SPECIFICATION

of

ELECTRICAL SERVICES

for

PROPOSED FIRE SERVICES UPGRADE TO

TAYLOR VILLAGE

at

156 OCEAN STREET, NARRABEEN NSW

for

WESLEY MISSION

CONSTRUCTION CERTIFICATE Deter 21/09/2014

NIVEN DONNELLY & PARTNERS PTY LTD

PROPOSED FIRE SERVICES UPGRADE TO TAYLOR VILLAGE 156 OCEAN STREET, NARRABEEN FOR WESLEY MISSION

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1.0 GENERAL

1.1 EXTENT OF WORK

The work covered by this section of the specification comprises.

- Alterations to the existing Ausgrid supply.
- Main switchboard
- Metering and earthing-

Disconnection and removal of the existing main switchboard. Carry out thermo
graphic tests on the existing Main Switchboard

- Submains and terminations including submains and terminations for other services
- Distribution boards including all controls.
- General lighting and small power
- Emergency evacuation lighting
- Final subcircuit wiring to lighting, power outlets and fixed equipment.
- Cable management/conduit system
- Alterations and additions to the existing fire indicator panel
- Smoke detection and alarm system to new rooms
- Building occupant warning system.
- Cutting and chasing of walls including apertures in walls for wall boxes for various outlets, switches etc
- Patching and making good of building elements after the work of the electrical services including building in of electrical conduits, and the like, weather sealing and acoustic packing where necessary.
- Fire sealing of penetrations
- Preparation of shop drawings
- Electrical works required by other trades and Client
- Provision of temporary diesel generator(s) during the shutdown periods.
- Ongoing co-ordination with the builder and other trade subcontractors
- Testing and commissioning
- As installed documentation and operational and maintenance manuals
- Client comprehensive maintenance for the duration of the defects liability period, which shall not be less than 12 months from the date of practical completion of the electrical work
- Liaise with the electricity supply authority and pay all related costs and fees.
- Submit to Ausgrid ES1 Form C Application for CT Metering
- Co-ordination of all the above work with other trades
- Provide all work and materials
 - Specified or shown on the drawings including architectural drawings.
 - Necessary for the satisfactory completion and operation of the works
 - Generally provided in accordance with accepted trade practice.

1.2 SHOP DRAWINGS

Shop drawings for the following electrical services items shall be provided at the commencement of the project.

Switchboards

The following information shall be shown on the drawings:

Single line diagram;

- Cascading and discrimination studies;
- The general arrangement including layout of equipment, busbars and connections-

- Inventory of materials, including ratings, withstand capacity manufacturer types etc.
- Structural and enclosing elements including sheet metal and sealing details;
- Terminal block layouts and identification;
- Details of labels and engraving.

Electrical and Occupant Warning system Cable Carrier Systems

The following information shall be shown on the drawings:

- Cable routes coordinated with other services and building structure
- Dimensioned conduit drawings including draw in pits

SAMPLES

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Requirement

Submit for approval prior to commencing the installation samples tagged or otherwise properly identified

Samples may be retained until the completion of the work, and used as a standard for acceptance or rejection of the items provided.

In particular provide samples of;

- All luminaries together with manufacturer data sheets
- Typical light switch
- Typical power socket outlets
- All types of warning speakers

In addition, provide samples as requested by the Superintendent.

1.3 STANDARDS AND COMPLIANCE WITH CODES

The extent of works covered by this specification shall be in accordance with the relevant standards as follows

Electrical installations	To AS/NZS 3000
Electrical reticulation:	
Smoke Detection System.	To AS 1670.1
Switchboards	
Interior Lighting	To AS 1680
Emergency Evacuation Lighting	To AS 2293
Building Regulations Australia	

Certificates or proof of compliance with the relevant Standards or Regulations shall be provided by the Contractor within fourteen (14) days when requested by the Engineer Materials and equipment will not be accepted if certificates of proof of compliance are not provided when requested

Additional payments will not be made for any costs involved in testing or obtaining certificates or proof of compliance. Such costs where applicable shall be included in the tender price.

The Contractor shall forward all relevant notices, arrange for inspections and pay all fees to the Supply Authority and other Authorities as required in connection with this Contract.

Before any work commences, the Registered Electrical Contractor shall submit to the Supply Authority a Notice of Intention to Wire form

At the completion of the work the Contractor shall submit to the Supply Authority a Notice of Completion form One photocopy of each of these forms shall be submitted to the Electrical Engineer.

No Certificate of Practical Completion for the works shall be issued until the photocopies are received

BALANCE OF LOAD

The load shall be balanced as close as possible between the individual phases of supply.

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2.0 WORKS BY OTHER TRADES AND ASSOCIATED WORKS

2.1 WORK BY OTHER TRADES

a.

The associated work to be carried out by other contractors or the client to enable the specified contract works to be performed is specified hereunder.

a) Work by Builder

- Provision of temporary power for the construction site (switchboards, lighting, socket outlets, submains, power supplies to equipment etc.) as well as the statutory required ongoing testing and tagging.
- Forming of all openings in walls, floors, ceilings, and roofs for the passage of conduits, ducts, mounting of luminaries and the like
- Making good to rendered, tiled or clad masonry surfaces necessary to conceal the electrical, communications, etc. installations.
- Hinges access panels and doors for access to control devices in false ceilings, walls, floors, services shafts and the like
- Flashing where conduits etc. penetrate roofs and outer walls (provide overflashing under electrical services)
- Framing of ceilings and bulkheads for light fittings and equipment etc
- Cranage and lifting of equipment
- Construction of Main Switchroom-
- Double keyed lock to main switchboard and metering panels to suit the relevant Authority key and building keys-
- Labels to Main Switchroom doors-
- Box outs for cables and fire rating where noted

b) Work by Hydraulic Services Trade

- Supply and installation of hydraulic services control panels
- Supply and installation of power and control wiring from control panels to final equipment locations.
- Coordination of works with the electrical services trade

c) Work by Fire Services Trade

- Supply and installation of Fire Services Control Panels.
- Supply and installation of power and control wiring from control panels to final equipment locations
- Supply and installation of sprinkler flow switch and of the sprinkler alarm stop valves and their wiring to the Fire Indicator Panel
- Coordination of works with the electrical services trade.

2.2 ELECTRICAL WORKS TO BE PROVIDED FOR OTHER TRADES AND CLIENT

The following electrical works are to be provided for other trades and the Client that are to be provided under the electrical trade shall include but not limited to the following

a) Hydraulic Services Trade

 Supply installation and termination of submains to control panels Coordinate with hydraulic services trade for the exact locations.

•	Supply and installation of power supplies/socket outlets to electrical equipment provided by the hydraulic trade such as small circulation pumps etc
•	Coordinate with hydraulic services trade for the exact locations.
b) Fir	e Services Trade
•	 Supply installation and termination of submains to control panels. Coordinate with hydraulic services trade for the exact locations.
•	 Supply and installation of power supplies/socket outlets to electrical equipment provided by the hydraulic trade such as small circulation pumps etc-

• Coordinate with fire services trade for the exact locations.

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3.0 CO-ORDINATION ELECTRICAL WORKS

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3.1 CO-ORDINATION WITH AUTHORITIES Requirement

The Electrical Sub-Contractor shall be responsible for coordinating with Electricity Supply Authority.

Co-ordinate with Ausgrid to ensure that:

- a) Liaise with Ausgrid regarding works involving the re-routing of the existing underground service cables to the new main switchboard and ensure that all works are carried out to their requirements.
- b) Inspections are progressive during the construction period.
- c) Supply to the site is available in accordance with the building programme

4.0 ELECTRICITY SUPPLY

4.1 METHOD OF SUPPLY

Clarification

The electricity supply shall be a 415/240 volts, 3 phase, 4 wire, 50 Hertz system obtained from an existing kiosk substation

The fault level at the point of supply is 30kA

4.2 ENERGY RETAILERS METERING Requirement Maintain in service the existing energy retailers metering on site.

Provide metering equipment as shown on the drawings. Provide all necessary panels, meter bases meters, wiring etc. for the complete metering arrangement.

Open accounts and pay all fees associated with establishing the accounts including the purchase of the metering equipment

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5.0 GENERAL LIGHT AND POWER INSTALLATION

5.1 INSTALLING ACCESSORIES

MOUNTING: Install flush mounted light switches, isolating switches, general purposes and other outlets in wall boxes

RESTRICTED LOCATION Do not install outlets across the junction of different wall finishes.

5.2 ACOUSTIC INSTALLATIONS

FLANKING PATHS: Preserve the sound reduction properties of sound rated partitions by sealing flanking sound transmission paths during installation, including but not necessarily limited to junctions between partitions and other building surfaces, air gaps around descrete, recesses such as pelmets and blind boxes, cut outs for services, and the like

SEALING METHODS Use appropriate sealing methods, including purpose-made solid profiled inserts, durable resilient gaskets, closed cell foam strips and the like. Use solid resilient materials in preference to foamed materials whenever possible.

5.3 SWITCHES

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Minimum Rating 10 A and 240 V; generally to suit rating of switching circuit Standard : To As 3133

Type as shown on the drawing. Clipsal "C P2000" in the main switchroom common areas. Colour as nominated by Superintendent Clipsal 56 series in the pumproom.

Secure mechanisms to the face plate with retaining screws or construct the face plate and mechanism so that the mechanism cannot be displaced

Installation Methods

Wall construction.	Installation requirements.
Rendered block or brick Flush v partition - See n	vall box – conduit chased into wall tote below. Wall box to be fire rated type in all walls required to have fire rating or acoustic rating.
Face brick or block wall Flush v	vall box – conduit set in internal V-chase. Wall box to be fire rated type in all walls required to have fire rating or acoustic rating.
External cavity wall or block wall	Flush wall box – conduit run in cavity and tied against inner brick surface. Wall box to be fire rated type in all walls required to have fire rating or acoustic rating
Internal gyprock partition	Flush wall box – cables run inside partitions

RCD circuit breaker on all power subcircuits supplying socket outlets.

5.4 GENERAL PURPOSE SOCKET OUTLETS – GENERAL LIGHT AND POWER INSTALLATION

Rating 10 A and 240 V unless otherwise specified

Identification Each outlet is to be labelled with the supplying distribution board reference and the circuit No.

Installation methods as for switches

Standard three pin arrangement with the earth pin in the 6 o'clock position

Type as shown on the drawings Colour as nominated by Superintendent

Unless otherwise specified place a red indicator on the toggle, to be visible when the switch is 'ON'.

RCD circuit breaker on all power subcircuits supplying socket outlets

5.5 CABLES AND CABLE JOINTS – GENERAL LIGHT AND POWER INSTALLATION Cables Generally

Install, terminate and joint cables in accordance with the manufacturer's recommendations

Ensure that cable serving or sheathing is not damaged.

Joints in cables will generally not be permitted unless unavoidable If joints are permitted, locate them as directed by Superintendent. Make joints with approved proprietary jointing and terminating kits used in accordance with the manufacturer's recommendations.

Definition: A 'joint' is defined as either a cable to cable joint or a cable to lug termination.

Use multi-stranded copper conductor unless otherwise specified

Power Cables

Type : 0.6/1 kV range, 75° temperature rated cable unless otherwise specified, delivered to site in the original packages and obtained from one manufacturer whenever possible.

Use standard conductors throughout.

Minimum sizes: 2 5 sq mm for lighting unless otherwise specified, and 2.5 sq.mm for power sub-circuits. Final size to be determined by voltage drop

Colour code the insulation of conductors as follows

- Active conductors in single phase circuits RED
- Active conductors in poly-phase circuits. RED, WHITE, BLUE to correspond to the supply authority coding
- Switched active conductors to all fittings: WHITE
- Neutral conductors BLACK
- Earth conductors GREEN/YELLOW

Sheating colour · WHITE

Cables may be connected at junction boxes located in accessible positions.

Single insulated cables may be used in PVC conduit unless otherwise specified

Final Sub-circuit Wiring Systems

Type . Use the following wiring systems for final sub-circuit wiring -

- a) Insulated cables in Class 'B' PVC conduit in concrete or masonry finishes.
- b) Insulated and sheathed cables to lighting outlets in areas of fixed ceilings
- c) Insulated and sheathed cables to recessed outlets in internal gyprock partitions
- All writing and conduits shall be concealed from view.

Submains

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Protoct each submain by a fuse or circuit breaker.

Terminate and connect each submain at each end-

Looping and junctioning is not permitted unless otherwise shown on the drawings-

Copper Cable Jointing

Cable Preparation Lightly sand the bare metal to be terminated

Sweat the lug or ferrule to the bare metal or crimp the lug or ferrule to the bare metal with a crimping tool

5.6 CONDUITS AND CABLE SUPPORTS

Conduits Generally

Type : Rigid metallic conduit, galvanised steel waterpipe, rigid non-metallic conduits of at least 20mm, or metal or UPVC ducting

Ducting minimum size. 20mm x 20mm

Fixings Do not use explosive-powered or similar equipment unless approved.

To woodwork: Conduit matching saddles and round head cadmium-plated wood screws.

To masonry: Conduit matching saddles and round head cadmium-plated screws screwed into lead or other approved plugs in properly formed holes.

To steelwork: Cadmium plated metal thread screws

Support conduits during construction

Saddle conduit at a maximum of 1m intervals unless otherwise specified with matching saddles

Protect UPVC conduits installed in accessible roof spaces and the like, which may be walked on, by timber battens.

Conduits are to be long lengths, straight, smooth, and free from rags, burrs, and sharp edges Do not use off-cuts to fabricate long lengths

Inspection fittings and the like shall be accessible.

Prime and paint conduits, ducts, troughing, cable trays, etc, exposed to view with a final coat of approved colour, generally to match the surroundings, but in switch and plant rooms, ceiling spaces, cable ways, and underground use light orange No. 557 to AS 1345

Provide draw-in boxes at suitable intervals not exceeding 30m in straight runs, and at intervals not exceeding 25m in other runs including directional changes. Agree the position of draw-in boxes with Superintendent prior to installation.

Fit draw-in boxes installed underground and gasketted covers and seal them against entry of moisture

Provide galvanised sheet steel tube for 1000 each side of expansion joints to enclose conduits

Concealed Conduits

Run conduits concealed in wall chases, embedded in floor slabs and installed in inaccessible locations, direct from point of termination with a minimum number of sets (the number of sets must not be greater than the equivalent of four normal bends) Do not use elbows, tees, inspection fittings, etc.

Locate conduits run in concrete slabs entirely within the structural slab. Do not run conduits in the concrete topping unless approved by Superintendent.

Steel conduit shall be galvanised if run in concrete slabs

Fix conduits directly to the reinforcing rods where the conduits pass above a single layer of rods, or fix mid way between double layers of rods Route the conduits in slabs so as to avoid cross-overs and to keep the number of conduits in any one location to a minimum Space conduits 75mm apart in slabs.

Attendance at Pours : Ensure the conduits are not displaced, broken, or damaged during concrete ours.

Give Superintendent two days notice prior to a concrete pour to enable conduits to be inspected

Rigid Metallic Conduits and Fittings

Standard to AS 2052, with screwed joints and terminations

Protective Coating . Heavy protection to AS 2052 unless otherwise specified

Paint ends and joint threads of steel conduits with aluminium paint and ensure that the system is both electrically and mechanically continuous and connected to the earthing system.

Rigid Non-Metallic Conduits and Fittings

Standard to AS 2053, heavy duty type. Associated fittings shall be of the same material as specified for the conduit.

Material Conduits, fittings and adhesive cement shall be from the same manufacturer if possible.

Adopt the manufacturer's recommended procedures for making joints, which shall be glued

Standard size wall boxes shall preferably be of the same material as the conduit Where special size boxes are specified, and where such boxes are not obtainable in UPVC, use prefabricated metal boxes where approved by Superintendent Earth metal boxes

Fittings – use large radii bends, formed with approved formers Use correctly sized springs to form bends in rigid UPVC conduit. Conduits manipulated or bent shall maintain true effective diameter and shape at all parts of the bend Do not use conduit sets distorted or showing evidence of kinds, wrinkles, flats or having been heated Use inspection type fittings where conduits are exposed Whenever possible, UPVC conduits should be preformed by the manufacturer

Install flexible couplings wherever expansion or contraction joints occur in a building Install expansion fittings in straight runs of rigid UPVC conduit except those embedded in concrete or in wall chases. Space expansion fittings, at 4m or less Install conduit clips close to expansion fittings to allow the conduit to move freely while expanding or contracting

Flexible Conduit Termination . Use fittings approved by Superintendent

Do not use UPVC conduit in areas where there is the likelihood of mechanical damage or extremes of temperature variation unless approved by Superintendent.

5.7 SUBMAINS

Termination

Provide all submains and sub-circuits as shown on the drawings and terminate at each end.

Where submains are to be connected to control panels by others, advise the respective suppliers of these panels of the size and type of submain to be provided prior to manufacture

Where submains connect to outgoing devices on the main switchboard, the terminations shall be sleeved with insulation material.

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6.0 GENERAL INSTALLATION NOTES

6.1 GENERAL

All work carried out shall comply with the requirements of AS 3000, and the requirements of all Authorities having jurisdiction over the work

6.2 LIVE SWITCHBOARDS

Under no circumstances shall works be carried out on the live switchboards.

6.3 INSTALLATION OF CABLING

- a) Circular insulated and sheathed cabling shall be installed such that the minimum bending radius of the cable is no less than 12 times the overall diameter of the cable
- b) Installation of these cables shall be carried out in such a manner as to keep tension forces to a minimum to prevent stretching
- c) Supply with glands, terminations and other accessories to the recommendation of the cable manufacturer.
- d) Use special crimping tools as recommended by the cable Manufacturers for lug termination
- e) Cables shall be installed such that the spacing between circuits does not affect the current rating as specified
- f) Use stranded copper conductor cables throughout the installation unless specified otherwise.
- g) Colour of insulation and sheath of cables shall be as nominated
- h) Supply and install all wiring necessary for the proper functioning of the complete installation in accordance with details as to size, rating and type noted or shown on the drawings or called for in the Specification.
- Install cables on the loop-in-loop out system No connectors shall be used unless specified or shown on the drawings. Any circuit found to contain connections will be required to be rewired Loop in cables only at terminals of equipment, accessories or junction boxes
- j) Cables installed in walls and covered with plaster are not be permitted.
- k) Install all cables without damage to insulation and replace, without cost, any in which damage occurs
- I) Prepare all ends for termination without cutting strands and fix in lugs or approved clips when such are necessary to prevent spread of strands when terminals are tightened
- m) Supply all cables in sizes detailed or complying with the AS 3000, where not detailed, or to match circuit breaker ratings where these are specified

n)	Preserve uniformity of each phase wire colour through the installation and re-re-wire with correct colour if phase is changed after installation to balance supply. Making tape at cable terminations will not be acceptable as sufficient colour coding. Re-wire without additional cost to correct any errors in colour coding.
0)	Install cables in location specified Run always horizontal or vertical parallel to building members and fix in an approved manner at centres complying with Wiring Rules but in no case more than 1200 mm.
p)	Remove all kinks, sages etc to give maximum neatness to the finished installation Protect where necessary from mechanical damage by covering as required by the AS 3000 Install throughout without damage to sheath
q)	Install approval type junction boxes of selected colour where necessary so that the number of conductors in any run is a minimum. Combine conductors into 2 or 3 core cables, flat type, minimum and included earth wires in sheath with conductors Preserve double insulation in all areas required by the AS 3000
r)	A completely concealed cabling system shall be installed Surface mounted cabling system shall be permitted only if it is specified in this Specification.
s)	Wiring for low voltage circuits shall not be drawn into conduit for extra low voltage systems. In addition, lighting and power final sub-circuits shall be run in separate conduits, except where a junction box is employed as a final distribution point, a number of final sub-circuits may be grouped together in layer conduits between the distribution board and the junction box provided that all sub-circuits in one conduit are of the same phase. In the case of three phase circuits all three phases, and neutral circuit if any, shall be drawn into the same conduit. Wiring for emergency lighting shall be run in separate conduit
t)	Where a group of the two categories of circuit are housed in or on common boxes, blocks, or intersection of trunking, they shall be portioned in accordance with AS 3000
u)	Check and ensure that the trunking and conduit of this service will not clash with ducting and piping of other services.
V)	Prior to installation, submit shop drawings, showing the proposed trunking and conduit layout with sizes and dimensions indicated for approval

6.4 CONDUIT AND FITTINGS

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- a) Use no conduit smaller than 20mm without specific approval Use flexible conduit only where it is impracticable to carry fixed conduit into equipment or as may be directed Provide draw-in boxes as necessary to facilitate the drawing-in of conductors on long runs and use sets where possible in lieu of bends or elbows
- b) Conceal conduits where practical by running in floor or ceiling slab except in Plant Rooms and other indicated areas where conduits shall be run on the surface. When exposed to view, install conduits parallel to building members using approved spacers placed under each saddle Saddle conduits at a maximum of 1200mm centres to provide a rigid installation throughout
- c) Cut all conduit ends square and remove all burs, rough edges, etc so that conduits are completely clean inside. Treat all threads in conduit with red lead or similar to

prevent corrosion at joints. Preserve electrical continuity where steel conduit is used

- d) Co-ordinate all conduit runs, wall ceiling, floor junctions and junction boxes positions with the builder prior to commencement of any work associated therewith.
- e) All conduits shall be capped at both ends to prevent the ingress of concrete or other foreign matter.
- f) No hacking will be allowed for the installation of conduits in the walls Employ a cutter for making the necessary chases in the walls.

6.5 WIRING DUCTS

- a) Wiring ducts may be used in lieu of conduits to enclose conductors Fix wiring ducts to walls or ceilings with approved brackets or hang at maximum 2000mm centres In other locations, supply and install systems as required. Install additional supports where required to prevent sagging or distortion of fully wired ducts.
- b) Size wiring ducts dimensioned on the drawings after allowing for 20% spare capacity Provide means for retaining conductors in ducts when the covers are removed
- c) Keep ducts closed at all times except when actually running conductors to prevent the accumulation of dirt or other foreign matter therein
- d) Where the cable ducting system connects to distribution boards or other apparatus, all cable entries shall be via an aperture equal to the area of the duct The aperture shall be trimmed with PVC moulding The cable duct shall be bonded to the distribution board or apparatus by two counter-sunk head brass nuts and bolts
- e) Where ducting is installed vertically, particular care shall be taken to retain cables in duct while cover is removed by use of cable retainers fitted to the ducting
- f) Repeated adjustment of these cable retainers shall not result in the breaking away from the duct.
- g) The complete ducting system shall be electrically continuous and each length of fittings shall be electrically bonded to the next or adjacent length
- h) The number of cables to be installed in ducts shall be such that a space factor of 45% is not exceeded, as required in the AS 3000 after making an allowance of 25% for the installation of future cables Under no circumstances shall circuit cables from different distribution boards be run in the same duct
- All ducts shall be epoxy-coated and shall be manufactured from zinc-coated, mild steel 16 SWG, for cross-section sizes of up to and including 300mm x 100mm, 14 SWG sheet steel shall be used.
- j) Wiring ducts may be supplied in length of 2 metres or 4 metres with each length being provided with a sleeve-type coupling and external earth bonding link of copper. All duct shall have smooth interior with cover plates overlapping the sides of the duct. In general, the duct shall be designed for exceptional strength and rigidity with duct lengths fitted with "butt-up" joints to form the necessary runs. Suitable adaptors shall be utilized for any change in cross-section of duct runs. All such adaptors, bends, tee pieces and stop bends used in the duct installation shall be fabricated from the same material as the duct and fitted with sleeve-type couplings at each duct connection.

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- k) A copper tape earth-continuity conductor of 25mm x 3mm cross-sectional shall be provided throughout the full length of the duct run and bonded to the duct at any section
- I) Where conduit is tapped off from trunking, suitable brass, smooth-bore bushes shall be fitted at all conduit terminations. The use of all-insulated type, plastic, fibre or bakelite bushes for this purpose shall not be permitted
- m) All trunking is to be finished with an approved type orange colour
- n) Each circuit in the wiring duct must be bunched at 2m intervals and must be duly identified with circuit label/tag

6.6 FINAL OUTLETS

General

a) Ascertain the proper position of all outlets and receptacles Outlets or receptacles, incorrectly located, shall be relocated without additional cost. Outlet locations shown on drawings are approximate. Do not scale from the drawings but consult the Architectural plans, sections, elevations and details for exact locations of outlets and equipment and areas with false or hung ceilings

b) The location of outlets, apparatus or equipment may be varied at any time up to the time of roughing-in All variations shall be carried out by the contractor at no extra cost providing that the variations are within a 3m radius of the indicated location

c) Ceiling boxes shall be aligned in rows with a maximum tolerance of 25mm deviation each 20 metres

Lighting Outlets

a) Erect all fittings in a workmanlike manner, square with other details, maintaining straight and true lines and vertical drops.

b) Ceiling boxes shall be aligned in rows with a maximum tolerance of 25mm deviation each 20 metres.

6.7 GENERAL PURPOSE POWER RETICULATION

General

The installation of outlets, boxes and conduits in concrete pours shall be co-ordinated throughout with Superintendent

The reticulation to general purpose outlets, fixed appliances and equipment shall generally conform to the following methods of installation -

- a) Lighting and power circuits shall not be installed in the same conduit Lighting and power outlets shall be wired on separate sub-circuits
- b) Exact locations of all items shall be determined using Drawings and from inspection on site

- c) Variations in location of outlets, etc. up to 3m from the positions shown on the drawings are deemed as being in the contract
- d) The grouping of circuit cables shall be arranged so that de-rating of circuits does not occur.

Typical Installation

General power circuits may be carried in the ceiling space where ceilings are installed Elsewhere and unless noted otherwise conduits will be cast in slab.

General power to toilet and lobby areas shall be supplied via conduit cast in walls or cabling run in partitions to outlets mounted in recessed wall boxes.

Ground Trenches

Where such cables are laid underground, cable routes shown in the drawings are approximate only. Successful tenderer shall peg out the centre lines of these routes for the approval prior to laying the cables

Unloss otherwise specified, cables shall be buried to a depth of 0.6 metres. The minimum width of cable trench for the underground cables shall be 450mm (18 inches) in order that the cables shall be properly handled and spaced at the bettern of the trench. When the trench has been excavated, it shall be thoroughly inspected along its entire route and all stones and any other objects likely to damage the cable sheathing shall be removed. The bettern of the trench shall then be covered with a layer of 75mm (3 inches) clean river sand and the cable laid on top. After cable laying a layer of 75mm (3 inches) clean river sand shall cover over the cable and carefully spread before placing the cable protective covers.

Cable protective covers shall be good quality house bricks. They shall be laid length wise from end to end along the entire route of the underground cable. The supply and laying of sand and cable protective covers shall be include in the rate of cable laying.

Trenches shall be backfilled with soil and consolidated after every 150mm (6 inches) of backfill using a mechanical rammer. The finished surface shall be left with surplus soil of 50mm high to allow for subsidence and the Sub-Contractor shall be responsible for the removal of any surplus soil.

When it is found necessary to interface with a finished road surface, carry out all necessary work (including resurface, crusher run and remetal) to make good that portion of the road area.

When cable trenches are opened, all cables shall be laid and the trenches shall be backfilled within 24 hours. At all times, safety precautions shall be taken and arrangements made to prevent damage to cable

Trenches shall be kept as straight as possible and shall be excavated to approved formations and dimensions. Trenches shall have vertical sides and are to be timbered and sheeted where necessary to prevent subsidence and to this end minimum lengths of trench shall be opened at any one time.

Cable Draw Pits

Where cables are installed in underground conduit provide cable draw pits of adequate size complete with pit covers as shown on the drawings. Drain cable pits into the nearest stormwater pit, by using 50mm dia PVC pipe. ٠

Cable Position Markers

The location of all directly buried cables shall be marked by concrete slab markers of 1.2.4 concrete mix 100mm square and 2100mm thick. Each cable run shall be marked at the point where it leaves the plinth, sub-station or other current controlling device and shall be marked at approximately every 30m, along the cable run with an additional marker at each change of direction of the cable run.

Impress the words "LV CABLE" or "HV CABLE" or "CONTROL CABLES" or "JOINT BOXES" as required on each cable making plan and shall also impress additional circuit symbols as directed.

Cable markers shall be installed flat and leveled with the finished ground surface-

Segregation of Circuits

Low voltage circuits shall be segregated from extra-low voltage circuits

Lighting and power final sub-circuits shall be segregated and run in separate conduits or trunkings

Low voltage circuits shall not be drawn into the same conduit or trunking as cables of telecommunication circuits Where cores of low voltage and telecommunication circuits are contained in a common multicore cables, the cores of telecommunication circuits shall be insulated individually or collectively in accordance with the requirements of AS 3000, for the highest voltage present in the low voltage circuits, or alternatively shall be separated from the cores of the low voltage circuits by an earth metal braid of equivalent current-carrying capacity to that of the cores of the low voltage circuits. Where terminations of the two categories of circuit are mounted in or on common boxes, switchplates or blocks, they shall be partitioned

Maintain separation to AS 3080

6.8 FASTENING AND FASTENING MATERIALS

- a) Firmly secure in place all conduits, ducting, cable, switches, receptacles, wall boxes, panels, distribution boards, outlets and similar equipment furnished under this specification. Use expansion shields or concrete inserts with concrete or brick, toggle bolts on hollow tile or lath; wood screws of adequate gauge on wood.
- b) Secure all fastenings directly to the building structure utilizing steel channel section suspension systems. Do not secure to work of other trades such as ceiling lath, pipes or pipe racks, unless specified
- c) High velocity gas discharge or percussion type nails shall <u>not</u> be used without prior approval Nuts, bolts, screws, washers, etc used as terminals shall be brass.

6.9 PAINTING AND FINISHING

- a) Provide factory top coat of paint for all metal items of equipment such as panels, switchgear, fixtures, as herein described to the following colour code All conduits, cabinets, boxes, enclosures, panels, etc. Items not specifically mentioned in the colour code shall be as directed. All steelwork shall be new and free from rust and scale before fabrication
- b) Thoroughly rub down after fabrication and coat with approved etching type, rust inhibiting primer and then carefully fill Finish to a glossy motor body finish with at

least two coats of sprayed enamel of selected colour applied and dried in accordance with the paint manufacturer's recommendations.

Touch up painting of equipment scraped or damaged in handling shall be carried as follows -

Refinish with primer and final coats to restore the surface to its specified condition in regard to colour, finish and quality Overall steelwork shall have uniform appearance Spot repainting which permits colour difference to show is <u>not</u> acceptable

<u>Colour Code</u> Equipment or Service	Base Colour or Colour Patch	Letter and/or Label
All Hangers	Black	-
Wiring Ducts	Electric orange epoxy coated	As specified
Cable Trays	Natural	As specified
Main Switchboards	Orango	As designated on drawings or ——— within the specification
Distribution Switchboards	Orango	As designated on drawings or within the specification

6.10 FINAL TESTS, APPROVAL AND ADJUSTMENTS General Installation

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- a) It is the intent of this specification to ensure all workmanship of all materials employed, all required equipment, and the manner and method of all installations conform to accepted construction and engineering practices, except as modified herein or by manufacturer's instructions and that each piece of equipment is in satisfactory condition to successfully perform its functional operation
- b) All testing shall be scheduled through Superintendent. No testing of any kind shall be done or scheduled without this clearance.
- c) Complete test and inspection records shall be made and incorporated into a report for each piece of equipment tested. All readings taken shall be recorded Three copies shall be made available
- d) Notify by letter all the interested parties at least 7 days prior to test, establishing the time when test is to be performed.
- e) Supply necessary meters, instruments, temporary wiring and labour to perform all required tests and adjustment of equipment and wiring installed and connected under this contract including the electrical equipment furnished by others to determine proper polarity, phasing, freedom from earths and shorts, and operating or equipment, meters, relays, etc

f)	If installation codes, laws, etc, require any work to be tested or approved, provide proper facilities for such access and for inspection
g)	Tests shall be made for continuity and identification of each conductor Both ends of a given conductor shall be identified alike Before circuit terminal connections are made, continuity and identification shall be checked by means of a DC test device using a bell or buzzer or battery powered phone to ring out the wires
h)	Test each circuit for grounds and shorts by means of a megger insulation testing instrument which shall impress a voltage of not less than 500 volts DC upon the circuit under test. Any circuit showing an insulation resistance less than the minimum values given in AS 3000 shall be investigated and faults corrected All circuits under megger insulation test shall be connected to respective final terminal and switches or breakers in the OFF position
I)	Correct or replace any nominal current carrying circuit, which is defective or earthed Also correct all troubles encountered by test and set breakers and relays as directed so that equipment will be in proper operating condition before being placed in service.
a	Following established precedure, equipment will be energised after certification that

j) Following established procedure, equipment will be energised after certification that the installation is satisfactory Final operation tests shall determine that the wiring connections are correct

6.11 MAINTENANCE

Make monthly tests and inspection of all equipment with necessary running maintenance including replacement of faulty workmanship or materials during the liability period

During such tests and inspections, continue to instruct Superintendent in the full operation and maintenance of the installation

Provide all necessary materials, tools, labour etc. to effect maintenance

A test and inspection log book shall be maintained in the switch room Then record each visit therein, reporting the work carried out and having confirmation thereof recorded by the Client's representative Give due notice of any sectional isolation or shutdown of the installation to carry out major maintenance or repair work

After each visit to site, submit a complete maintenance service form in duplication reporting the inspection and test on the installation and any abnormal operation

6.12 CABLE TESTING

As soon as it is practicable after the completion of installation and jointing of the cables specified herein, or of any usable group of such cables, and prior to practical completion, carry out the tests described below together with such other tests and measurements to prove compliance with this Specification and with the requirements of AS 3000.

An insulation resistance test, carried out with a "Megger" insulation tester or other similar type of testing instrument, to measure the insulation resistance between each conductor and the remaining conductors and between each conductor and the metallic sheath, if any, and armouring. The test voltage to be applied shall be as follows

Low voltage cables	-	500 volts
High voltage cables	-	not less than 1000 volts

The above tests shall be carried out both before and after any voltage tests and the insulation resistance shall not be less than the figures in AS 3000 Submit insulation resistance figures for cables above 3 3kV

An earth continuity test shall be carried out to verify that the cable armouring and metal sheath, if any, have been properly bonded to earth.

Phase-rotation and phase-correspondence shall be tested to prove that the cables have been correctly connected

6.13 LOW VOLTAGE SWITCHBOARD TESTS

Low voltage switchboards shall be thoroughly checked or correct functioning in every respect and shall be subjected to the following tests-

With control circuits disconnected but with all isolators closed and power fuses fitted, the panels shall be subjected to a voltage test across the following points-

i Phase to phase ii. Phase to neutral iii. Phase to earth iv Neutral to earth

The voltage levels and test direction shall be in accordance with the relevant Australian Standard for the equipment provided

This shall be followed by an insulation resistance test with an approved type of 500V test instrument. With all electronic components and timeswitches removed or isolated and with all main isolators closed and power fuses fitted, an insulation resistance of not less than 20 Megohms shall be obtained between each of the following points.-

v. Phase to phase

vi Phase to neutral

vii. Phase to earth

viii. Neutral to earth

Test pressures shall be maintained for a minimum period of 4 hours plus any additional period required to permit examination of the system to the full satisfaction of the contractor Any leaking or doubtful joints, fittings or piping shall be remade or replaced and retested. Make good damage caused by water leaks

7.0 SWITCHBOARDS

7.1 SCOPE

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Supply and install additional switchesar to the existing fully insulated main switchboard and distribution boards as detailed herein and shown on the drawings

7.2 AUTHORINIES APPROVALS

Documents evidencing approval of regulatory authorities, to be provided before construction of main switchboard construction. The switchboard shall be constructed to the requirements of Energy Australia relating to fully insulated switchboards.

7.3 APPROVED SUB-CONTRACTORS

-----Obtain the switchboard from an approved specialist switchboard manufacturor.

7.4 SHOP DRAWINGS

Supply shop drawings showing.

- ---- Single line diagram,
- Cascading and distribution studies,
- The general arrangement including layout of equipment, busbars and connections;
- Inventory of materials, including ratings, withstand capacity manufacturor types etc;
- Structural and enclosing elements including sheet metal and sealing details;
- Terminal block layouts and identification;
- Details of labels and engraving;

 Main switchroom layout at 1 50 showing switchboards, metal panels, power factor panels etc

Number of copies. 4.

7.5 WORK AS-EXECUTED DRAWINGS

Before the Date for Practical Completion supply work-as-executed drawings showing the same level of information as the shop drawings

Number of copies. As specified

7.6 INSPECTION

Give sufficient notice so that inspection may be made at the following stages:

- Fabrication completed
- Works assembly completed
- Switchboard installed and connected

Acceptance

Minimum notice required 4 days

7.7-OPERATIONAL-MAINTENANCE

Maintenance Period Co-extensive with the Defects Liability Period.

During the maintenance period-

- Carry out periodic inspections and maintain the switchboard installation in a condition to most the specified performance.
- Carry out thermal imaging of all switchboards after three months of services and carry out rectification works-
- Promptly rectify faults Replace faulty materials and equipment without charge.

Provide written reports on maintenance activities-

Carry out thermal imaging of all switchboards after three months of services-

Maintenance By Principal . NII

At the end of the maintenance period make a final inspection of the installation and upon satisfactory completion certify in writing that the installation is operating correctly-

7.8 MANUALS

Provide manuals as specified within operation and maintenance section document which are to include the following data

Operator's manual

- Information necessary for the satisfactory long-term operation and regular maintenance of the installation,
- Recommended maintenance periods and procedures,
- Particulars of maintenance tools or equipment provided and instructions for their use

Technical manual

- Detailed technical description of each equipment item and its function, and instructions for use;
- Where necessary, procedures for dismantling and re-assembly of equipment,
- List of spare parts provided;
- The 'work-as-executed' drawings

7.9 INSTALLATION

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Site Erection Installation : to AS 3000

Wall Mounting Switchboards . Fix the switchboard rigidly into position by not less than four fixing screws of minimum size 10mm Use masonry anchors for brickwork and concrete work-

Floor Mounting Switchboards : Install the switchboard level and plumb using neatly cut and fitted packing plates under the channel base. Align shipping sections and bolt together - Fix the base to the floor by means of minimum 12mm fixing screws, front and rear, at either end and at intervals of 2m along the length of the beard. Complete busbar connections after alignment and bolting procedures are completed. Neatly pack the space under the base after leveling with sand-coment grout.

7.10 DESIGN AND CONSTRUCTION

General Design

Main Switchboard	To AS 3439 1 Form 3 bib IP42 fully insulated to the line side of
Warr Ownorboard.	
	the circuit protection equipment
Distribution Boards:	To AS 3439 Form 1 IP56 unless enclosed in a deducated
Biothballon Boardo.	
	oloctrical services cuppoard -

External Design

Provide an enclosure comprising panels, doors and the like, giving the specified enclosure, segregation and degree of protection

Design and construction: To AS 3439 1 where applicable-

Degree of protection To AS 1939.

Physical Size. To fit within spaces allocated including allowances for cable zones. Refer to Architectural details for all sizes available.

Fabricate supporting frames from rolled, cold formed or extruded metal sections, with joints fully welded and ground smooth. Provide concealed fixing or brackets located to allow the assembly to be mounted and fixed in the specified location without removal of equipment.

Machine fold sheet metal angles, corners and edges with a minimum return of 25mm around the edges of front and rear panels, and 13mm minimum return edge around doors. Provide stiffening to panels and doors where necessary to prevent distortion or drumming.

Provide equipment mounting panels fixed to threaded metal inserts located inside the enclosure at the rear of the mounting panels.

Provide fixings in the supporting structure, and removable attachments, for lifting switchboard assemblies whose shipping dimensions exceed 1.8m high x 0.6m wide-

Provide a metal plinth channel, not less than 75mm high, for mounting the complete switchboard assembly on site. Drill sufficient clearance holes for 12mm diameter bolts, in the switchboard and the plinth, to rigidly fix the switchboard assembly to the plinth and the plinth to the door.

Cable Entries

Provide sufficient clear space within each enclosure, adjacent to the cable entries, to allow the incoming cables and wiring to be neatly run and terminated, without overcrowding.

For cable entry and internal distribution, provide cable entries of net less than 100mm depth by the full width of cubicle space which is unrestricted by equipment or internal wiring

Provide to each entry a removable gland plate fitted with a gasket to maintain the specified degree of protection.

Doors

Maximum Width . 750mm-

Minimum Door Swing . Through 135°-

Hang doors on heavy-duty chromium-plated steel hinges, which allow easy removal of the door when in the open position-

Provide a chromium plated lever-type handle to each door, operating a latching system with latching bar and guides.

Incorporate a cylinder lock in the latching system All the locks of one installation shall be keyed alike.

Number of keys required: 4.

Provide a resilient strip seal, of feamed neeprene or the like, around each deer, housed in a suitable channel or housing and fixed with an approved industrial adhesive.

Seal contact:

 Indoor locations: Positive contact with a flat surface of the enclosure at least as wide as the seal strip.

Weatherproof switchboards - A continuous positive line of contact.

Escutcheon Plates

Provide removable escutcheon plates with neat cut-outs for circuit breaker handles and the like Fit chromium plated lifting handles or knobs to each escutcheon plate.

Provide a continuous 12mm wide support frame for the fixing of each escutcheon plate, including additional support where necessary to prevent panel distortion-

Fix each plate to the frame with motal fixings hold captive in the plate and spaced uniformly

Maximum Height : 1200mm-

Hang oscutcheen plates on hinges which allow opening through a minimum of 90^e and permit the removal of the escutcheen when in the open position

Finishes

Where metal surfaces are to be painted, prepare them as specified in Clause 6.08-

Paint Systems For indoor locations: A system not inferior to FULL GLOSS, SOLENT-BORNE-

Paint Colours . To AS 2700 Orange External White Internal

7.11 CONDUCTORS

Busbars

Provide basbar circuits within the switchboard, extending from the termination of the incoming unit to the line side of protective equipment for outgoing circuits-

Provide the busbar system into separate 'essential' and 'non-essential' circuits, each segregated from the other by fixed and continuous barriers. Clearly label each segregated section of the busbar system.

Pro-drill the main busbar for future extension and extend busbar droppers to spare locations. Drill each dropper to suit connection of future equipment of the same type as that specified

Cross Section : Radius edges and corners to prevent damage to insulation-

Provide support sufficient to withstand without damage the maximum prospective fault surrents-

Make busbar joints with high tensile bolts and nuts, locked in position with lock nuts or locking tabs Tighten bolts to the manufacturer's recommendation with a tension wrench. Do not use tapped heles and stude or the like for jointing current-carrying sections.

Insulate busbars as follows:

Active and neutral busbars: A fully-insulated system using the specified insulation material.

Joints: Insulate either by taping or plastic coating, as follows.

- Taped joints: Apply a non-adhesive stop-off type tape, coloured to match the specified colour coding, half lapped to achieve a thickness of not less than that of the solid insulation.
- Plastic-coated joints: Apply, in accordance with the manufacturer's recommendation, and to a minimum thickness equal to that of the solid insulation, an air-drying plastic coating material which achieves a tensile strength in excess of 17MPa, and a minimum elongation of 300%.

Colour the insulation as follows:

Active busbars: Rod, white or blue Neutral busbars: Black Earth busbar Green and yellow

Extend the neutral busbar into each switchboard compartment containing outgoing circuits with neutral connections Provide terminals or drill the busbar for neutral connections

Identification. Clearly mark and number terminal connections

Men Link - Provide a bolted removable link in the incoming compartment, between the neutral and earth busbars.

Neutral and Earth Links

Locate neutral and earth links within 0.6m of each cable entry.

Provide stud connections for cables of cross section 16mm² or larger

Provide terminals for incoming and outgoing neutral and earth conductors, including the MEN link Provide additional terminals for future circuits

Identification: Clearly mark and number terminals.

7.12 SWITCHGEAR AND CONTROL GEAR

Switchgear

Provide mains switching, outgoing circuit switching, protection and auxiliary equipment as shown on the drawings.

Moulded Case and Minature Circuit Breakers

Standards. To AS 2184 for fault capacities of 10 kA or more. To AS 3111 for miniature overcurrent circuit breakers up to 1000A current rating and less than 10kA fault capacity.

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

Clip Tray Chassis: For miniature over-current circuit breakers provide clip tray assemblies, capable of accepting the installation of single, double or triple circuit breakers and related busbars Provide moulded clip-on pole fillers for all unused portions of the chassis

Maintain sufficient space around the circuit breakers to allow all incoming and outgoing cables, including cables to spare poles, to be installed and terminated without overcrowding. For clip tray chassis mountings the clearance between the circuit breaker terminals and compartment walls shall not be less than 90mm up to 36 poles and 115mm above 36 poles

Allow auxiliary contacts and other required accessories.

Manufacture of Moulded Case and Miniature Circuit Breakers

Circuit breakers shall be of the same manufacture Provide manufacturer cascading and discrimination together with switchboard single line diagrams

Earth Leakage Devices

Standards: To AS 3190-1990.

Type Provide residual current devices of the current operated earth leakage circuit breakers type which are all from the same manufacturer

Residual Current Rated residual current not to exceed 30mA.

Location. When shown on the drawings.

Mounting. As for moulded case circuit breakers

Maximum Tripping Time. 20 milliseconds

Switch-Isolator and Fuse-Switch Units Standard To AS 1775

Rated Thermal Current As applicable to the unit when installed in the specified enclosure.

Rated Short-Circuit Making Capacity Not loss than the switchboard fault level or as otherwise specified.

Utilisation Category: For circuits comprising essentially motor or other highly inductive leads, not less than AC-23. For other circuits, not less than AC-22-

Operation: Independent manual operation with a positive manually operated ON-OFF indicator. Provide a facility to lock the unit in the OFF position.

Design: Totally enclosed unit incorporating are control devices and shrouded stationary contacts-

Control and Test Switches Standard: To AS 1431

Rated Operational Current: Not less than 6 A at 240 V a.c at utilisation category AC-11

Degree of Protection Not less than the degree of protection specified for the switchboard.

Push Buttons Colour code the operators to suit the functions as follows:

Start, On or Close. Green Stop, Off or Open. Red Reset. Black

Rotgary Switches Provide actuating knobs coloured as follows

Control switches Red Selector switches: Black Time Switches.

Operation. Electronically controlled from 240V 50Hz supply Provide day omit and manual override facilities.

Type[•] Programmable digital. Mains failure operation[•] By a battery with 100 hour operating capacity and a guaranteed life of 10 years

Contact rating: 16 A at 240 V a c. to utilisation category AC-11

Construction Provide a readily accessible means of adjustment of the switch operation. The switch operational settings shall be clearly visible when the switch cover is fitted.

Identification: Provide engraved or etched surrounds or labels, identifying the control function of each push button and switch, and the operation of each switch position.

Contactors

Standard To AS 1029 Part 1

Type. Block type, air break

Rated Operational Current Not less than the full load current of the load controlled

Rated Duty Uninterrupted (continuous)

Minimum Size. 16 A at 415 V a c.

Utilisation Category Not less than AC-3 suitable for operational in low noise areas for DC-3 as applicable.

Auxiliary Contacts. Provide auxiliary contacts for the specified control circuits Where space is available, fit not less than one 'a' and one 'b' spare contact

Where the number of specified auxiliary contacts exceeds the number, which can be accommodated, provide a separate slave relay

Reversing Contactors Shall be mechanically and electrically interlocked

Mount the contractor with sufficient clearance to other equipment and to its enclosure to allow full access for maintenance, removal and replacement of coils and contacts, without the need to disconnect wiring or remove other equipment.

Interconnection Do not connect contactors in series or parallel to achieve the specified ratings

Control Relays

Standard: To AS 2481

Suitable for continuous operation under the specified conditions with operating characteristics suitable for the application.

Plug-in types shall be latched to the receptacle base by a captive clip, which may be applied and released without the use of tools

Minimum Contact Rating: 5A at 240V for a.c applications

Contact Elements: Type: Electrically separate, double break, silver alloy, non-welding contacts.

Duty level IIIA to AS 2481 Table 3 6.

Configuration. For standard control relays, provide assemblies with a minimum of four sets of contacts and capable of being expanded to a total of eight contacts in the same assembly Where space is available, provide not less than one normally open and one normally closed contact

Field conversion: Provide contact blocks which are readily convertible in the field to either normally open or normally closed contacts

Time delay relays shall be adjustable over the full timing range and have a timing repeatability within 12.5% of the nominal setting.

Time Switches: Two circuit digital programmable type

Cascading

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Ensure that the let through energy of the upstream devices is not more than that which can be withstood by the downstream devices and cabling

Discrimination

Coordinate protective devices so that a fault or overload appearing at a given point in the installation is cleared by the protective device installed immediately upstream of the fault or overload and by that device alone.

7.13 ACCESSORIES, INSTRUMENTS, METERS

Labels

To AS 3439.1 and AS 3000. Marking shall include labels for each switchboard control, circuit designations and ratings, fuses fitted to fuse holders, current-limiting fuses, warning notices for operational and maintenance personnel, and the like

Provide samples of proposed label material, label sizes, lettering sizes and lettering text for approval-

Location: Screw-fix each label adjacent to its relevant item of equipment, but not on the equipment.

Material: Two-colour laminated plastic or photo-anodised rigid aluminium.

Colours: Warning notices White letters on red background-

Lettering Height: Generally not less than the following.

Main switchboard designation 25mm Main switches 20mm Fooder control switches: 10mm Identifying labels. (on outside of cubicle rear covers, etc): 4mm Equipment labels within cubicles. 3mm Warning notices: 4mm

Schedule Cards: For light and general power distribution provide schedule cards of minimum size 200mm x 150mm with text typewritten to show.

Sub-main designation and rating;

Light and power circuit number, type and area supplied;

Approval: Submit the proposed schedule for approval.

Mount the schedule card in a holder fixed to the inside of the enclosure door, adjacent to the distribution circuit switches, and protect the schedule with a hard plastic cover.

7.14 POWER MEASUREMENT

Requirement

Provide power measuring instrument for the display and communication of electrical parameters-

Location

The instrument shall be integral with the site main switchboard

Display

The instrument shall be capable of displaying voltage, current, kilowatts, kilovoltamperes, power factor, frequency, kilowattheurs and maximum demand values with time stamping on a high resolution digital graphic display.

The instrument shall be equal in functionality and parameters displayed to Schneider PM5310 digital metering system

Analogue Outputs

Provide 4-20mA dc outputs signal for the following parameters:

- Average line current
- Average line voltage
- Total VA
- Average power factor
- Maximum domand

The signals shall be terminated in a terminal strip.

7.15 SWITCHBOARD SCHEDULES

Operating Parameters Schedule	
Supply System:	
Nominal voltages	
- Line.	415
- Phase.	240
Frequency:	50
Number of phases:	3
Number of wires:	5
Neutral connection:	Men
Earthing system.	AS 3000
Maximum fault level symmetrical (kA r.m.s.):	50kA
Power measurement	On main switchboard. See separate
Carties Carddiana	500000
	E t=
Ampient air temperature range:	- 3 (0 +40
Construction Schedule	
Switchboard Designation:	Main Switchboard or
	Distribution Board
Location:	Indoor
Degree of Protection:	As indicated in Section 8.10
Numerical designation:	As noted on drawings
Form of Segregation	As specified elsewhere
Arrangement Of Cubicles.	Dead Front
Safety Measures:	MEN
Service Isolation Device.	On main switchboard with labelling to
	EA requirements
Materials and Finish	As noted elsewhere

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	Definitions-	To AS 3439 Clause 2-4
	Dimensions.	To fit within space allocated including
		allowances for cable reticulation and
		metering. Refer to latest Architectural
		dotails for spaces available
	Authority Approval:	Obtain Authority approval prior to construction
	Surge Protection	On main switchboard, 80KA nominal
	5	discharge current, Erico TDS MT or
		similar

8.0 LUMINAIRES

8.1 SCOPE

Supply and install and connect all light fittings as detailed on the drawings. Light fittings shall be supplied complete with lamps, control gear and diffusers

8.2 STANDARDS

The following standards are referred to in this Section.

AS 1170	Minimum design loads on structures
AS 2643	Fluorescent lamp ballasts – Performance requirements
AS 3000	SAA Wiring Rules
AS 3137	Luminaires (light fittings)
BS 1362	General purpose fuse links for domestic and similar purposes (primarily for use in plugs)
BS 5042	Built-in lamp holders and starter holders for tubular fluorescent lamps
AS 1680	Interior Lighting
AS 4051	Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment Building Code of Australia

8.3 CERTIFICATION

Obtain supply authority certificate of suitability for each type of luminaire and mark the certificate numbers on the luminaries

8.4 PACKAGING

Pack luminaries and components in robust and sealed enclosures suitable for withstanding conditions between dispatch and installation.

8.5 FLUORESCENT LUMINAIRES

Fluorescent Lamps

MCFE/U general purpose lamp with low resistance cathode and stand bi-pin caps All linear fluorescent tubes are to be tri-phosphor and be equal to Phillips ALTO

Colour temperature of lamps Method of operation Refer to drawings - 4000^oK unless indicated otherwise Correct the power factor of each luminaire to 0.9

Provide blocking inductors where required by the Supply Authority.

8.6 LED LUMINAIRES

LED Luminaires

The LED downlights in the Coommon Room shall be complete with dimmable drivers. The drivers shall be compatible with the dimming system Provide dimmer controller to suit.

Colour temperature of LEDs. 3000°K unless indicated otherwise. Method of operation: Refer to drawings

Correct the power factor of each luminaire to 0 9 Dimming System

The dimming system for the LED luminaires shall be Clipsal C-Bus system or similar. Supply and install all necessary equipment for the satisfactory operation of the system.

8.7 EMERGENCY EVACUATION LIGHTING

a) Scope

Supply and install an emergency and exit lighting system as detailed

b) Standards

The following standards are referred to in this Section.

AS 1431	Control switching devices for voltages up to 650 V a.c. and
	250 V d c
	Part 2 – Particular requirements
AS 1939	Classification of degrees of protection provided by
	enclosures for electrical equipment
AS 2293	Emergency evacuation lighting in buildings
	Part 1 – System design, installation and operations
	Part 2 – Inspection and maintenance
	Part 3 – Emergency luminaries and exit signs
AS 2676	Installation and maintenance of batteries in buildings
AS 2676	Part 2 – Inspection and maintenance Part 3 – Emergency luminaries and exit signs Installation and maintenance of batteries in buildings

Site Copy⁻ Keep on the site a copy of AS 2293 Pts 1, 2 and 3

c) Work-As-Executed Drawings

Requirement

Before the Date of Substantial Completion provide "work-as-executed" drawings of the emergency lighting installation, showing the final layout of installed equipment, location and reference number of each luminaire to correspond with the log book entry

Availability

Refer section one above for base drawing availability

d) Samples

Submit samples of each size and type of emergency luminaire and exit signs

e) Testing

Manufacturers' Tests. Classification testing. To AS 2293.3 Type testing: To AS 2293.3

Certification. For each size and type of self-contained emergency luminaire and exit sign supply copies of a certificate of tests stating the testing authority, manufacturer and details of parameters and results for each test. Provide copies of the certification within the operation and maintenance manuals

• Number of copies: 4

Commissioning Test. To AS 2293 1. Results to be shown in log book

f) Inspection and Maintenance

Standard To AS 2293 2

Maintenance Period. Co-extensive with the Defects Liability Period

During the maintenance period:

- Carry out periodic inspections and maintain the emergency lighting installation in a condition to meet the specified performance;
- · Promptly rectify faults Replace faulty materials and equipment without charge,
- Provide maintenance records.

At the end of the maintenance period make a final inspection of the installation and upon satisfactory completion certify in writing that the installation is operating correctly.

g) Operating and Maintenance Manual

Standard. To AS 2293 1

Provide the specified number of copies of the manual, which will be based on the format specified within the operation and maintenance section of this document in addition to the information specified in AS 2293.1

Form A4 size, printed or typed on durable printing paper, neatly bound in durable vinyl or similar hard covers

Number of Copies. 4

Provide a prototype copy for approval before printing the final copies

h) Maintenance Records

To AS 2293.1

Log Book[.] A4 size, printed or typed on durable printing paper and neatly bound in durable vinyl or similar covers, coloured distinctly different from the colour of the operating and maintenance manual covers

Identification: Each luminaire is to be labelled, Brother 'P- Touch' or similar with a separate identification number which is to be included within the log book and also incorporated into the "work-as-executed" drawings.

i) Emergency Evacuation Lighting Standard. To AS 2293.3

Emergency Luminaires and Exit Signs. To AS 2293.3 and generally as specified in the Luminaires Section.

Spares and Accessories. Provide a set of maintenance and testing equipment as recommended by the manufacturer. Include the following

2 spare lamps of each type 1 spare battery sets

Location House the spares and accessories within the room housing the distribution board

1 3

j) Single-Point Systems

e *

Emergency Power Supply. To AS 2293.3

Battery Indelibly stamp each battery with its date of manufacture Provide the manufacturer's warranty on the battery life with the luminaire operating under normal conditions at an ambient temperature of 25deg C

Battery Duration: To be 120 minutes

Battery Charger Two-rate, constant current, constant voltage, temperature compensated type with automatically selected booster and float charing rates

Visual indicator light: To AS 1431.2, coloured red.

Testing Facilities. To AS 2293 3 Provide a test switch on each luminaire.

Automatic Timer Provide an automatic timer arranged to discharge the battery for the purpose of carrying out the maintenance procedures in AS 2293 2 within each distribution board as detailed on the drawings.

Inverter System: Protect the inverter system against damage whilst in operation in the event of failure, removal or replacement of a lamp.

Installation: To AS 2293 1 Circuiting Install on circuits as follows:

Emergency Lighting – Individual light fittings to be connected to same circuit breaker as closest general lighting fitting.

Time Delay – Time delay to be provided on lighting circuits where the normal lighting does not restrict instantly.

Exit Signs - Individual exit signs to be complete with 2hr maintained emergency power pack

k) System Type Schedule Emergency Evacuation Lighting System Type⁻ Single Point

Ambient Temperature Range - 10 deg.C to + 40 deg C

Mains Power Supply:a.c voltage available:415/240Frequency.50Hz

Emergency Power Supply[.] Duration of Operation. 120 Min

9.0 EARTHING

9.1 MAIN EARTH

The main earth for the installation shall consist of electrodes as required by AS 3000.

9.2 EARTHING REQUIREMENTS

The installation is to be earthed using the MEN system.

Carry out earthing for the complete installation in accordance with the requirements of the Standards Association of Australian Wiring Rules, the Supply Authority and as shown on the Earthing Standard diagram.

9.3 EARTHING OF OUTLETS

Provide and connect to each and every outlet, whether plug socket lighting outlet or permanently connected appliance, and whether accessible or otherwise, and earthing conductor of a size as laid down by the Wiring Regulations AS 3000

Earth all steel conduits, trays and ducts at their switchboard or distribution board origin

9.4 EQUIPOTENTIAL BONDING REQUIREMENTS

Carry out equipotential bonding in accordance with the requirements of the Standards Association of Australian Wiring rules, the Supply Authority • •

10.0 OPERATION AND MAINTENENANCE

10.1 GENERAL

Scope

This section sets out the operational maintenance and training requirements for all systems and details the content and provision for Operating and Maintenance manuals, "work-asexecuted" Drawings and Electronic information

10.2 MAINTENANCE

Requirement

Provide preventative maintenance of equipment supplied and installed under this sub-contract during the Defects Liability Period.

The cost for preventative maintenance during the Defects Liability Period shall be included in the sub-contract

All equipment installed under this sub-contract shall be maintained in accordance with the appropriate maintenance manual, the manufacturer's recommendations and these specifications

All maintenance, including maintenance by manufacturers and/or local suppliers, shall be carried out in accordance with the following procedure

- The pro-forma to be used and full details of maintenance shall be to the approval of superintendent and shall be submitted not later than three months after signing the subcontract.
- A monthly visit shall be made by an experienced Service Engineer during the last week in each month
- A register held by the Client or his representative shall be signed by the Service Engineer at each visit
- A monthly return in triplicate to Superintendent shall be made by the first week in each month stating maintenance work completed and action taken on defects by the Service Engineer
- Breakdown maintenance shall be attended to promptly on call from the Client or Superintendent and details entered on the monthly return

Provide all minor lubricants and like consumable materials required for preventative maintenance.

Callouts

Provide to the Principal telephone numbers for maintenance staff who can be contacted in the event of a breakdown to attend site within 16 hours for a problem that is not an emergency. Attend site to repair any fault that affects essential or major plant within 4 hours.

Program

Before the start of the maintenance period, submit a maintenance program showing the proposed dates of required service visits Undertake regular visits at not less than 1 month intervals. Record the result of each service visit in the log book, including comments on the

functioning of the system, work carried out, items requiring corrective action, testing results, any necessary remedial action, adjustments made, name of service operator, and the like, and obtain the signature of the Principal's designated representative

Certification

At the end of the maintenance period, make a final service visit and upon satisfactory completion of the above procedures, certify in writing that the system is operating in "as-installed" condition

Activities

Undertake as a minimum preventive servicing requirements of the system set out below and in addition all servicing to ensure that the system remains in a fully operational and clean state:

- Replace all faulty and damaged parts of the installation and make all necessary adjustments
- Service all equipment in accordance with the recommendations of all equipment and component manufacturers.
- Clean out systems as necessary
- Carry out thermal imaging of all switchboards after 3 months of project completion
- Carry out statutory inspections and maintenance, complete logbooks for emergency lighting systems and fire detection system
- Fine tune television reception systems
- Make adjustments to lighting and control systems (time clocks aiming of luminaries etc.)

Release of the final payment and retention sum shall be made at the end of the Defects Liability Period upon submission of inspection and maintenance reports and inclusion of them into all copies of the Operation and Maintenance Manuals

Service Contract

Submit during the Defects Liability Period, in draft form, a proposal for a service agreement covering regular inspections and servicing of the installation, to take effect on the expiration of the Defects Liability Period

10.3 TRAINING

Requirement

Provide training of the Principal's Representatives on site at times and dates to be agreed during the contract. Allow to provide initial training for a full period of 3 days within 1 month of practical completion. Allow a further full period of 1 day each within 3 months, 6 months and 11 months of practical completion Provide at each session, sufficient training for the Principal's Representative to operate and maintain all systems. Provide a full outline of the training course to the Principal, two weeks prior to the courses and obtain approval of the adequacy of the course outline.

10.4 MANUALS

Requirement

Provide Operating and Maintenance Manuals for all systems and equipment utilised throughout the project Submit draft copies of the proposed Operating and Maintenance Manuals at 50% of the project, complete in all respects with the exception of "work-asexecuted" Drawings and Commissioning and Test results. Provide one final draft prior to practical completion. Practical Completion Certificates will not be issued until the final draft copy of the manuals are received

Provide 3 sets of the corrected and completed manuals within 4 weeks of Practical Completion

Form

A4 size, typed on durable printing paper, each page consecutively numbered, neatly bound in durable hard-backed vinyl covers permanently labelled. Place diagrams on the same page as the relevant text, or on the facing page, or on gatefold pages at the end of the volume. The type, style and manual form shall be continuous through the manual

Manual

Provide the information necessary for the satisfactory long-term operation and regular maintenance of the installation as well as technical reference information on all plant and equipment, including:

- Binder Information
 - Project name and service on the spine
 - Project name and service on the front cover along with the Principal's name, Contractor's name, Subcontractor's name and the Superintendent's Representative's name.
- Title Page. Provide the name of the Subcontractor and his address and contact numbers and the expiry date of the Defects Liability Period.
- Index[.] Provide a comprehensive Table of Contents
- General Description⁻ Provide an easy to read description of the installation covering all systems and their functions Make reference to latter and more detailed descriptions of plant or systems.
- List of Equipment Containing each item of plant installed with item number, equipment make and model, serial number and name plate data. Identify the functional purpose of the plant, its operational capabilities and capacities.
- Suppliers: List of equipment and service suppliers with name, address and contact telephone and facsimile numbers
- Sections following covering.
 - General description of systems and equipment
 - Equipment schedules
 - Manufacturers literature
 - Maintenance instruction
 - Log books
 - Testing and certification documentation
 - "Work-as-executed" drawings

General Description of Systems and Equipment

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

Equipment Schedules

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

Manufacturer's Literature

Include manufacturers data on operation and maintenance of all equipment installed Do not include irrelevant data or data that does not pertain to the model of equipment installed Where data sheets contain data on multiple equipment than highlight equipment actually installed

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

Maintenance Instructions

Detail all requirements for preventive and corrective maintenance of the complete plant Arrange in tabulated sections of recommended daily, weekly, monthly and annual maintenance in the form of a log book as described further below

Note periodicity, performance standards to be maintained, physical inspections to be performed, cleaning, lubrication, adjustments, special tools required, special materials required, testing procedures, trouble shooting and fault diagnosis procedures, dismantling and assembly procedures.

Manufacturer's Instructions

For maintenance, repair or overhaul for each item of equipment including calibration of all controls and instruments These instructions shall be included in the MAINTENANCE INSTRUCTIONS

Log Books

Include in the manual, log book pages set up for recording the maintenance items listed above (operational and maintenance actions and procedures, periodicity, performance standards, adjustments made, materials used, test results, comments for future maintenance actions, notes covering the condition of the installation, etc) sufficient in number to receive the entries for the maintenance period and for a further period of 12 months.

Testing and certification documentation

Include in the manual all testing and certification documentation as specified elsewhere for the individual systems.

10.5 WORK-AS-EXECUTED DRAWINGS

Requirement

Provide drawings of the "Work-as-executed" using a computer aided draughting (CAD) program Produce drawings on the same sheet size as the tender drawings. Include a graphic scale as well as a designated scale

Submit three (3) sets of full size prints, three (3) sets of A3 reduced prints bound separately as part of the Operating and Maintenance Manuals and electronic data as listed below.

Before the date of Practical Completion, provide the Superintendent's Representative with one full size print of "work-as-executed" drawings for review. Include finalised "work-as-executed"

drawings in the Operating and Maintenance Manuals. Include all changes and variations made during the execution of the work

Remove all details and notes specific to construction only and not specifically required to show work-as-executed. Ensure all terminology is corrected to remove 'past tense' referencing.

Ensure all information relevant to instructions issued during the construction period are incorporated

Drawing Availability

Refer to section one of this document for base drawing availability

CAD Files

Submit CAD drawing files in accordance with the following.

- Drawing files in Autocad 2000 or more recent format
- · Bind cross-referenced files used in the production of the drawings
- Prepare all CAD drawings at full scale, i e., 1 1
- Provide a CAD file summary including:
 - index of CAD file names related to drawing names
 - list of all layers, linetypes and blocks
 - scales at which CAD files are plotted

Electronic Information

Provide two electronic copies of the following information

- All text within the Operating and Maintenance Manuals.
- As-installed drawing CAD files

Provide each electronic copy on separate media. Utilise 640 MB CD-Roms, clearly labelled and indexed in labelled proprietary diskette storage containers. Provide within the manuals, all information and instructions necessary for retrieval of information from the disks.

11.0 FIRE DETECTION & ALARM SYSTEM; BUILDING OCCUPANT WARNING SYSTEM

11.1 GENERAL CLAUSES

11.1.1 General Requirement

This specification is to be read in conjunction with the associated drawings, the General Conditions of Contract, addendums and instructions issued by the Project Manager

Site Visit

Notwithstanding the exhibition of the Plans to the Tenderer, it will be presumed that the tenderer has visited the site and has acquired such information as may be necessary for the purpose of this work and has verified such dimensions as are relative to the work by actual measurements taken on site.

11.1.2 Scope

A fire detection and alarm system exists on site. Carry out alterations and additions to the existing system

- The works shall include but not limited to the following:
- alterations and additions to the existing fire indicator panel (FIP)
- smoke detectors
- heat detectors
- manual call points
- visual warning device
- wiring, mountings, etc
- interface to fire services
- Provide to the building an occupant warning system comprising:
- warning speakers
- visual alarm devices

11.1.3 Extent

The work shall include:

- detailed system design
- manufacture, supply and installation
- removal of redundant material and equipment
- testing and commissioning
- operating and maintenance manuals
- as-installed drawings
- maintenance during defects liability period

11.1.4 Specialist Sub-Contractor

The fire alarm system shall be designed, supplied, installed, commissioned, maintained and guaranteed by an experienced specialist fire protection system sub-contractor

1 14

Experience The specialist sub-contractor shall provide a system which has already been installed and can be proved to be working satisfactorily in accordance with Code and Authority requirements in at least 10 different buildings in Australia.

11.1.5 Drawings

t

Provide workshop drawings of FIP for inspection and comment prior to manufacture

11.16 Samples

Provide samples of all detectors, loudspeakers and manual call points for inspection and comment prior to ordering.

11.2 STANDARDS AND REGULATIONS

11.2.1 Reference Documents

The following standards apply

AS 1603	Automatic Fire Detection and Alarm Systems - Parts as applicable
AS 1670 1-2004	Fire Detection, Warning, Control and Intercom Systems - System Design, Installation and Commissioning Part 1: Fire
AS 1851	Maintenance of Fire Protection Equipment
AS/NZS 3000	SAA Wiring Rules
AS 3013	Electrical Installations - Wiring Systems for Specific Applications.

11.3 AUTHORITIES

11.3.1 Requirement

The system shall comply with the requirements of the following

- Local Fire Brigade Board
- Building Code of Australia (BCA)
- Local Government Authority

Certificate of Compliance

Forward to the Chief Officer of the local Fire Authority, with a copy to the Superintendent, a certificate stating that the installed fire services system complies in full with the AS Codes and Authority requirements This certificate shall be in the form required by the Authority and shall be provided prior to Practical Completion

11.4 WORKS BY OTHER TRADES AND ASSOCIATED WORKS

11.4.1 WORK BY OTHER TRADES

The associated work to be carried out by other contractors to enable the specified contract works to be performed is specified hereunder

1 4

PROPOSED FIRE SPRINKLER & HYDRANT SUPPLY TANKS, TAYLOR VILLAGE NARRABEEN ELECTRICAL SERVICES

a) Work by Builder

• Forming of all openings in walls, floors, ceilings, and roofs for the passage of conduit trays, ducts, mounting of warning speakers, and the like.

5

- Making good to rendered, tiled or clad masonry surfaces necessary to conceal the installations.
- Hinges access panels and doors for access to control devices in false ceilings, walls, floors, services shafts and the like
- Flashing where conduits etc penetrate roofs and outer walls (provide overflashing under electrical services).
- Cranage and lifting of equipment
- Box outs for cables and fire rating where noted.

b) Work by the Fire Services Trade

- Supply and installation of fire services control panels.
- Supply and installation of sprinkler flow switch and of sprinkler alarm stop valves and their wiring to the Fire Indicator Panel.

c) Work by Electrical Services Trade

Provision of power supply to the FIP

11.5. FIRE DETECTION AND ALARM SYSTEM

11.5.1 General

A fire detection and alarm system exists on site. Carry out alterations and addition to the existing Fire Indicator Panel and to the existing fire detection and alarm system as indicated on the drawings.

11.5.2 Fire Indicator Panel (FIP)

Features

A Fire Indicator Panel (FIP) exists on site.

Upgrade the existing FIP to suit the proposed occupant warning system and the fire sprinkler system.

The upgraded FIP shall have the following additional features

- to be complete with evacuation module
- isolation facilities to permit testing to be carried out without transmission of Brigade alarm, activation of the occupant warning system, of sprinkler flow valve and of sprinkler alarm valves.
- connection of speakers and horns to the evacuation module
- provision for connection of Repeater Panels utilizing high level interface
- manual mechanical services reset
- SSL approved and compatible with the alarm activating devices

Location

The existing FIP cabinet is located as shown on the drawings.

Power Supply

Connect FIP to the 240 Volt, 50 Hz AC supply.

Upgrade the existing power supply if necessary

Batteries

Upgrade existing dc supply and battery capacity to be adequate for the specified initial alarm zone capacity and control system requirements Batteries shall be long life (10 year rated), maintenance free, valve regulated, lead-acid type.

11.5.4 Alarm Zones Requirement

Connect or group detectors in alarm zones as required by the Codes and as shown on drawings. Alarm zones, indicating lights and controls shall be arranged in groups in accordance with requirements of the Fire Brigade

Separate Alarm Zones

Requirement. Wire from the FIP to provide separate alarm zone facilities for the generation of

an alarm condition upon the occurrence of the following

Sprinkler system The automatic operation of pressure and flow switches

Alarm Operation

Operation of any latching alarm other than an optional manual call point shall raise a general fire alarm

11.5.5 Detectors

Туре

Detectors shall be compatible with the existing Fire Indicator Panel . Location and type of new detectors is shown on drawings Where specific types are not shown, select in accordance with AS 1670.

Approvals

Detectors shall be SSL and ICA listed

Heat Detectors

To AS 1603.1.

Types: Type A, B, C and D shall be available and shall be installed in locations as appropriate.

Smoke Detectors, Photo Optical Type To AS 1603.2.

Features Operate on principle of light scatter caused by smoke particles Device shall have high immunity to dust accumulation

11.5.6 Detectors Generally

Locations

Locations of detectors shown on drawings are approximate. Determine exact position on site in conjunction with the Superintendent having regard to building features, other services and locate symmetrically in respect to luminaires, air diffusers, etc. and in accordance with regulations

Identification

Clearly and permanently mark each detector and remote self-indicating detector with label.

Self-Indicating Detector

Detectors shall be fitted with an individual self-indicating device, consisting of a light emitting diode (LED), mounted in a clearly visible position, which illuminates whenever the detector operation causes an alarm condition to register on the FIP. A faulty self-indicating device shall not render the detector inoperative under fire conditions.

Mounting position

- Visible detectors: On the outside of the detector or its base;

Installation

Install detectors so that they can be easily inspected and tested in situ, and readily withdrawn from service for testing or replacement.

Standard

To AS 1603 11.

11.5.9 Wiring

Standard

To AS 1670, AS 1668.1 and AS 2118

General Detector Circuits

Install cables through accessible ceiling spaces Where not accessible, provide conduit enclosures for cable Do not use explosive powered fasteners Support cables independently of ceiling and other services

11.6 BUILDING OCCUPANT WARNING SYSTEM

Supply and install to the building a comprehensive occupant warning system complying with AS 1670.1. Wire system items to the Fire Indicator Panel. The warning system shall be an amplified sound system producing evacuation signals with verbal message.

11.6.1 Loudspeakers

Generally

Mounting. Securely fix to building elements. Flush mount in suspended ceilings and, if practicable elsewhere, otherwise surface mount in enclosure

- Wall mounting height: 150mm below finished ceiling level.
- Location: Where necessary vary the loudspeaker locations from those shown on the drawing so that in their final positions the loudspeakers give satisfactory coverage.

Obtain the Superintendent's approval prior to such relocation.

Recessed Loudspeaker

- Be 100mm (minimum) diameter
- Be of reasonable approved quality

- Be wide range type of uniform performance characteristics

- Be fitted with tapped transformer to enable 0 5, 1, 1 5, 2, 2 5 watts r.m s to be drawn from a 100V line by a simple rearrangement of tapping Speakers transformers shall be attached to the speakers and shall be fitted with approved type tag terminals for termination of cables.
- Be fitted with high quality, high temperature bi-polar capacitors where necessary for line sensing purposes.
- Be fitted with a screw block connection to facilitate easy removal
- Have all terminals insulated.

Marking. Permanently mark with unique circuit or serial numbers, concealed

11.6.2 Visual Warning Devices

Supply and install visual warning devices where shown on the drawings

11.7 SPARES

Allow for supply and installation of the following items, additional for those shown on the drawings or scheduled insulation.

- 1 smoke detector
- 1 heat detector
- 5 recessed ceiling speakers
- 2 surface mounted speakers
- 2 horn speakers

Cost The contract sum will be advised at the agreed unit rates for detectors and speakers according to the final number installed.

11.8 FIRE DETECTION FEATURES DRAWINGS

11.8.1 Requirement

Prepare and provide a set of plans of each area of the building showing fire protection and associated features in schematic form

11.8.2 Presentation

The drawing shall be to approved scale, colour coded, laminated in plastic and bound in a ring type binder in floor order Size of sheets shall be on one A3 sheet

11.8.3 Legend

Provide legend sheet at front of set

11.8.4 Information and Colour Code

The plans shall show the features listed in the following clauses with colour code as indicated

11.8.6 Electrical

Switchboards, main switchroom

Yellow with Diagonal Black line

-Substations/transformers Yellow Evacuation warning panel Blue 11.8.7 Fire Equipment Hydrant/hose reels, booster connection Red : Fire indicator panel Red : Mimic panel Red Hydrant pumps Red : Break glass alarms Red 11.8.8 Fire Walls/Compartments Red 11.8.9 Special Risk Areas **Dashed Red** Outline

11.8.10 Operation of Air Handling Equipment

- Statement of normal condition
- Condition upon fire alarm
- Manual controls available

11.8.11 Services Information

Where information in respect of other services is required to complete the drawings, it shall be obtained by visual inspection, by reference to relevant drawings which may be inspected on site by request and by reference to other relevant Contractors where applicable

11.9 COMMISSIONING AND TESTING

11.9.1 Requirement

Commission and test system to AS 1670

Additional tests: Carry out any additional tests which may be required by the relevant authority or by the Superintendent

Documentation Provide 3 signed copies of the "Installers Statement and Certificate", "Commissioning Test Report" and "As-Installed Diagrams" to the Superintendent as detailed in AS 1670 and Appendices.

Certificate of Compliance: Provide copies as specified in clause "Authorities"

11.10 OPERATING AND MAINTENANCE MANUALS

11.10.1 Requirement

Not later than 14 days prior to Practical Completion, provide 3 copies of Operating and Maintenance Manuals complete with As-installed Drawings The manuals and drawings shall be subject to inspection and approval and shall be revised if required.

11.11 STAFF TRAINING

11.11.1 Requirement

Train staff nominated by Principal in the use and operation of the system. Allow for at least 2 separate site visits for this purpose.

Manuals. Shall be available during training sessions

11.12 MAINTENANCE AND DEFECTS

11.12.1 Requirement

Maintain system during the Defects Liability Period in accordance with AS 1670 and AS 1851 and as required by the Authorities.

Advice Advise Principal prior to each maintenance visit and make visits at a time suitable to the Principal if requested.

11.12.2 Faults

Attend site within 4 hours of notification of a fault by the Principal or Superintendent Experienced service staff shall be available at all times to attend to faults on request via normal or mobile phone call.

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PROPOSED FIRE SPRINKLER & HYDRANT SUPPLY TANKS, TAYLOR VILLAGE NARRABEEN ELECTRICAL SERVICES

12.0 RETURNABLE SCHEDULES

Complete the following tender forms and return as part of the tender submission.

12.1 TENDER FORM - T1 : SUMMARY OF TENDER

We, hereby Tender for the supply, delivery, installation, commissioning and testing of the Electrical Services installation associated with the abovementioned development in accordance with the specification and drawings prepared by the Consulting Engineer for the electrical services

ITEM	COST
1 Alterations and additions to the existing service mains	\$
2 Supply and installation of energy retailers metering and earthing	\$
3 Supply and installation of main new switchboard	\$
4. Supply and installation of main distribution board	\$
5 Supply and installation of oarthing and oquipotontial bonding	\$
6. Supply and installation of distribution boards	\$
7 Supply and installation of submains	\$
8Supply and installation of major inground conduits including draw in pits	\$
9 Supply and installation of general power	\$
10. Supply and installation of internal and building mounted luminaries	\$
11. Supply and installation of emergency evacuation lighting	\$

Tenderer

Date

_____Signed _____

ITEM	ĊOST
12 Alterations and additions to the existing smoke detection and alarm system	\$
13 Supply and installation of a building occupant warning system	\$
14 Preparation of shop drawings	\$
15. Testing and commissioning	\$
16. Operating and maintenance schedules	\$
 17 Workshops and as installed drawings Purchase drawings from engineers (\$50 per drawing for electronic format Workshop and as installed drawings 	\$
18 Maintenance – fire sealing, patching, making good etc	\$
19. Miscellaneous	\$
20 Any other works not included elsewhere, list below	\$
Total fixed lump sum price	\$
List any works for item 19 and 20 above	

Tenderer

Date

_____Signed ______

12.2 TENDER FORM T2 : SCHEDULE OF MATERIAL

Tender shall indicate in the appropriate space below, the Manufacturer, Catalogue Number (where applicable) and Delivery Period for major items of material and equipment on which tender is based

This information shall be submitted along with the tender documentation.

Materials	Manufacturer	Catalogue	Delivery Period
Main Switchboard			
Surge Reduction Filters			
Distribution Boards			
TPI & TPS Cables			
PVC Insulated Cables			
XLPE/PVC Insulated Cables			
2hr Fire Rated Cables			
Moulded Case Circuit Breakers			
Miniature Circuit Breakers			
Fuses (HRC)			
Light Switches & Accessories			
Lighting Control (Dimming) System			
Socket Outlets & Accessories			
	List only if different t	o that specified	d being the second s
Tenderer			
Date	Sig	ned	

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PROPOSED ELECTRICAL TRADE CONTRACTOR

DETAILS		- 4 ⁴		
Company				
Contact Name	•			
Telephone	•			
Facsimile	•		 	

SUB-CONTRACTORS

TRADE	· · · · · · · · ·	COMPANY
Switchboards and Distribution Boards		
Smoke Detection System and		
Building Occupant Warning		
System		

Tenderer _____

Date

_____Signed _____

13.0 SCHEDULE OF UNIT RATES

This is the Schedule of Unit Rates referred to in the "Tender Conditions" A copy of this Schedule/s is to be completed by the Tenderer and submitted with his Tender

Prices for all items listed are to be inserted by the Tenderer. The prices shall include all Subcontractor's costs, including overhead and profit, but exclude the cost of any material or service to be provided free of charge to the Sub-contractor by the Principal.

The superintendent reserves the right to reject any tender if the prices submitted are considered unreasonable

an existing Distribution ing MCB's pole "6 kA rating"		
pole "6 kPa rating" pole "6 kPa rating" pole "6 kA rating"	5 5 5 5 5	\$ \$ \$
a flush mounted 10A conduiting on existing of 2 5mm ² TPI cables	\$	\$
a flush mounted 10A circuit allowing 6 metres nd earth.	\$	\$
one of the following complete with 5 metres d earth		
of	***	\$ \$ \$ \$ \$ \$ \$ \$
and the second s	 pole "6 kP a rating" pole "6 kA rating" i a flush mounted 10A i conduiting on existing of 2 5mm² TPI cables f a flush mounted 10A circuit allowing 6 metres nd earth. f one of the following n complete with 5 metres d earth 	> pole "6 kPa rating" pole "6 kA rating" i a flush mounted 10A i conduiting on existing of 2 5mm² TPI cables f a flush mounted 10A circuit allowing 6 metres nd earth. f one of the following n complete with 5 metres d earth \$\$

a À y

5	Supply and installation of a surface/flush mounted light switch, on an existing circuit allowing 5 metres of 2 5mm ² TPS cables and earth		\$	\$
ltem	Description	Qty	Addition	Deduction
6	Additional lighting point allowing 6 metres of cast in UPVC conduit, and J Box complete with 2.5mm ² TPI cables and earth.		\$	\$
7.	Additional orange HDU PVC conduit installed underground- • 25mm dia • 32mm dia • 50mm dia • 80mm dia • 125mm dia		\$ \$ \$ \$ \$	\$ \$ \$
8-	Additional white PVC conduit installed underground • 25mm dia • 32mm dia • 50mnm dia		\$ \$ \$	\$ \$ \$
9.	Supply and installation of a three phase and neutral fixed appliance including isolator and connection to but excluding ACB allowing 15 metres of cable.		\$	\$
10.	Supply and installation of a three phase and neutral fixed appliance, including isolator and connection, allowing 20 motros of 6mm ² TPI and ECC cable in galvanised steel conduit-		\$	\$
11.	Supply and installation of a single phase and neutral fixed appliance, including isolator and connection, allowing 20 metres of 4mm ² TPI and ECC cable in galvanised steel conduit		\$-	\$
12.	Supply and installation of a smoke detector		\$	\$
13	Supply and installation of a heat detector		\$	\$
14.	Supply and installation of a warning speaker		\$	\$