 Labels on assembly exteriors

Provide Manufacturer's name and details. Labels shall be Etched aluminium with 20mm minimum height block letters, mechanical fixing, colours as below for interior labels, UV resistant treatment.

Compliance engraved label to be provided on fascia of switchboards which includes information regarding current rating, fault rating, type test certificate, form of segregation, pollution degree, month and year of manufacture, dimension of switchboard and rated voltage.

Provide designation label (assembly name).

Indicate source of electrical supply.

Label controls and fault current limiters, including the following:

- Circuit designation for main switches, main controls and submains controls.
- Details of consumers mains and submains.
- Incoming busbar or cable rating to first tee-off.
- Fuse link size.

7.3.14.3 Labels on assembly interiors

Provide labels for equipment within assemblies. Locate so that it is clear which equipment is referred to, and so that lettering is not obscured by equipment or wiring. Engraved laminated pvc screw fixed. Lettering shall be 6mm block lettering for minor equipment and 10mm block lettering for major equipment. Warning and emergency equipment labels shall be white letters on red background. And standard labels shall be black letter on white background.

7.3.14.4 Danger, warning and caution notices

Busbars: If polymer membrane coating is used without further insulation, provide warning notices on the front cover near the main switch or local main switch and on rear covers, indicating that busbars are not insulated.

Fault current limiters: In assembly sections containing fault current limiter fuses provide caution notices fixed next to the fault current limiters, stating that replacement fuse links are to match the installed fuse link ratings, make and characteristics. Provide separate label stating make and fault current limiting fuse ratings.

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Externally controlled equipment: To prevent accidental contact with live parts, provide warning notices for equipment on assemblies not isolated by main switch or local main switch.

Anti-condensation heaters: To prevent accidental switching off, provide caution notices for anti-condensation heaters.

Insulation and shrouding: For insulation or shrouding requiring removal during normal assembly maintenance, provide danger notices with appropriate wording for replacement of insulation shrouding before re-energising assemblies.

Positioning: Locate notices so that they can be readily seen, next to or, if impracticable, on busbar chamber covers of functional units and behind the front cover of functional units.

Provide circuit identification labels in the cabling chamber of each functional unit, located next to external terminations.

7.3.14.5 Size

Engrave as shown on labels above.

7.3.14.6 Schedule cards

General: For general light and power distribution boards, provide schedule cards of minimum size 200 x 150 mm, with typewritten text showing the following as-installed information:

- Submain designation, rating and short-circuit protective device.
- Light and power circuit numbers and current ratings, cable sizes and type and areas supplied.

Mount schedule cards in a holder fixed to the inside of the assembly or cupboard door, next to the distribution circuit switches. Protect with hard plastic transparent covers.

7.3.14.7 Single-line diagrams

Provide single-line diagrams for all switchboards.

Provide non-fading print, at least A3 size. Enclose in a non-reflective PVC frame and wall mount close to assembly.

7.3.14.8 Marking cables

Identify the origin of all wiring. Provide durable labels fitted to each core and sheath, permanently marked with numbers, letters or both to suit the connection diagrams.

7.4 Installation

Install switchboards level and plumb in the spaces provided.

Fix wall mounted assemblies using a minimum of 4 non-ferrous or galvanised metal fixings.

Mount floor mounted assemblies on purposed built suitable foundation or plinth, generally reinforced in-situ poured concrete.

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Secure assembly plinth to foundation using a minimum of 4 masonry anchors.

Provide assembly mounting structure over switchboard entry pits, and finish off with galvanised steel checkerplate orGatic type lid sections complete with lifting provisions.

Bolt transportation sections together to form a rigid assembly. Complete all necessary interpanel connections.

Install Supply Authority equipment as required.

Ensure isolation of dissimilar metals to prevent galvanic corrosion in external locations.

For concrete plinth mounted switchboards provide a bituminous impregnated cork gasket between the switchboard base and the concrete plinth. Provide reinforced concrete foundation / plinth, trowel finished a minimum of 100m above surrounding ground level. Secure switchboard to concrete base using corrosion resistant fixings suitably isolated from the switchboard metalware.

Continue cable support systems to the assembly and complete cable access in a manner which retains the IP rating of the assembly.

Leave spare capacity at cable entries and gland plates for future circuit cable entries.

For all mains and submains cables provide glands and gland plates.

For final sub circuit cable entries provide suitable vermin proof cable enclosure.

For distribution switchboards exposed to view, provide cable access cover from switchboard to ceiling and/or floor as appropriate to neatly conceal cables and provide a uniform appearance.

Fully support all cables inside enclosures using cable duct or trays. Secure cables using non-metallic ties. Support and secure cables to within 200mm of terminations.

Ensure earth bonding throughout the assemblies.

Run internal switchboard cabling at right angles through compartment walls and gland off or seal in the same manner as for switchboard cable entries.

7.5 Testing And Verification

Carry out all type tests and routine tests for a PTTA in accordance with Section 8 of AS/NZS 3439.1.

Submit test results for verification.

7.6 Completion

Adjust, set and program all adjustable or programmable equipment.

Carry out all required site tests.

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Clean all assemblies and remove all waste.

Energise assemblies in accordance with Workplace Health & Safety and company quality assurance procedures.

Carry out thermographic tests and submit report 1 month after practical completion and at the end of the defects liability period.

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8. ACCESSORIES, APPLIANCES & DIRECT CONNECTIONS

8.1 General

Supply and install all accessories and appliances including all switched socket outlets, isolators and switches.

Provide direct connections to equipment via local isolators mounted adjacent to the equipment.

8.2 Quality

8.2.1 Submissions

Provide product data of all proposed accessories and appliances.

8.2.2 Design

Determine from the Architect the requirements for accessory colours and finishes prior to ordering.

8.2.3 Uniformity

Provide accessories of the same manufacture for each accessory type.

8.3 Products

8.3.1 Socket Outlets

Provide single phase 10A rated switched socket outlets, one make and style throughout, flush mounted with separate cover plates, high impact polycarbonate construction.
Clipsal 2000 series is not acceptable. The socket outlet shall be Clipsal C2000 series or HPM XL series.

Double outlet type shall be arranged under the one cover plate.

Provide neon indicators, integral RCDs and the like as specified.

Sockets outlets shall be Clipsal, HPM, Legrand or approved equal.

Provide large rocker type, Clipsal Prestige or approved equal, where indicated.

8.3.2 3 Phase Outlets

Provide 5 pin switched socket outlets and sockets, polycarbonate enclosure type, surface or flush mounted as specified , IP56 enclosure rating, one make and style throughout, Clipsal HPM, NHP ISO Range, Legrand or approved equal.

8.3.3 Switches

Provide 10A fluorescent load rated flush mounted rocker type switch plates and mechanism with separate snap on cover plate.

Switches shall be of the same manufacture as the socket outlets.

Provide neon indicators, key operation and the like as specified.

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Multigang stainless steel type switch panels shall be flush mounted with finished stainless steel cover plates and engraved switch designations.
Provide large rocker type mechanisms, Clipsal Prestige or approved equal, where shown.

8.3.4 Weatherproof or Protected Accessories

Weatherproof accessories shall be polycarbonate or metal as specified with minimum protection classification of IP56 to AS 60529.

8.3.5 Isolators

Provide isolators for all direct connected equipment. Isolator rating and type shall be suitable for the equipment rating and the location.

8.3.6 Appliances Generally

Provide appliances as specified, complete with all controls, controllers and connecting cabling.

Confirm appliance loadings and supply requirements prior to ordering and installation.

8.4 Installation

8.4.1 Accessories, Outlets and Isolators

Install accessories, outlets and isolators using purpose built mounting boxes, plates, brackets and fixings.

Provide earth bonding connections for all metallic mounting components.

Install to mounting heights as shown or advised by the Architect.

Flush wall mount unless shown otherwise.

Confirm final location of all accessories prior to rough-in. Locations shown on drawings are indicative only. Allow for displacement of up to 1 metre from positions indicated.

Segregate terminal zones by physical barriers to limit maximum voltage to 230 V under one cover plate or in one wall box.

Finish all accessories plumb, level and in line.

Ensure accessories mounted in acoustic rated walls are mounted in acoustic type wall boxes and are offset by at least 150mm for outlets mounted on opposite sides of the wall.

8.4.2 Appliances and Direct Connected Equipment

Provide a suitably rated and labelled isolator adjacent to each directly connected appliance or item of electrical equipment.

Enclose final connections in flexible PVC conduit where exposed to view.

Shorten flex and plug connections to avoid excessive cable lengths.

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8.5 Labelling

Label switches and outlets to identify circuit origin (EDB designation) using marking pen under clip on cover and brother type label on faceplate as to circuit breaker numbers & switchboard origin.

Labels for socket outlets, switches and isolators shall be engraved, laminated plastic with contrasting colours (white background, black lettering) and mechanically fixed (adhesive backed not acceptable).
Thin plastic stick on labels able to be produced with a hand held machine are not acceptable.

8.6 Completion

Test all appliances and accessories for satisfactory operation.

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9. LUMINAIRES AND LIGHTING

9.1 General

Supply and install all luminaires, lamps and lighting controls as scheduled, specified and shown on the drawings.

Luminaire manufacture and catalogue number shall be as shown on the drawings. Alternatives will not be accepted.

Specified requirements over-ride standard requirements of selected manufacture and catalogue number of luminaries.

9.2 Quality

9.2.1 Standards

AS/NZS 60598 series for luminaire construction.

AS/NZS 1158.6 for road lighting luminaries.

AS/NZS 4782 for fluorescent lamps

AS/NZS 60901 for single capped fluorescent lamps

9.2.2 Submissions

Provide samples of all product as advised on the drawing.

Provide product data for lighting control systems and dimmers.

9.3 Products

9.3.1 Luminaire Construction

Luminaires shall:

- be thermally designed to ensure optimum lamp operation and component operating temperatures below recommended limits.
- be rigid, true and symmetrical in construction.
- have support and fixing mechanisms to suit the intended application
- have photometric performance equivalent to the published data
- be constructed of durable and corrosion resisting materials suitable for the installed conditions and environment
- be complete with all required lamp holders, terminal blocks, fuses, control gear, temperature rated cabling, diffusers, reflectors, lamps, cable clamps, and fixings as required for complete luminaries.
- have control gear and lamps matched for optimum performance.
- have electronic control gear for all fluorescent lamp types, dimmable type where specified.
- have electronic control gear for discharge lamps up to 150W.
- have purpose built low loss electronic controllers for LED lamps.
- have control gear fixed to luminaire body and with captive fixings to allow in-situ replacement of defective components.
- have a minimum power factor of 0.9 lagging.

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- have fused terminal blocks suitable for up to 3 x 2.5mm^2 cables.
- have C-Tick approval for EMC classification.

Steel sheet metal construction shall:
- be minimum 0.8mm thick zincanneal sheet, free from blemishes with all exposed joints welded, filled and rubbed smooth.
- Be finished using approved polyester powdercoat surface treatment and paint.

Recess mounted luminaries shall be provided with 1.5m long flex and plug top.

9.3.2 Ballasts

Provide dimming control gear where specified on drawing.
Provide electronic ballasts for LED, fluorescent or discharge lamps up to 150W rating.

Provide a separate electronic ballast for each luminaire.

Electronic fluorescent lamp ballasts shall comply with AS/NZS 60929 and AS/NZS 61347 series.

Discharge lamp ballasts shall comply with AS/NZS 61347 series and AS/NZS 60923.

Provide ballasts suitable for the specified luminaire and control gear arrangements, taking into account requirements such as remote mounting of control gear, dimming and lighting control systems.

9.3.3 Power Factor Correction

Provide capacitors as required to ensure a minimum luminaire power factor of 0.9 lagging.

Capacitors shall be self-healing, sealed with inbuilt protective device to AS 61048 and AS 61049.

9.3.4 Lamps

Fluorescent lamps shall be 16mm (T5) or single ended compact type as specified, colour temperature 4000K unless specified otherwise.

Colour rendering index shall be a minimum of Ra 84.

Provide metal halide or high pressure sodium discharge lamps as specified.

Lamps shall be manufactured by Osram, Phillips, GE or Sylvania.

9.3.5 LED Type Luminaires

Provide LED luminaires as specified.

For non-dimmable LED's provide constant current electronic drivers suitably rated for the load.

For dimming type LED fittings provide purpose built electronic dimming controllers rated for the load.

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9.3.6 Lighting Control Systems

Provide lighting controllers including switches, movement sensors, timers, PE cell and the like as shown on the drawings and as specified.

Smart lighting controls shall be installed and implemented by the following methods:

- Movement Sensor Control
- Timeclock control

The motion sensor lighting control system shall provide a controlled switching of the lights throughout areas of the building shown on the drawings.
The system shall provide control of lighting within individual rooms from multiple motion sensors located in the room. Motion sensors within room shall be linked together by the system such that all lights turn on immediately from the motion detected by the sensor, and off after a settable time delay when no motion is sensed by any sensor in the room. The on delay shall be a maximum of 1 second and off delay shall be settable over a minimum range of 5 minutes to 30 minutes.
The system shall be capable of having multiple zones on the drawings and shall be capable of providing manual switching of all luminaires as required by BCA.

Motion sensors shall be selected and positioned to provide detection of movement of a person by fifty millimetres anywhere in the room. The drawing shows a minimum number of detectors based on the BEG Sensors. Provide additional detectors where required to achieve the above performance.
The system shall have a fail-safe mode. The failure of any modules on the system shall not affect the space of any other module.

The lighting control system is based on iAutomation BEG Motion Sensors. Contact i-Automation for type of sensor required to suit the rooms and corridors.

Testing, Commissioning and Documentation

Commissioning of the Lighting control system shall be carried out as recommended by the system manufacturer.

9.4 Installation

9.4.1 General

Install luminaires in line, parallel or square to the building structure, level, at the same mounting height, plumb and flush with surrounding surfaces.

Support luminaires using proprietary supports, battens, trims, noggings, ceiling roses, chains, suspension rods, trunking, ducting, stainless steel braided wire or lighting track as appropriate.

Fix and secure luminaires to ensure permanent mounting under service conditions. Provide a minimum of 2 fixings per luminaire and more as required to avoid movement or distortion.

Install luminaires so that there are no light leaks.

Mount luminaires and control gear clear of insulation and flammable materials in accordance with AS/NZS 3000 Clause 4.5.2.3.

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Size conductors supplying ELV lamps to ensure volt drop is minimised.

Install PE cell switches in locations suitable for reliable performance.

Make wiring connections using flex and plug or hard wiring as appropriate.

Adjust lamp locations and aim luminaires.

Install LED type luminaires to ensure heat dissipation in accordance with manufacturer's requirements.

9.4.2 Electronic Components

Install electronic components including electronic ballasts, LED drivers and LED arrays in locations suitable for limitation of temperature rise to within manufacturer's specified limits.

9.4.3 Recessed Luminaires

Co-ordinate requirements with ceiling installer for all cutouts, trims and additional supports for recessed luminaires.

9.4.4 Suspended Ceilings

Support recessed luminaires on ceiling grid or trimming materials as required to carry the weight of the luminaire, in accordance with AS/NZS 3000 Clause 4.5.2.4.

9.4.5 Lighting Controllers

Install all lighting control systems and run cabling for control and power supplies as required.

Arrange controls in groups or zones as shown on the drawings.

Carry out all required programming and data installation.

Provide automatic control of artificial lighting for energy management purposes in accordance with Clause J6.3 of the Building Code of Australia.

9.4.6 External Lighting

Secure to structure using corrosion resistant fixings.

Maintain IP rating at cable entry and fixings.

Install blockouts in masonry or in-situ concrete for recessed luminaires.

Provide cable entries to manufacturers recommendations to maintain weather or water proof enclosure.

Install cabling between components to ensure moisture protection integrity is maintained. Run continuous cable lengths between components.

Provide in-situ concrete footings to structural design requirements for all post or pole mounted luminaires. Exposed concrete shall be trowel finished and gaps between concrete foundation and base plates shall be grouted and finished smooth.

Aim all external lighting systems as shown.

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9.5 Completion

Test and verify operation of all luminaires.

Program all lighting control systems.

Adjust all controls in conjunction with the Architect and Owner for system operation as required.

Clean all luminaires and diffusers to as-new condition.

Provide all necessary access equipment for luminaire and lighting controls commissioning

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10. EMERGENCY EVACUATION LIGHTING

10.1 General

Supply and install emergency evacuation lighting complying with the requirements of the Building Code of Australia.

10.2 Quality

10.2.1 Standards

- AS/NZS 2293.1 for system design, installation and operation.
- AS/NZS 2293.2 for inspection and maintenance
- AS/NZS 2293.3 for construction of luminaires.

10.2.2 Technical Data

Submit technical data and AS/NZS 2293.1 classification data for each emergency and exit luminaire type.

10.2.3 Design

Ensure system compliance with the Building Code of Australia& AS2293.

10.3 Products

10.3.1 Emergency Luminaries

Provide emergency luminaires manufactured generally in accordance with Specification Section "Luminaires and Lighting".

Batteries for emergency luminaires shall be sealed, high temperature nickel cadmium type, complying with AS 3731 and have a rated life of 3 years minimum at 25°C ambient temperature.

Mark each battery with date of installation using an indelible pen.

10.4 Installation

Install emergency luminaires in accordance with Section "Luminaires and Lighting" and the requirements of AS/NZS 2293 Series.

Provide a 230V unswitched active supply to each emergency luminaire for mains failure sensing in each control area.

Arrange lighting controls so that emergency lights are activated on the failure of normal lighting in the vicinity. Ensure that failure of any lighting control circuit that causes failure of the normal lighting in an area also activates the emergency lighting in that area.

10.5 Completion

Prior to testing connect mains supply for at least 24 hours to enable full battery charge.

Carry out tests under both simulated mains failure and test switching conditions to ensure satisfactory system operation.

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Replace faulty components and retest the affected zone.

Confirm battery charging function after completion of test.

Provide Certification to confirm correct installation of the emergency lighting system to NSW legislation.

Carry out 6 monthly procedures in accordance with AS/NZS 2293.2 just prior to practical completion and twice during the defects liability period. Record all results in log book.

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11. TELECOMMUNICATIONS CABLING

11.1 General

Supply and install a complete integrated telecommunications cabling system including the following:

- Integrated voice and data cabling and cable support systems.
- Category ***6 (Class E)*** horizontal cabling outlets, terminations and patch leads.
- Weatherproofing and fireproof sealing of all penetrations associated with data cabling.
- New telecommunications equipment termination rack (For Tandara site only)
- Earthing.
- Facilitate NBN connection (For Tandara site only)
- Labelling and records.
- Surge protection.

11.2 Work Performed by the Client

- Provision of active switches

11.3 Quality

11.3.1 Standards

All work specified shall be in accordance with the latest publications of all Rules, Regulations, and Acts etc. of all properly constituted Authorities having jurisdiction over the work including but not limited to:

- AS CCM (Communications Cabling Manual) Volume 1 – Handbooks, Codes and Regulations, 2007:
  - HB 243, Australian regulatory arrangements
  - HB 29, Communications cabling manual
  - HB 252, Residential communications cabling manual
  - AS/ACIF S008:2006, Requirements for customer cabling products
  - AS/ACIF S009:2006, Installation requirements for customer cabling (Wiring Rules)
- AS CCM (Communications Cabling Manual) Volume 2 – Standards, 2007:
  - AS/NZS 3080:2003, Telecommunications installations – Generic cabling for commercial premises (ISO/IEC 11801:2002, MOD)
  - AS/NZS 3084:2003, Telecommunications installations – Telecommunications pathways and spaces for commercial buildings
  - AS/NZS 3085.1:2004, Telecommunications installations – Administration of communications cabling systems – Basic requirements
  - AS/NZS ISO/IEC 15018:2005, Information technology – Generic cabling for homes
  - AS/NZS ISO/IEC 24702:2007, Telecommunications installations – Generic Cabling – Industrial premises

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- AS/NZS IEC 61935.1:2006, Testing of balance communications cabling in accordance with ISO/IEC 11801 – Installing cabling
- AS/NZS IEC 61935.2:2006, Testing of balance communications cabling in accordance with ISO/IEC 11801 – Patch cords and work area cords
- AS/NZS ISO/IEC 14763.3:2007, Telecommunications installations – Implementation and operation of customer premises cabling – Testing of optical fibre cabling

- AS/NZS 3000 SAA Wiring Rules
- AS/NZS 4117 Surge suppression devices for telecommunication applications
- AS/NZS 4262 Telecommunication overvoltages
- AS/NZS ISO/IEC 14763.3 Testing of optical fibre cabling.
- Building Code of Australia

11.3.2 Licensed to Work

Ensure work is carried out by licensed personnel, particularly in relation to the Telecommunications Act 1997 and the Electrical Safety Act 2006 (Qld)

11.3.3 Accredited Installers and Companies

Installation companies shall have current accreditation with the manufacturer of the cabling system to be installed.

Installation personnel shall have current certification/re-certification (not more than 2 years old) with the manufacturer of the cabling system to be installed.

Installation personnel shall have a current ACMA or Accredited Industry Registrar Cabling License with the appropriate endorsements for the work being performed.

Provide details as requested in Clause 11.3.6, "Submissions".

11.3.4 Warranty

Use components and installation standards such that the system components and installation is warranted by a 20/20 year system warranty.

Submit manufacturer's warranty on the cabling system as specified.

Warranty certificate shall be provided in the O&M manuals.

The warranty shall cover system performance, materials and workmanship for the period covered by the warranty.

11.3.5 Quality Assurance

The installation company shall be quality endorsed meeting all standards required under
ISO 3901, and AS/NZS ISO 9000 series of quality related standards.

11.3.6 Submissions

11.3.6.1 Product Data

Submit technical data for all telecommunications cabling system components.

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Submit details of proposed labelling systems, and proposed identification scheme.

11.3.6.2 Shop Drawings

Submit shop drawings for cabling schematics, communications room layout, equipment/patch rack layouts and trunk cable pathways.

11.3.6.3 Licenses and Accreditation

Submit copies of current licenses and accreditation for the installation company and individual installers.

11.3.6.4 Certification

Submit installation certification for the completed system.

11.3.6.5 Warranty

Submit manufacturers warranty for the complete cabling system.

11.4 Products

11.4.1 Equipment and Termination Cabinet

Supply and Install 1 off Equipment and Termination Cabinets (BD) with the following for the building distributor -

- 12 RU 600mm Wide x 600mm deep
- 19 inch metal frame to ANSI/EIA 310-D.
- fully enclosed and lockable for security
- perforated panels for maximum ventilation
- wall mounted
- sheet steel sides and top
- lockable front access door
- clear Perspex steel framed front door, solid rear doors
- cable access provisions
- minimum 6 switched socket power rail
- Keyed alike for multiple cabinets or doors.

11.4.2 Modular Connector Termination/Patch Panels

Provide UTP Patch Panels with the following features:

- 19 inch rack mounted, 24 port high density RJ45 with rear and front cable management
- Rear Termination: High density IDC.

11.4.3 Cables

11.4.3.1 Copper

To AS/ACIF S008.

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11.4.3.2 External
Water penetration resistance to IEC 60794-1-2.

11.4.4 Modular Connector (Telecommunications) Outlets
Provide RJ45 8 way modular jacks.

Comply with AS/NZS 3080.

Pinout arrangement shall be T568A to AS/NZS 3080.

11.4.5 UTP Patch Leads
Provide UTP patch leads for patch panels with the following features:

- 4 pair stranded conductors
- Same category and manufacture as the horizontal cabling system.
- Factory terminated RJ45 modular plugs
- ACMA approved
- 3 metre length blue (25% of total)
- 2 metre length, white (15% of total)
- 2 metre length, blue (25% of total)
- 1 metre length, blue (25% of total)
- 1 metre length, white (10% of total)

Total number required: One patch lead for each RJ45 port at patch panels.

11.4.6 UTP Fly Leads Modify as required
Provide field outlet fly leads, 3 metre length, blue, same manufacture and construction as for Patch Leads.

Total number required: 50% of outlets in the field.

11.4.7 Telephone Patch Leads
Provide telephone patch leads with the following features:

- 1 pair conductors
- Category 3 minimum
- RJ45 modular plug each end
- ACMA approved
- 1 metre length.
- Colour Yellow

11.4.8 Fibre Optic Patch Leads
Provide fibre optic patch leads with the following features:

- Two core
- Cross over
- 50/125 micron OM3, colour - aqua
- 9/125 micron OS1, - yellow

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11.4.9 Cable Support Systems

Cable support systems shall comply with the requirements specified in the Section "Cables and Cable Supports".

11.4.10 Surge and Transient Protection

Provide surge and transient protection devices to carrier requirement.

11.5 Installation

11.5.1 Cables

Refer to "Cables and Cable Supports" for general installation requirements.

Provide separate cable support system for the telecommunications cabling system.

Install cables in accordance with manufacturers recommendations, in particular bending radii and pulling tension.

Cable runs between distributors and from distributors to outlets shall be continuous and without joints and splices.

All cables shall be terminated.

Provide bend control accessories to ensure that minimum bend radii are maintained.

Maintain separation from other cabled services and electrical equipment in accordance with the applicable standards including AS/ACIF S009.

Minimum separation to LV cables (parallel runs) shall be 300mm.

Cabling inside modular furniture partitions and similar enclosures or in a service pole shall maintain the 50 mm safety separation or have a solid durable barrier.
Wherever possible, maintain a performance separation of up to 300 mm from LV power cables to minimise noise induction.

Where patch cords are installed behind removable panels in modular furniture or in under-desk pathways, maintain a separation from LV power of 10 mm if possible.
The preferred length of patch cords running continuously in parallel with LV power under desks and in umbilicals is 5 m max.

All cabling within false ceilings shall be supported by metal cable tray, trunking, ducting, or catenary wires, fixed by a manufacturer approved hangers and methods onto structural building elements.

All cabling under indoor raised flooring systems should use metal pathways as a preference.

All conductive pathways should be earthed on the floor where such cable tray is installed.

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Support cables over their entire route length on suitable cable supports such as cable mesh, tray, catenaries and ducting. Avoid compressing cables by over-tightening cable ties or other installation process. Support cables using Velcro type cable ties to the extent required to prevent cable creep or stress, and generally at not more than 300 mm intervals.

Bunch cables into groups not exceeding 24 cables. Random lay horizontal runs to break up parallel runs. Separate bunched cable groups to enable removal and replacement as required.

Segregate fibre optic and copper cable runs into distinct groups.

Catenary wires may be used for final distribution only. Maximum loading shall be 24 cables.Tie cables using 6 mm (minimum) Velcro spaced at 300 mm (maximum) centres.

Provide minimum 300 mm spare cable at each termination to allow for re-termination.

Any cable that has been painted for greater than 1m length shall be replaced (e.g overspray). Ensure all cables are suitably shielded prior to spray painting.

Any cable that has been immersed in fluid shall be replaced. Do not install cables until a weatherproof roof has been installed.

Cables run underground shall be installed in conduits.

For short runs provide manufacturers recommended minimum cable length and coil excess length in a suitable location.

11.5.2 Terminations

Terminate all cabling and complete all jumpering.

Termination configuration for telecommunications RJ45 modular connectors shall be T568A to AS/NZS 3080 unless advised otherwise.

Use manufacturers recommended tools for all terminations.

Terminate block cabling pairs sequentially. Confirm sequencing requirements with the Architect. For UTP cable terminations remove minimum cable sheath and maintain twist rate as close as possible to the termination point.

11.5.3 Patching

Install jumper cables and patch leads of the same performance standard as the service being connected.

11.5.4 Telecommunications Outlets (TOs)

Install generally in the positions shown on the drawings. Confirm locations where positions are ambiguous.

Provide faceplates for TOs to match electrical accessories. Colour of faceplates shall be to Architect's selection.

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11.5.5 Transient Protection

Install multi-stage surge diverters at terminations of all inter-building copper cables and Telstra lead-in.

11.5.6 Earthing

Install communications earth system in accordance with AS/ACIF S009 and SAA HB29.

Provide functional communications earth cables, earthing bars and connections to equipment as required and in each distributor.

Connect metallic cable support systems and equipment support cabinets to the protective (electrical) earth system.

11.5.7 Distributors, Cabinets and Racks

Factory assemble, deliver to site and secure in final locations.

Complete assembly of all components and cabling.

11.5.8 Labelling

Provide labels for the following:

- Backbone cables at each end to indicate type, size, origin. Provide mechanically attached labels.
- Telecommunications outlets to indicate outlet number and distributor. Install labels on fixed outlet plate and write with Black marker pen behind cover plate. Labels to bee mechanically fixed and not adhesive type.
- Termination patch rack outlet row and port numbers. . Provide mechanically attached labels.
- Distributors and cabinets. Use engraved traffolyte labels.

11.6 Completion

11.6.1 General

Carry out commissioning and tests as required by the nominated standards to ensure satisfactory operation of the complete telecommunications cabling system.

Perform visual inspections to ensure all systems are completed as specified.

Clean all equipment and leave in as-new condition.

Replace all non-complying components and retest.

11.6.2 Tests

Test copper balanced cabling and patch cords to AS/NZS IEC 61935.1 and 61935.2.

Test fiber optic cabling to AS/NZS ISO/IEC 14763.3.

Use skilled personnel to carry out all tests.

Provide all required test equipment and ensure calibration is up to date.

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Test the installation progressively so that faulty materials or workmanship can be rectified, and then carry out final testing at practical completion.

Submit full test results to the Architect for review. Results shall show numerical results as measured and not indicators such as "pass, fail, OK" or similar.

Include all test results in the Operating and Maintenance Manuals.

11.6.3 Records

Provide a cable records management system, of approved format, both hard and soft copies and to AS/NZS 3085.1.

Provide approved record books at each distributor and complete all required details

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12. TENDER FORM A - TENDER INFORMATION

This tender will be deemed non-compliant and will not be accepted unless a **completed Tender Form, Tender Breakdown, Schedule of Details and Unit Rate** Schedule is submitted as a part of the tender submitted.

For	Penrith Childcares (2 sites)
At	Penrith, NSW
I/We, the undersigned, hereby tender the following sum to complete the works in accordance with the Specification and Drawings	
1. Tender Sum	$
2. Prime Cost and Provisional Sums	$
3. Contingency Sum	$
4. Total Fixed Lump Sum	$
5. Goods and Services Tax	$

A.1 Addenda

We acknowledge receipt of each Addendum to the Specification as listed below and confirm that the costs associated with each of these have been included in the above Tender Price.

List each addendum number received:	

Include a signed copy of each of the above Addenda with this Tender Submission.

Company	
Contact Name	
Signed	
Date	
Witness	

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13. TENDER FORM B - ITEMISED TENDER FORM

The total tender price for the Electrical Services installation comprises the following:

Service	Total Price (Excl. GST)
Main Switchboard	$
Submains cable	$
Distribution switchboard	$
Cable support systems	$
General light and wiring systems	$
Light fittings (excluding emergency lighting)	$
General Power and wiring systems	$
Lighting motion sensors	$
Emergency evacuation lighting	$
Telecommunications cabling system and other works	$
Electronic security system (as mentioned on drawings)	$
Other items not included above(to be nominated)	
*	$
*	$
*	$
TOTAL LUMP SUM FIXED PRICE(excl. GST)	$

Company	
Contact Name	
Signed	
Date	
Witness	

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14. TENDER FORM C - SCHEDULE OF TECHNICAL DETAILS

The schedule of technical details forms part of the specification and shall be completed in full and returned with the tender.

Equipment	Manufacturer	Model No. or Type
Distribution Switchboard		
Switchboard Assemblies		
Isolators		
Circuit Breakers		

Equipment	Manufacturer	Model No. or Type
Luminaires (use separate sheet)		

Company	
Contact Name	
Signed	
Date	
Witness	

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Equipment	Manufacturer	Model No. or Type
Emergency Evacuation Lighting		
Luminaire Type EX1		
Luminaire Type EM1		

Equipment	Manufacturer	Model No. or Type
Telecommunications Cabling Network		
Installation Contractor		
Equipment Racks		
Patchable Panels		
UTP Cable		
RJ45 Outlets		
Other Telecommunication work		

Company	
Contact Name	
Signed	
Date	
Witness	

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15. TENDER FORM D – SCHEDULE OF UNIT RATES

The following rates shall be used to assess variations and shall include all allowances for overheads, profit, attendance, mark-up, union requirements, superannuation payments and the like.

A.2 Labour

A.2.1 Electrical Contractor

	Normal Time	Time and a Half	Double Time
Qualified Tradesman	$ /hr	$ /hr	$ /hr
Apprentice Tradesman	$ /hr	$ /hr	$ /hr

A.2.2 Security Systems

	Normal Time	Time and a Half	Double Time
Technician	$ /hr	$ /hr	$ /hr

A.2.3 Communication Technician

	Normal Time	Time and a Half	Double Time
Technician	$ /hr	$ /hr	$ /hr

A.3 Mark Up

Mark-up to be applied on the addition or deletion of work _____ %

Company	
Contact Name	
Signed	
Date	
Witness	

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A.4 Lighting

Supply and installation of a one gang light switch incl 15m cable	$	each
Supply and installation of a one lighting point incl 30m cable	$	each

Luminaire (use sheet as required)	Supply/Delete (Light Fitting Only)	Supply & Install Light Fitting (Incl. Lighting Point and 5m Cable)
	$	$
	$	$
	$	$
	$	$
	$	$
	$	$
	$	$
	$	$

A.5 Switchboards

Supply & installation of standard 16A single phase MCB/RCD including termination of sub-circuit cable	$	each
Supply & installation of standard 20A single phase MCB including termination of sub-circuit cable	$	each
Supply & installation of standard 20A single phase MCB/RCD including termination of sub-circuit cable	$	each

A.6 Power

Supply & installation of standard 10A GPO (single) including 20m of cable, wall mounted	$	each
Supply & installation of standard 10A GPO (double) including 20m of cable, wall mounted	$	each
Supply & installation of 20A single phase direct connection including 40m of cable and weatherproof isolator	$	each
Supply & installation of 20A three phase direct connection including 40m of cable and weatherproof isolator	$	each

Company	
Contact Name	
Signed	
Date	
Witness	

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A.7 Communications Cabling

Supply & installation of single data or telephone RJ 45 wall mounted outlet flush mounted and 40m of 4 pair UTP cable	$	each
Supply & installation of double data or telephone RJ 45 wall mounted outlet flush mounted and 40m of 4 pair UTP cable	$	each
Supply & installation of 1x24 port patch panel fitted with RJ 45 outlets and mounted in 19" equipment rack	$	each

A.8 Sub Mains

	Addition Cost	Deletion Cost
4x1C 50mm Cu + E XLPE/PVC	$	$
4x1C 70mm Cu + E XLPE/PVC	$	$

A.9 Cable Tray

Unit price / metre of cable tray including brackets & accessories, installed.

	Addition Cost	Deletion Cost
150mm wide	$	$
300mm wide	$	$

Company	
Contact Name	
Signed	
Date	
Witness	

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