SCENTRE GROUP DEVELOPMENT, DESIGN & CONSTRUCTION

PEOPLE PROTECTING PEOPLE

GENERAL SPECIFICATION ELECTRICAL SERVICES

Dwner and Operator of Westfield in Australia and New Zealand SCENTRE DESIGN AND CONSTRUCTION PTY LIMITED ABN 53 000 267 265 Level 30, 85 Castlereagh Street, Sydney NSW 2000 Australia · GPO Box 4004 Sydney NSW 2001 Australia · T +61 (02) 9358 7000 · scentregroup.com

.

DOCUMENT INFORMATION

Document No.	Issue No.	Date of this issue
NSD-SDC-ELE-GSS-001	9.0	20/12/2023

PREFACE

This General Specification is intended as supplementary information to be read in conjunction with the Project Specification issued in the Contract Documents.

The Scope of Works relevant to the Contract is contained within the Project Specification(s) and this specification provides additional information as to requirements pertaining to that scope.

Items may be referenced within that are not within the Scope of Works.

CONTENTS

1 GENERAL REC		ERAL REQUIREMENTS	5
	1.1	GENERAL	5
	1.2	STANDARDS	5
	1.3	TECHNICAL REQUIREMENTS	5
	1.4	PLANT AND EQUIPMENT	5
	1.5	MATERIALS AND WORKMANSHIP	5
	1.6	CABLE MANAGEMENT SYSTEM	6
	1.7	INSTALLATION	. 11
	1.8	BUILDING PENETRATIONS	. 12
	1.9	VIBRATION SUPPRESSION	. 13
	1.10	NOISE CONTROL	. 14
	1.11	METAL WORK	. 14
	1.12	WELDING, BRAZING AND CRIMPING	. 14
	1.13	SITE PAINTING	. 15
	1.14	ELECTRICAL HAZARD IDENTIFICATION (EHI)	. 15
	1.15	SERVICES TRENCHES	. 15
	1.16	MARKING AND LABELLING	. 17
	1.17	TRAINING	. 19
	1.18	WORKS AS EXECUTED (AS-BUILT) DRAWINGS / MODEL	. 19
	1.19	OPERATION AND MAINTENANCE MANUAL	. 20
	1.20	CONTRACTOR DESIGN DELIVERABLES	. 26
2	HIGH	VOLTAGE INSTALLATION	28
	2.1	GENERAL	.28
	2.1	SWITCHGEAR ASSEMBLIES	28
	23	POWER TRANSFORMERS	29
	2.5	HV CABLING	30
	2.4	FARTHING	30
	2.6	TECHNICAL REQUIRMENTS	. 30
3	LOW	VOLTAGE INSTALLATION	31
	3.1	GENERAL	. 31
	3.2	CONSUMERS MAINS	.31
	3.3	SWITCHBOARDS	.31
	3.4	SWITCHGEAR AND CONTROLGEAR	.35
	3.5	METERING	.37
	3.6	EMBEDDED NETWORK	.41
	3.7	HOUSE AND TENANT POWER	.43
	3.8	GENERAL POWER	.45
	3.9	WIRING AND CABLING	. 53
	3.10	UNDERGROUND SERVICES	. 56
	3.11	ACCESSORIES	. 58
4	4 ACTIVE HARMONIC FILTERING AND POWER FACTOR CORRECTION		60
	4.1	ACTIVE HARMONIC FILTERING	. 60
	4.2	POWER FACTOR CORRECTION	.61
5	LIGH	TING	65
	5.1	GENERAL	. 65
	5.2	LUMINAIRES	. 65
	5.3	LIGHTING FOR CENTRE MANAGEMENT FACILITIES	. 67
	5.4	TRANSFORMERS	. 68
	5.5	POWER FACTOR CORRECTION	. 69

	5.6 5.7 5.8	INSTALLATION LIGHTING CONTROL STANDARDS	. 69 . 69 . 73
6	EME	RGENCY ESCAPE LIGHTING AND EXIT SIGNS	76
	6.1 6.2 6.3 6.4	GENERAL SINGLE-POINT SYSTEM MONITORING SYSTEM INSTALLATION	. 76 . 77 . 78 . 79
7	STAN	IDBY POWER SUPPLY SYSTEM	80
	7.1	GENERAL	. 80
	7.2		.80
	7.3 7.4	DIESEL EUEL PUMP	.87
	7.5	GAS GENERATOR	. 87
	7.6	INTERFACE WITH VERTICAL TRANSPORTATION SYSTEM	. 87
	7.7	FACILITIES FOR CONNECTION TO TEMPORARY STANDBY GENERATOR	. 87
8	PUBL	IC ADDRESS AND BACKGROUND MUSIC SYSTEM	88
9	CONTROLLED PARKING		88
10	HEAF	RING AUGMENTATION – LISTENING SYSTEM	89
11	MASTER ANTENNA TELEVISION SYSTEM		
12	SOLAR PV SYSTEM		
13	DEMAND MANAGEMENT SYSTEM90		
14	ELECTRIC VEHICLE CHARGING		90
15	LIGH	GHTNING PROTECTION SYSTEM	
	15.1 15.2	GENERAL INSTALLATION	. 91 . 91

LIST OF TABLES

Table 1: Electrical Tray Separation Distances	9
Table 2: Meter Types	37
Table 3: NMI Parent Meter Parameters	42
Table 4: Lighting Requirements	75
Table 5: Emergency Luminaire Selection	76
Table 6: Main Fuel Tank – Finish Coating	85

1 GENERAL REQUIREMENTS

1.1 GENERAL

This General Specification covers the requirements of materials and workmanship, as well as technical requirements, for Electrical Services installations. Unless specified otherwise in other project specific documents, these requirements will apply when they are relevant to the project and/or if they are referenced within Section 5 of the Project Specification.

If a service is not detailed in the project specification this general specification is to be used when adding services to the project as the minimum standard for that service and as a basis for costing by the contractor.

1.2 STANDARDS

1) General:

- a) Comply with NCC, relevant Australian Standards and all State, local government and council requirements.
- b) Refer to the latest issue of the Australian Standard unless a particular issue is referenced in the NCC.

1.3 TECHNICAL REQUIREMENTS

The scope of work detailed within the Project Specification is to be considered a concept design for costing purposes. Design review, development and associated documentation is the responsibility of the Design & Construction (D&C) Contractor who assumes the design responsibility for the project based on the concept design intent.

The Contractor's design shall incorporate the technical requirements detailed within this General Specification to enable the building services systems to function at the optimum level, maximise energy efficiency and to minimise the environmental impact, while being economically sustainable, maintainable and appropriate to the business nature of the building. The systems need to be designed such that they can be commissioned in line with the design parameters and measurements can be taken to verify such parameters have been met.

1.4 PLANT AND EQUIPMENT

- 1) Locate and arrange all services and equipment so that:
 - a) Failure of plant and equipment does not create a hazard for the building occupants.
 - b) Failure of plant and equipment causes minimum or no damage to the building, its finishes and contents.
 - c) Inspection and maintenance operations can be carried out in a safe and efficient manner with minimum inconvenience and disruption to building occupants or damage to the building structure or finishes.
 - d) If parts of the plant require regular inspection and maintenance, either locate plant so it is safely and readily accessible from floor level or provide permanent access platforms and ladders.
- 2) Allow to modify manufacturer's standard equipment when necessary to provide the plant access to Scentre Groups approval.

1.5 MATERIALS AND WORKMANSHIP

- 1) Materials: Provide new and high quality materials and components.
- 2) Workmanship: The standard of workmanship for all works shall conform to the industry best practice and shall be in accordance with the relevant standards, codes of practice.
- 3) Consistency: For the whole quantity of each material or product, use the same manufacturer or source and provide consistent type, size, quality and appearance.

- 4) Factory finish: To manufacturer's standard for factory fabricated equipment. All ferrous metallic work which is exposed to elements shall be hot dip galvanised. Any damage to the factory finish shall be repaired at completion.
- 5) Manufacturer: Select equipment from the manufacturers and suppliers as nominated by Scentre Group.
- 6) Alternatives: If alternative manufactures are proposed, submit proposed alternatives and include samples and available technical information for approval prior to installation.
- 7) Samples: Submit samples for review as required.

1.6 CABLE MANAGEMENT SYSTEM

1.6.1 GENERAL

- 1) General: Provide cable management systems comprising cable enclosures (conduits, cable ducts, trunkings, trays and ladders) and cable supports for all electric wiring.
- 2) Comply with the following:
 - a) AS/NZS 2053.1: Conduits and fittings for electrical installations General requirements.
 - b) AS/NZS 4296: Cable trunking systems
 - c) AS 1939: Degrees of protection provided by enclosures for electrical equipment (IP Code).
- 3) Segregation: General: Segregate cables in accordance with the relevant Australian Standards.
- 4) Protection: Protect cables in accordance with AS/NZS 3000.
- 5) De-rating of cables: Cables shall be grouped and spaced on cable ladders and cable trays in such a way that the de-rating factor of cables will be the lowest, in accordance with AS/NZS 3008.1.1.

1.6.2 CENTRAL CABLE MANAGEMENT SYSTEM (CCMS)

1.6.3 GENERAL

- 1) The Central Cable Management System (CCMS) shall be designed and installed by the Electrical Contractor. All other Services Contractors shall liaise with the Electrical Contractor to determine and advise cable containment and pathway requirements. The pathways shown on the design drawings show the 'design intent only', and the Electrical Contractor is to make all allowances necessary to augment the CCMS to include the services noted below, such that the development has a complete CCMS. It is incumbent on the other Services Contractors to review the CCMS design drawings and confirm the allowances are acceptable in their tenders. If no advice has been received at tender, it assumed that the Contractors accept the CCMS design and have made all other allowances within their tenders.
- 2) All individual cable management systems (required for other services) to and from the CCMS will be the responsibility of each individual Services Contractor and must conform to the requirements below. The Electrical Contractor shall coordinate with other Services Contractors during the developed design phase of the project to finalise the scope of CCMS. Any additional cable management required by other Services Contractors after this time will be at their cost.

It is the responsibility of all Services Contractors to coordinate the CCMS design with each other, and to notify the Electrical Contractor of any design considerations.

- 3) CCMS may be required for the following systems below:
 - a) Electrical & Communication Cabling
 - b) Structured Cabling Systems
 - c) Master Antenna Television System (MATV)
 - d) Mechanical Services Cabling
 - e) Distributed Antenna Systems (DAS)

- f) Carrier Structured Cabling
- g) Building Management System (BMS)
- h) Wireless Access Points (WAP)
- i) Lighting Control Systems
- j) Emergency Lighting Systems
- k) CCTV Security Systems
- I) Access Control Systems
- m) Fire Alarm and Warning Systems
- n) Public Address System
- o) Mall Music Systems
- p) Audio Visual System
- q) People Counting System
- r) Parking Systems (Parking Guidance and Controlled Parking)
- s) Demand Management System
- t) Digital Signage Systems
- u) Two-Way Radio System
- 4) All cable pathways are to be installed in accordance with the information and drawings provided in AS/NZS3084. Particular reference is to be made to separation of services and also to diagrams showing installation sectional detail and typical construction diagrams.
- 5) The cable management system shall be designed in accordance with all relevant standards including AS/NZS3000, AS/NZS3084 and AS/ACIF S009.

1.6.4 DESIGN REQUIREMENTS

- 1) Locate cable ladders and trays away from specialty shops and plasterboard ceiling areas wherever practical; otherwise fix cable ladders and trays at high level to achieve minimum 4 m ceiling height.
- 2) Avoid running cable ladders and trays across malls.
- 3) Cabling containment systems shall be installed so that sufficient space remains around containment system to facilitate moves, additions and changes.
- 4) Cable containment systems shall be appropriately sized so that they are not more than 40% filled at initial installation.
- 5) Cables shall not be stacked higher than the side of the cable tray or basket.
- 6) Adequate space should be left around the containment systems to allow the set-up and use of cable-pilling equipment.
- 7) Cable pathways for Fire systems shall not be shared with any other service. Fire containment systems shall be installed above Power and other structured cable containment and pathway systems.
- 8) De-rating of cables: Cables supported by cable ladders and cable trays shall be grouped and spaced in such a way that de-rating of the cable will be kept to the minimum.
- 9) Cable support systems supporting essential services or fire rated cables shall be rated to WS52W in accordance with AS/NZS 3013 (120-minute fire rating, moderate impact protection).
- 10) The Electrical cable trays shall be bonded to Earth.
- 11) The structured communications cable containment system shall be bonded to the Telecommunications Reference Earth.

- 12) Structured cabling for data / voice services including Cat.6 cables, fibre cables, multi-pair voice cables, coaxial and shielded cables (>80dB coupling attenuation) may lie together in a common tray.
- 13) Structured cabling that carry analog or switching (for example security sensors and audio cabling) shall be separated by metal barrier from digital cables when sharing a cable tray.
- 14) Electrical cables and structured communications cables may not share penetrations and may not co-exist in the same conduits, slots or sleeves.
- 15) Electrical cable trays shall be solid or slotted.
- 16) Communications structured cabling tray may be slotted or cable basket.
- 17) Final cable management detail is to be determined to suit specific site conditions and area and recognising the services distribution requirements.

1.6.5 INDICATIVE DIAGRAMS

An indicative cross-section detail is provided for horizontally aligned cable containment (Figure 1) and vertically aligned cable containment (Figure 2) for information only to all trade contractors. Refer to Table 1 for Separation Distance (d) details.

All Cable Tray run locations to be clearly shown on "As Built" drawings.



Figure 1: Horizontally aligned cable containment



Figure 2: Vertically aligned cable containment

1.6.6 CATENARY WIRING, DUCTS AND CONDUITS

- 1) Catenary wiring shall only be used where single cables or circuits diverge from the cable management system (or CCMS).
- 2) Ducts and conduits shall be used where multiple cables diverge from the cable management system (or CCMS) provided that:
 - a) Cables are spaced in such a way that de-rating of the cable will be kept to the minimum.
 - b) They are not filled more than 50% to allow space for future moves, adds or changes.
- The use of PVC/NON-PVC conduits and fittings shall be selected in accordance with the ESD Targets.

1.6.7 SEPARATION DISTANCES

- 1) Refer to the following guidelines for minimum separation distances. When space permits greater separation should be maintained.
- 2) The following table assumes the electrical cables are placed in a solid or slotted cable tray with a fill rate of <40%. Communications cables may be in slotted tray or wire basket containment systems.

Quantity of Power Circuits (230V, 20A)	Horizontal Separation (minimum) (Electrical-Tray, Comms- basket/tray)	Vertical Separation (minimum) (Electrical-Tray, Comms- basket/tray)		
1-3	100 mm	150 mm		
4-6	100 mm	150 mm		
7-9	100 mm	150 mm		
10-12	150 mm	150 mm		
13-15	150 mm	150 mm		
16-30	200 mm	200 mm		
31-45	300 mm	300 mm		
46-60	400 mm	400 mm		
61-75	500 mm	500 mm		
75+	600 mm	600 mm		

3 Phase cables shall be treated as 3 one-off cables

More than 20A shall be considered as multiples of 20A

Less than 20A shall be considered as 20A

Consider expansion requirements of power cables when sizing

Table 1: Electrical Tray Separation Distances

1.6.8 CONDUITS

1.6.8.1 GENERAL

- 1) Type: Generally, PVC conduits to be 25 mm minimum. Use metallic conduits wherever exposed to mechanical damage.
- 2) Set out: If exposed to view, install conduits in parallel runs with right angle changes of direction.
- 3) Draw-in boxes: Provide draw-in boxes at intervals not exceeding 30 m in straight runs, and at changes of level or direction.
- 4) Flexible conduit: Use for equipment and plant subjected to vibration. If necessary, use for adjustment or ease of maintenance. Provide the minimum possible length.
- 5) Minimum sizes: Metallic and non-metallic conduits: 25 mm.

- 6) Rigid conduits: Provide straight long runs, smooth and free from rags, burrs and sharp edges. Set conduits to minimise the number of fittings.
- 7) Set out: If exposed to view, install conduits in parallel runs with right angle changes of direction.
- 8) Inspection fittings: Provide facilities for inspection. Locate inspection fittings in accessible positions.
- 9) Draw-in boxes:
 - a) General: Provide draw-in boxes at intervals not exceeding 30 m in straight runs, and at changes of level or direction.
 - b) Underground draw-in boxes: Provide covers and seal against moisture.
- 10) Draw wires: Provide galvanise steel drawing wires for all spare conduits.

1.6.8.2 CONDUIT INSTALLATIONS

All conduit installations as a minimum must comply with AS/NZS 3000, and under no circumstances shall be cast-in slabs, unless the written approval has been obtained from Scentre Group.

For proposed installations:

- 1) Unless otherwise approved by Scentre Group, services are to be reticulated via surface mounted conduit or cable management systems fixed to the underside of slabs.
- 2) Conduits reticulated for rooftop services (e.g. car park pole lights) may be run in slab within beams (if water ingress is an issue), subject to approval by the Project Services Manager, or preferably shall be run in ceiling space of the level below, fixed to the underside of slab (where an existing installation is being modified). All conduits shall have an upturn and penetration directly beneath each service with appropriate measures taken to waterproof the slab.
- 3) Slab on ground concrete pours are to have conduits installed beneath the slab.
- 4) Conduits for ground level services in malls are to be installed within a "services zone" and run parallel to each other and building grids. Access pits to be located within mall areas at every change of direction.
- Conduits reticulated within column cladding to be heavy duty PVC (HD PVC) and installed in a straight vertical arrangement, and have their location identified at the top of the column or ceiling. Submains cabling of all types shall not be reticulated within column cladding or wall partitions/cavities. Chasing of columns is not permitted.

For proposed installations where services cannot be reticulated using the above systems:

- 1) If written approval is given to cast in slabs, conduits are to be tied on bar chairs with a minimum 60mm clearance above the formwork level and be reticulated in beams where possible. In any event the conduit is to be run between the top and bottom layers of reinforcement.
- 2) Conduit pathways are to parallel to grids, between fittings and fixtures instead of shortest possible (or diagonal) routes.
- Casting conduits in columns should be avoided. If there is no other option, conduits cast in columns to be located within steel reinforcement, and written approval from Scentre Group shall be obtained. Chasing of columns is not permitted.

1.6.9 CABLE DUCT / TRUNKING

- 1) Cable ducts:
 - a) Material: Metal.
 - b) Material finish: Metallic-coated to AS 1397 Grade G2, Coating Class Z275.
 - c) Construction: Solid.
 - d) Accessories: Purpose-made to match the duct system.
 - e) Covers: Screw-fixed or clip-on type removable only with the use of tools.

- f) Cable support: Except for horizontal runs where the covers are on top, support wiring with retaining clips at intervals of not more than 1000 mm.
- 2) Proprietary trunking systems:
 - a) General: Provide proprietary, skirting duct, wall duct, floor duct and service column systems, incorporating segregation where used for multiple services. Provide rigid supports. Round off sharp edges and provide bushed or proprietary cable entries into metallic trunking.
 - b) Accessories: Provide proprietary fixings and mountings facilities for accessories and outlets.

1.6.10 CABLE TRAY / LADDER SUPPORT SYSTEMS

- General: Provide a complete cable ladder system, complete with brackets, fixings and accessories. Fabricate brackets, racks and hangers using structural steel sections or other materials in sections of equivalent strength. Run cables < 13 mm diameter on cable trays or in ducts.
- 2) Standard: NEMA VE-1.
- 3) Construction:
 - a) General: Use 2 folded steel side rails with cable support rungs between the rails.
 - b) Material: Galvanised, heavy-duty steel (including covers).
 - c) Rung spacing: 300 mm maximum.
 - d) Minimum width:
 - i) For power cable: 450 mm.
 - ii) For communications cable: 150 mm.
 - e) Bend radius: Provide bends with a minimum inside radius of 12 times the outside diameter of the largest diameter cable carried.
 - f) Covers: Provide ventilated flat covers to cable trays/ladders installed in accessible locations.
 - g) Fixing to building structure:
 - i) General: Fix supports to the building structure or fabric using direct fixing, hangers or brackets (under a screwed type fixing).
 - ii) Supports: Galvanised.
 - iii) Spacing: Space supports at maximum intervals of 1.5 m.
 - iv) Rods: 10 mm minimum diameter.
 - v) Access: Provide a minimum of 150 mm free space above and 600 mm free space on one side of trays and ladders.
- 4) Spare capacity: \geq 50%.
- 5) Cable fixing:
 - a) Provide slats or rails suitable for fixing cable ties, strapping or saddles.
 - b) Cable protection: Provide rounded support surfaces under cables where they leave trays or ladders.

1.7 INSTALLATION

- 1) General: Install equipment and services plumb, fix securely and organise reticulation neatly. Provide for movement in both structure and services.
- 2) Install equipment in accordance with manufacturer's recommendation, and in such a way that the performance of the equipment shall not be adversely affected.
- Arrangement: Arrange services so that services running together are parallel with each other and with adjacent building elements. Under suspended ground floors, keep services at least 150 mm clear above ground surface, additional to insulation, and ensure access is not impeded.

- 4) System integration: Interconnect system elements so that the installation performs the designed functions.
- 5) Fixing:
 - a) General: If equipment or services are not suitable for fixing to non-structural building elements, fix directly to structure and trim around holes or penetrations in non-structural building elements. Return the building fabric penetrated to the building fabric's original fire/acoustic rating.
 - b) Fasteners: Use proprietary fasteners capable of transmitting the loads imposed, and sufficient to ensure the rigidity of the assembly.
 - c) Securely fix all plant and equipment to the building structure to resist seismic loads determined in accordance with AS 1170.4.
- 6) Mounting: (caution heavy items will require structural engineers' approval prior to installation)
 - a) Wall/ceiling mount: Provide galvanised steel support from building structure.
 - b) Roof mount:
 - i) Roof mount Metal: Unless equipment platform is provided by the Builder, provide galvanised steel support from roof structure.
 - ii) Concrete roof: Fix equipment on concrete plinth.
- 7) Equipment plinth:
 - a) General: Provide concrete plinth for floor mounted equipment. Contractor to confirm size and location on a builders' work drawing for review and coordination.
 - b) Construction: Provide a galvanised steel frame to all four sides of the supported equipment. Builder will provide the concrete infill.
- 8) External application: Equipment and installation located outdoor shall be suitable for external application and shall be protected from the elements.
- 9) Cleaning: At completion, clean all plant, equipment and associated materials (internal and external). Remove all redundant material and rubbish from site.
- 10) Services connections:
 - a) Statutory Authorities requirements: If the authorities elect to perform or supply part of the works, make the necessary arrangements. Install equipment supplied, but not installed, by the authorities.
 - b) Connections: Connect to statutory authorities' services or service points. Excavate to locate and expose connection points. On completion reinstate the surfaces and facilities which have been disturbed.

1.8 BUILDING PENETRATIONS

- 1) General: Provide all necessary building penetrations details shop drawings including those formed in situ in concrete and block work structures to allow structural coordination. Seal all penetrations after installation of services in accordance with any applicable fire or acoustic rating.
- 2) Piping sleeves:
 - a) General: Provide metal sleeves formed from pipe sections for piping penetrations through building elements.
 - b) Sleeve diameter: Sufficient to provide an annular space around the pipe or pipe insulation of at least 12 mm.
 - c) Minimum sleeve thickness:
 - i) Metal: 1 mm.
 - ii) PVC: 3 mm.

- d) Sleeve terminations:
 - i) If cover plates are fitted: Flush with the building surface.
 - ii) If floor draining to floor waste: 50 mm above finished floor.
 - iii) In fire-rated and acoustic-rated building elements: 50 mm beyond finished building surface.
 - iv) Elsewhere: 5 mm beyond finished building surface.
- e) Finish: Prime paint ferrous surfaces.
- 3) Cable sleeves: Provide UPVC sleeves formed from pipe sections, for penetration through ground floor slab and beams and external walls by cables not enclosed in conduit.
- 4) Penetrations:
 - a) Fire Resistance Level: Seal penetrations using a system to comply with NCC Spec A1.3, AS 1530.4 and AS 4072.1 to retain the design FRL of the building element.
 - b) Non-fire rated building elements: Seal penetrations around conduits and sleeves. Seal around cables within sleeves. If the building element is acoustic rated, maintain the rating.
 - c) Roof penetration: Provide leak-proof seal for roof penetration with under-flashing and overflashing.
 - d) Limitations: Do not penetrate or fix to the following without approval:
 - i) Structural building elements including external walls, fire walls, floor slabs and beams.
 - ii) Membrane elements including damp-proof course, waterproofing membranes and roof coverings.
 - e) Membranes: If approval is given to penetrate membranes, provide waterproof seal between the membrane and the penetrating component.

1.9 VIBRATION SUPPRESSION

- 1) General: Minimise the transmission of vibration and noise from rotating or reciprocating equipment to other building elements.
- 2) Flexible connection: Provide flexible connections to rotating machinery and assemblies containing rotating machinery.
 - a) Isolate ducts by flexible connections.
 - b) Isolate pipes by incorporating sufficient flexibility into the pipework or by use of proprietary flexible pipe connections installed so that no stress is placed on pipes due to end reaction.
- Equipment requiring vibration isolation mountings: Except for external equipment that is not connected to the structure of any building, support rotating or reciprocating equipment on mountings as follows:
 - a) For static deflections < 15 mm: Single or double deflection neoprene in-shear mountings incorporating steel top and base plates and a tapped hole for bolting to equipment.
 - b) For static deflections \geq 15 mm: Spring mountings.
 - c) Selection of vibration isolation mountings: Select mountings to achieve 95% isolation efficiency at the normal operating speeds of the equipment.
- 4) Spring mountings: Use freestanding laterally stable springs with at least 12 mm clearance between springs and other members such as bolts and housing. Provide the following:
 - a) Ratio of mean coil diameter to compressed length at the designated minimum static deflection: > 0.8:1.
 - b) Minimum travel to solid of at least 150% of the designated minimum static defection.
 - c) Levelling bolts and lock nuts.

- d) Neoprene acoustic isolation pads between base plate and support.
- e) Vertical resilient limit stops: To prevent spring extension when unloaded, to serve as blocking during erection, and which remain out of contact during normal operation.
- f) Snubbing: Snub the springs to prevent bounce at start-up.
- 5) Installation: Set and adjust vibration isolation mounting supports to give adequate clearance for free movement of the supports.
- 6) Inertia bases:
 - a) General: Use inertia bases with mass at least that of the equipment supported.
 - b) Construction: Steel-framed reinforced concrete.

1.10 NOISE CONTROL

- 1) General: Control noise levels at site boundaries and in occupied spaces by proper system design, equipment selection, and acoustic treatment to plant rooms and noise sources.
- 2) Environmental noise:
 - a) General: Comply with the noise limit requirements of the authorities.
 - b) Background noise: If there are no specific authorities' noise limit requirements, classify the site as noise area category R3 in accordance with AS 1055.
 - c) Noise level at boundary: If there are no specific authorities' noise limit requirements, ensure that when equipment operates under normal conditions it will not raise the ambient noise level at the nearest boundary of the site by more than 5 dB when measured on the unweighted 'A' scale, and will be free of any disturbing tone or harmonic sound, at any time of day and night, 7 days a week.
 - d) Building interior noise: Ensure that the sound levels of different areas of the building interior will not exceed the recommended 'satisfactory' levels in accordance with AS 2107 when all equipment is operating under normal conditions.
- Engage acoustic consultant to assess noise levels in accordance with local council requirements and include control measures through proper system design, equipment selection, and acoustic treatment to plant rooms and noise sources.

1.11 METAL WORK

- 1) Use metalwork capable of transmitting the loads imposed, and sufficient to ensure the rigidity of the assembly without causing deflection or distortion of finished surfaces. Construct to prevent rattle and resonance.
- 2) Edges and surfaces: Keep clean, neat and free from burrs and indentation. Remove sharp edges.

1.12 WELDING, BRAZING AND CRIMPING

- 1) Hot work permit: Apply hot work permit procedures for all welding, brazing, grinding or other operations including open flames or producing heat and or sparks.
- 2) Welding:
 - a) Steel: To AS 1554.1.
 - b) Aluminium: To AS 1665.
 - c) Stainless steel: Follow the recommendations of WTIA Technical Note 16.
- 3) Brazing: Ensure brazed joints have sufficient lap to provide a mechanically sound joint.
- 4) Crimping: Provide manufacturers details if press fit crimped joint system proposed.
- 5) Filler metal:
 - a) General: To AS 1167.1.

- b) Copper-to-copper, copper-to-brass, brass to brass: Minimum 2% silver content and maximum 0.05% cadmium.
- c) Application: Ensure the brazing alloy wets all surfaces and fills the clearance between the overlapping parts.

1.13 SITE PAINTING

- 1) Paint all new surfaces of equipment, duct and pipes except surfaces of chromium, anodised aluminium, UPVC and stainless steel finish; non-metallic flexible materials and normally lubricated machine surfaces.
- 2) Exposed to view: 1 prime coat and 2 full gloss enamel finish coats.
- 3) Uninsulated ferrous pipes in concealed space: 1 prime coat.
- 4) Factory painted items: Repair damaged paint.
- 5) Low VOC emitting paints: Provide the following low odour/low environmental impact paint types with the following VOC limits:
 - a) Primers and undercoats: <5 g/litre.
 - b) Low gloss white or light coloured latex paints: <5 g/litre.
 - c) Coloured low gloss latex paints: <16 g/litre.
 - d) Gloss latex paints: <90 g/litre.
- 6) Paint application: Apply first coat immediately after substrate preparation and before contamination of the substrate can occur. Ensure each coat of paint or clear finish is uniform in colour, gloss, thickness and texture, and free of runs, sags, blisters or other discontinuities.
- 7) Repair galvanising: If galvanised surfaces have been cut or welded after galvanising, prime the affected area using zinc rich organic binder.
- 8) Colour schedule: Refer to relevant sections for details.

1.14 ELECTRICAL HAZARD IDENTIFICATION (EHI)

- 1) The Electrical Hazard Identification (EHI) procedure was intended as a key control to mitigate and prevent unsafe interaction of works and electrical services.
- 2) The purpose of the EHI procedure is to ensure any person(s) undertaking works in a Scentre Group asset or workplace are fully aware of the potential Electrical Hazards that are present in the works area and that they have a clear understanding of the controls to be implemented when they undertake the works.
- 3) The Contractor is to ensure EHI activities are completed prior to commencing any excavation, trenching or where a surface is to be disturbed.
- 4) The EHI procedure <u>must always be followed</u>.

1.15 SERVICES TRENCHES

- 1) General: Provide trenches and reinstatement for all below ground installations.
- 2) Excavation:
 - a) Compliance: Excavation of trenches shall be in accordance with the relevant Australian Standards.
 - b) Existing surfaces: Before excavating trenches, saw-cut existing concrete and bituminous surfaces on each side of the trench to provide a straight even joint. Cross cutting of the trenches shall not extend beyond trench edges. Lift and store unit paving for later reinstatement.
 - c) Route: If practicable, make trenches straight between pits, personnel access ways, junctions and changes in cable/pipe route, with vertical sides and uniform grades.
 - d) Spoil: If excavated material cannot be used for filling or backfilling, remove it from the site. It is contractor's responsibility to test for soil contamination.

- e) Trench widths: Keep trench widths to the minimum consistent with the laying and bedding of services, and the construction of personnel access ways and pits.
- f) Trench depths: If excavation is necessary below the level of adjacent footings, and in ground services, seek approval, and provide necessary support for the footings.
- g) Excess excavation: If trench excavation exceeds the correct depth, reinstate to the correct depth and bearing value using compacted bedding material or grade N20 concrete.
- h) Obstructions: Clear trench of sharp projections. Cut back roots to at least 600 mm clear of services, pending approval from arborist. Remove other obstructions including stumps and boulders, which interfere with services or bedding. If rock is encountered, give notice.
- i) Dewatering: Keep trenches free of water. Place bedding material, services and backfilling on firm ground free of surface water. Contractor to allow for temporary dewatering.
- j) Boring: If required by statutory authorities, provide under road boring carried out by a suitable qualified person in lieu of trenches. Ensure a tight fit to the service pipes. If voids are encountered, fill by pressure grouting.
- k) Timbering of Excavation: Where necessary for safe and efficient completion of the work, erect shoring and timbering of sufficient strength and quality to prevent earth and other material slipping or falling into or being shaken from the side of the excavation. As the work proceeds, all shoring and timbering shall be withdrawn except in the cases where the Superintendent has directed in writing that such shoring and/or timbering shall be left in position. The supply, erection and withdrawal of all timberwork shall be considered to be included in the cost of excavation. The whole of this work shall be in accordance with the requirements of the relevant safety acts and regulations. Minimum trench widths specified shall be clear of all trench supports.
- I) Precaution and Safeguards: Carry out the work in a careful, secure, safe and tidy manner and take all precautions against damage whether arising from bad workmanship, breakage of machinery or plant, inefficient timbering, flooding or any other cause whatsoever. Provide erect and maintain warning signs, temporary fences, barriers and night-lights adjacent to any works such as trenches and excavations or stacks of material, which could be considered a danger to persons, or traffic of any kind. The Contractor shall obey all directions given to him by the Superintendent or Authority regarding the provisions of lighting and barriers but shall not be relieved of responsibility for any accident of damage. Obtain permission from Authorities when required for placement of barricades.
- 3) Backfilling:
 - a) Compliance: Bedding and backfill shall be in accordance with the relevant Australian Standards.
 - b) General: Backfill trenches as soon as possible after approval of laid and bedded service. Place the backfill in layers < 150 mm thick and compact to the density which applies to the location of the trenches, to minimise settlement and so that pipes/cables are buttressed by the trench walls.
 - c) Boring: If required by statutory authorities, provide under road boring, carried out by a suitably qualified person, in lieu of trenches. Ensure a tight fit to the service pipes or cables. If voids are encountered, fill by pressure grouting.
 - d) Under roads and paved areas: Coarse sand, controlled low strength material, or fine crushed rock.
 - e) In topsoil areas: Complete the backfilling with topsoil for at least the top 50 mm.
 - f) In reactive clay: In sites classified M, H, P or E to AS 2870 use an impervious material if trenches fall towards footings.
 - g) Elsewhere: Well graded, inorganic, non-perishable material, maximum size 75mm, plasticity index ≤ 5%. Do not place stones greater than 25 mm within 150 mm of services.

4) Reinstatement:

- a) Lawn areas: Provide 150 mm of loam and re-sow the lawn over the trench and other disturbed areas.
- b) Paving and roads: Reinstate to match adjacent work, paved surfaces and assets disturbed or removed during excavation of trenching.
- c) Concrete surfaces: Reinstate concrete surfaces to the original level. If necessary, provide steel reinforcement keyed to the adjacent concrete and laid to prevent the reinstalled concrete from subsiding and cracking.
- d) Bituminous surfaces:
 - i) General: Provide crushed rock base and sub base to match the existing pavement. Prime coat the existing surfacing with bitumen. Lay and compact hot-mix asphalt so that the edges are flush and the centre is cambered 10 mm above the existing pavement. If hot pre-mix is not available, cold pre-mix may be accepted.
 - ii) Minimum asphalt thickness: 50 mm or the adjacent pavement thickness, whichever is thicker.
- e) Unit paving: Provide sand bedding and, if necessary, compacted crushed rock base. Reinstate the paving units.
- f) Any existing line marking that has been removed during excavation shall be reinstated at the contractor's cost.

1.16 MARKING AND LABELLING

- 1) General: Mark services and equipment to provide a ready means of identification.
- 2) Piping: Identify throughout its length, including in concealed space.
- 3) Electrical:
 - a) Mark operable control devices, indicators, isolating switches to provide a ready means of identification.
 - b) Label cables to indicate the origin and destination, cable number, cable cross sectional area and associated earth cable size.
 - c) Fault current limiters: In assembly sections containing fault current limiter fuses provide caution notices fixed next to the fault current limiters, stating that replacement fuse links are to match as-installed fuse link ratings, make and characteristics. Provide separate label stating fault current limiting fuse ratings.
 - d) Externally controlled equipment: To prevent accidental contact with live parts, provide warning notices for equipment on assemblies not isolated by main switch or local main switch.
 - e) Stand-by power: Provide warning notices stating that assemblies may be energised from the stand-by supply at any time.
 - f) Custom-built assemblies: For insulation or shrouding requiring removal during normal assembly maintenance, provide danger notices with appropriate wording for replacement of insulation shrouding before re-energising assemblies.
 - g) Location: Locate notices so that they can be readily seen, next to, if impracticable, on busbar chamber covers of functional units, and behind the front cover of functional units. Provide circuit identification labels in the cabling chamber of each functional unit, located next to external terminations.
 - h) Schedule cards: Provide schedule cards with written text showing the following as-installed information.
 - i) Submain designation, rating and short-circuit protective device.
 - j) Equipment item numbers and current ratings, cable sizes and types and areas supplied.

- k) Mounting: Mount schedule cards in a holder fixed to the inside of the assembly or cupboard door, next to the distribution circuit switches. Protect with hard plastic transparent covers or laminated.
- 4) Live Electrical Services:
 - a) Base building electrical services that cannot be obviously identified shall have a Live Services label fitted in a clear visible location at 4,000 mm increments. These include electrical services that are not clearly visible, or are not an obvious electrical system, such as:
 - i) Electrical services installed within enclosed cable tray;
 - ii) Busduct systems (also known as busways or busbar trunking systems);
 - iii) Cable link boxes or junction boxes;
 - iv) Mineral Insulated Metal Sheathed (MIMS) cable (also known as MICC or Pyro cable); and
 - v) Electrical services concealed behind surfaces / within structures that are hidden from view.
 - b) This label is intended to be a visual indicator for Contractors working on or near energised electrical services and to ensure any unintended contact from individuals, tools and construction materials is mitigated.
 - c) Contractors will be provided the Live Service labels from Scentre Group.
- 5) Consistency: Label and mark equipment using a consistent scheme across all services elements of the project.
- 6) Text: Provide marking and labelling text identical to the text and terminology used in Operating and Maintenance Manuals.
- 7) Labels and Notices: Select from the following:
 - a) For indoor application: Engraved two-colour laminated plastic or proprietary pre-printed selfadhesive flexible plastic labels.
 - b) For outdoor application: Engraved and black filled lettering on stainless steel or brass, minimum thickness 1 mm to be screw fixed.
- 8) Location: Locate labels so that they are easily seen and are either attached to, below or next to the item being marked.
- 9) Fixing:
 - a) General: Use mechanical fixing.
 - b) Valves and pumps: Attach by key ring to valve hand wheels.
- 10) Emergency functions: Code compliant Safety Signs required for operational environment.
- 11) Colours: Generally, in conformance with Australian Standards as appropriate, otherwise black lettering on white background except as follows:
 - a) Danger, warning labels: White lettering on red background.
 - b) Main switch and caution labels: Red lettering on white background.
- 12) Minimum lettering heights: Unless specified in the Australian Standard:
 - a) Equipment nameplates: 40 mm.
 - b) Warning notices: 7 mm.
 - c) Automatic controls and electrical equipment: 5 mm.
 - d) Isolating switches: 5 mm.
 - e) Inside electrical enclosures: 3.5 mm.
 - f) Other: 3 mm.

1.17 TRAINING

Conduct initial training for Scentre's representatives at an agreed time, using draft O&M Manuals, not later than one month prior to Completion / Handover of any stage or tenancy. Conduct a second training one month after Completion / Handover to ensure that Scentre Management fully comprehend the operation and function of the installation.

For any equipment requiring seasonal operation, demonstrate during the appropriate season and within 9 months of the Completion / Handover.

Cover the design intent, function, operation and maintenance of the installations. Use the Operations and Maintenance Manual as basis for instruction.

Conduct training by demonstrators or qualified person who are knowledgeable about the installation.

The initial training session is to comprise a minimum of a PowerPoint presentation covering all basic functions of the systems installed, FAQ's, troubleshooting and maintenance requirements. Interactive training using the head end management controls of each system is also required.

The PowerPoint presentation should be produced in an easy to follow manner and copies of this distributed to the trainees on completion. The presentation is to be submitted 3 weeks prior to the arranged training date and will need to be submitted for a formal approval. All changes are to be incorporated and re-submitted ready for the formal training session.

The follow up training sessions should reiterate that covered during the initial training and also address any problems that have occurred during the DLP and what works have occurred to rectify the problem.

1.18 WORKS AS EXECUTED (AS-BUILT) DRAWINGS / MODEL

 General: Produce accurate Work-as-executed (As-Built) drawings/model as a true reflection of the agreed coordination and subsequent installation, in line with the Scentre BIM Execution Plan (BEP), the Revit Manual, Autocad standards and Project Specification as applicable. A full suite of standards is available on request and will be provided to the Contractor on Contract Award. The Contractor will be required to comply with these documentation standards.

Work-as-executed drawings/model shall contain the following information as a minimum:

- a) Work-as-executed drawings shall be based on the shop drawings, the most current architectural backgrounds, and include changes made during the construction and commissioning periods. The contractor is to maintain a set of drawings on site marked up with any alterations to their shop drawings during construction. These should be available for inspection at any time and as a record to assist them in their final work-as-executed drawing production.
- b) Provide all necessary information of contractor's designed systems noting that the as-built document is not a shop drawing.
- c) Contain such information as, but not exhaustive of air flow direction, air volumes, pressure drops, air velocity, invert levels, fabrication, erection, installation, location, sizing, material, dimension, geometry, etc.
- d) Record all unexpected obstructions that may be of use to the operational building.
- e) Add all related shop drawings to as-built drawings as an appendix to the drawings. Make sure there are references on the drawing page to the appendix.
- f) Update the index sheet to show the latest drawing changes or additions
- g) For inspection purposes drawings are to be stamped with 'RECORD DRAWING AS-BUILT FOR INSPECTION' including contractor's name, date, and other relevant information as may be required.
- h) Following inspection and subsequent workflow review process, if a sheet has not been changed at all or no mark has been added, label the sheet 'AS-BUILT' and transmit using the web based project tool.

- i) If a sheet has been changed or modifications have been added, label it 'REVISED AS-BUILT' ensuring clear, concise details of the change or modification are noted.
- j) The Level of Development for a Revit work-as-executed model shall be LOD300 as applicable.
- k) FINAL AS BUILT drawings / model to be issued upon completion of the process above.
- Asset tagging or naming are produced in accordance with SCG Engineering Services Asset Reference Numbering and Naming. The Scentre asset register will need to be populated as part of the equipment schedules for approval by the Scentre engineers.

Should the Contractor not have in-house AutoCAD/Revit documentation capacity then the drafting is to be undertaken for the Contractor (at the Contractors cost) by a suitable drafting company with demonstrable AutoCAD/Revit capability. Such company is to be nominated for Scentre approval prior to Contract Award.

All costs caused by incomplete or inaccurate as-builts will be recovered from the Contractor.

The production of as-built information does not in any way infer that Practical Completion has been achieved unless otherwise advised by the Project Manager.

- 2) Inspections of Work-as-executed (As-Built) Installation and Corresponding Drawing/Model: The contractor is responsible for scheduling area specific inspections in advance with the Services Manager, Services Coordinator and, or Scentre Engineering representative to ensure availability of required persons in maintaining programme. Should the programme outline milestones for such inspections not be met then it remains the responsibility of the contractor for scheduling of the same inspections. In addition, the contractor must ensure that any services installed within adjacent tenancy service zones are inspected prior to the tenancy being handed over to the tenant.
- 3) Submissions:
 - a) Submit the draft work-as-executed drawings for review and comment.
 - b) Submit the final work-as-executed drawings prior to practical completion in the following formats:
 - i) Portable Document Format (PDF)
 - ii) Autocad CAD (DWG) files
 - iii) Revit Model (RVT) (as applicable to the Project)
 - iv) Navisworks (NWC or NWD) (as applicable to the Project)
 - c) The work-as-executed drawings/model are to be provided and uploaded to the web based system, e.g. Aconex or similar in use by Scentre specific to this project or distributed in any such manner as directed by the Project Manager.
- 4) Data Version: Work-as-executed drawings/model shall be produced in the current agreed AUTOCAD/REVIT/NAVISWORK version in use at the time of the Project. Data in other compatible formats may be considered, but will only be accepted with prior agreement by the Project Services Manager.

1.19 OPERATION AND MAINTENANCE MANUAL

1.19.1 GENERAL

The Contractor shall submit Operation and Maintenance (O&M) Manuals on the online Project Management System in use by Scentre for this project.

1.19.2 STAGED COMPLETION / SECTIONAL HANDOVERS

Where a project has multiple stages the O&M Manual is to be prepared and submitted one (1) month prior to the first stage completion. It will be written in such a manner as to later incorporate, without major modification, any works amended during following stages not foreseen at time of the O&M submission.

The Contractor is to then update the manual one (1) month prior to the completion of each subsequent stage.

1.19.3 SUBMISSION

All O&M Manuals shall be submitted through either Aconex or a similar approved Documents Manuals platform.

The draft O&M manuals shall be submitted one (1) month before the date for practical completion or commencement of training on services equipment, whichever is the earlier.

The final O&M manuals shall be submitted within four (4) weeks after practical completion.

1.19.4 DOCUMENTATION FOR MAJOR AND MINI-MAJOR TENANTS

Where Major and or Mini-Major Tenants are part of the scope of works the contractor shall in addition to providing the work-as-executed drawings and operation and maintenance manuals specified for the main Project, also provide three copies of work-as-executed drawings and operation and maintenance manual for each of the major and mini-major tenants undertaken as part of this contract. The drawings and the manuals shall contain all, and only the information relevant to the installation of the particular tenant and any interface it has with the base building plant and equipment.

1.19.5 FORMAT AND STRUCTURE

1.19.5.1 ELECTRONIC COPIES

Electronic copies of the O&M manuals shall be:

- 1) Sized and set to print on A4 paper.
- 2) Provided in two formats:
 - a) Adobe Portable documents format, PDF
 - b) The original source file
- Produced to suit electronic online documentation as defined within the Preliminaries (such as BIM PLAN or equivalent);
- 4) Produced in a form suitable for use with Adobe Acrobat software;
- 5) Suitable for use with pre-formatted documents produced by other software products for inclusion in the manuals, be provided in Adobe Portable Document Format, PDF;
- 6) Provided in electronic format with the following information:
 - a) Project name
 - b) Services
 - c) Drawing numbers
 - d) File type/s
 - e) Date

As-constructed drawings shall have:

- 7) PDF Versions of DWG drawings be named the same with the file type extension providing differentiation of files (include short descriptor such as elec,-power, lighting etc in all file names);
- 8) DWG files be supplied with all XREFs bound into a single file. This is inclusive of all images, shapes and fonts. Providing XREFs with main drawing will NOT be accepted; and
- 9) Each drawing shall be provided as a separate file. A tabbed suite of drawings will NOT be accepted.

1.19.5.2 GENERAL STRUCTURE

The Operation and Maintenance Manuals shall be set up with the following structure which includes but not limited to the associated information:

- 1) Contents
- 2) Introduction and Guide
- 3) Design Intent
- 4) System Description
- 5) Equipment Description
- 6) Assets Register
- 7) Operating Procedures
- 8) Maintenance Procedures
- 9) Warranties, Licences and Certificates
- 10) Testing and Inspection, Commissioning Results
- 11) Spare Parts
- 12) Help and Contacts
- 13) As-Constructed and Shop Drawings
- 14) Health and Safety

1.19.5.3 INTRODUCTION AND GUIDE

This section shall include the following:

- 1) Introduction: provide information on what the project is about, where on the site or building the works has been completed, etc.
- 2) Directory: Names, addresses, and telephone numbers of consultants, contractors, and names of responsible parties.
- 3) General description of installations.
- 4) How to use guide: Information on where certain information can be found to reduce the amount of time a person is required to read and find information
- 5) Contractual and Legal Information

1.19.5.4 DESIGN INTENT

This section shall include the following:

- 1) A description of the energy efficiency features and strategies in relation to the design of the building, including an overview of the potential savings, as stated for economic and environmental impact.
- 2) Design parameters, assumptions and relevant standards referenced within the design.
- 3) Print out of calculations (e.g. heat load, maximum demand).

1.19.5.5 SYSTEM DESCRIPTION

Technical description of the systems installed. Identifying function, normal operating characteristics, and limiting conditions.

1.19.5.6 EQUIPMENT DESCRIPTION

1) Names, addresses and telephone numbers of manufacturers and suppliers of items of equipment installed.

- 2) Schedule (system by system) of equipment, stating make, model numbers, locations, duties, performance figures. Use unique item number cross-referenced to the work-as-executed drawings.
- 3) Manufacturer's technical literature for equipment installed.

1.19.5.7 ASSETS REGISTER

The Contractor shall complete the Asset Register with all asset details for work completed, and comply with SCG Engineering Services Asset Reference Numbering and Naming for assets naming convention.

1.19.5.8 TECHNICAL DATA

Manufacturer's technical literature assembled specifically for the project and excluding irrelevant matter. Each product data sheet marked to clearly identify the specific products and components used in the installation and data applicable. Additional instructions and illustrations as required to identify any changes to the manufacturer's data or to illustrate the function of each component in the installation.

1.19.5.9 OPERATING PROCEDURES

Include the following information in this section:

- 1) Manufacturer's technical literature as appropriate. For other than common accessories, where no manufacturer literature is available, a precise and concise description of the operation procedure in plain English shall be provided.
- 2) Safe starting, running, operating and shutting-down procedures for the equipment installed including logical step-by-step sequence of instructions for each procedure.
- 3) Control sequence and flow diagrams for the systems installed.
- 4) A legend for colour-coded services. A legend of the symbols used on the drawings, unless included on the drawings.
- 5) Schedule of the parameter setting of each protective device, including fixed and adjustable circuit breakers, protective relays, adjustable photoelectric switches, pressure switches, and any other control and monitoring device, as established during commissioning and maintenance.
- 6) Provide all procedures that may be utilised to identify and rectify common system/equipment faults.
- 7) First Aid.

1.19.5.10 MAINTENANCE PROCEDURES

Provide the following information in the section:

- 1) Maintenance instructions
 - a) Emergency procedures, including telephone numbers for emergency services, and procedures for fault-finding.
 - b) Manufacturers technical literature as appropriate.
 - c) Detailed recommendations for the frequency of performance of routine maintenance tasks.
 - d) List of procedures and tasks associated with preventive (routine) maintenance.
 - e) Procedures for safe trouble shooting, disassembly, repair and reassembly, cleaning, alignment inspection and adjustment, including a logical step-by-step sequence of instructions for each procedure.
 - f) Provide detailed cleaning regimes for each major system (and individual equipment) in accordance with the manufacturer's requirements and warranties.

- 2) Maintenance schedules
 - a) A schedule of the frequency of the required or recommended maintenance, testing or inspection for each type of equipment. This schedule is to include weekly, monthly attendance times.
 - b) Provide separate maintenance schedules for each type of equipment with the minimum details as shown below:
 - i) Information/data name
 - ii) Location of the equipment
 - iii) Description of the equipment
 - iv) Unique ID
 - v) Inspection type/frequency
 - vi) Maintenance required
 - vii) Inspection results
 - viii) Comments on each inspection
 - ix) Inspection date
 - x) Inspector name, title and address

Update the maintenance section of the O&M manuals at the end of defects liability period to include all changes and upgrades to services.

1.19.5.11 WARRANTIES, LICENCES AND CERTIFICATES

Include the following information in this section:

- 1) Copies of manufacturers warranties.
- 2) Copies of any relevant licences (manufacturers, system, and/or authority).
- 3) Copies of all guarantees.
- 4) Certificates from authorities and certifiers.
- 5) Individual certificates (from the installing/specialist trades) of compliance for each and every system to be provided.
- 6) If installation is not by the manufacturer, and product warranty is conditional on the manufacturer's approval of the installer, submit the manufacturer's approval of the installing firm.

All Warranties shall name the equipment owner.

1.19.5.12 TESTING AND INSPECTION, COMMISSIONING RESULTS

Include the following information in this section as a minimum:

- 1) ITP
- 2) Records of test results
- 3) Records of commissioning plan and program
- 4) Records of certified testing equipment

1.19.5.13 SPARE PARTS LIST

Include the following information in this section:

1) Schedule of spares with an expected operating life less than 60,000 hours, including item label manufacturer name, address and telephone number, catalogue number, name and address of local distributor, and the expected replacement frequency.

- 2) Schedule of consumable items (oil, grease, belts, bearings, etc.) to be used during servicing.
- 3) The cost of such spares shall include, supply, individual packing and identification of each item, and delivery to site.
- 4) Spares and service expertise shall be available for at least 15 years after Completion.
- 5) Spares and Consumable Register including the following information for each product:
 - a) Product
 - b) Manufacturer Name
 - c) Address and Telephone Number
 - d) Catalogue Number
 - e) Local Distributor Name, Address and Telephone
 - f) Replacement Frequency
 - g) Comments
- 6) Imported Equipment: Where the Contractor has imported equipment from outside of Australia then the following additional information in a separate table:
 - a) List of all imported equipment
 - b) Country of origin
 - c) Importer details
 - d) Australia servicing contact details

1.19.5.14 HELP AND CONTACTS

Provide all help and contact details for each service contract (including specialist installers). Minimum contact details are as follows:

- 1) Discipline/Service (i.e. Electrical, Security, Structured Cabling, Assistance Call, etc.)
- 2) Name of Contractor
- 3) Address
- 4) Daytime telephone contact
- 5) Afterhours telephone contact

1.19.5.15 AS-CONSTRUCTED AND SHOP DRAWINGS

Include the following information in this section:

- 1) Index list of all drawings in numerical order including full title and revision date
- 2) Copy of all As-Constructed Drawings
- 3) Copy of all approved Shop Drawings
- All hard copies shall be provided on the same size print sheet for uniformity of all drawings.

1.19.5.16 HEALTH AND SAFETY

Include the following information in this section:

- 1) Guidance to relevant legislation
- 2) Control of workplace hazardous substances
- 3) Risk Assessments
- 4) Disposal Information

1.20 CONTRACTOR DESIGN DELIVERABLES

1.20.1 TECHNICAL DATA

- 1) General: Carry out system design. Submit system design details and technical data for all items of plant and equipment selected before ordering equipment.
- 2) Data to be submitted: Include at least the following:
 - a) System design:
 - i) Assumptions and design parameters.
 - ii) Engineering Calculations The calculations should be via relevant software, accompanied by schematic drawings.
 - b) Schedules of equipment selected with the following information:
 - i) Model name, designation and number.
 - ii) Capacity of all system elements.
 - iii) Country of origin and manufacture.
 - iv) Materials used in the construction.
 - v) Size, including required clearances for installation.
 - vi) Manufacturers' technical literature, type test report.

1.20.2 DRAWINGS

- General: Prepare and submit drawings for the fabrication and installation of services and equipment. Drawings shall be dimensioned, with reference to building structure and other services. Drawings shall contain all necessary information for coordination and construction on site, including symbols and legends, details, sections and equipment schedules. These drawings are to be submitted to Scentre Group for review prior to construction.
- 2) Drawings: Prepare and submit the following drawings:
 - a) Drawings of work by the Builder including:
 - i) Equipment rooms and platforms.
 - ii) Shafts and risers.
 - iii) Access doors and panels.
 - iv) In situ penetrations and openings.
 - v) Penetrations and ceiling cut outs.
 - vi) Structural support for equipment with loads to be imposed on the structure during installation and operation.
 - vii) Fire resistance of building structures.
 - viii) Other Builder's works documented.
- 3) Drawings of work by other contractors.
- 4) Electrical services drawings including:
 - a) Equipment layouts and sections including reflected ceiling plans and seismic restraint details, including:
 - i) Substation, switch room, building distributor room layouts and sections.
 - ii) Details of switchboard, control panel and telecommunication distributors and equipment racks.
 - iii) Details of standby generator.

- iv) Schematic wiring diagrams for HV installation, LV installation & PA system.
- v) Power layout plans showing location, identification number and type of all switchboards, distribution boards, control panels, socket outlets and power supply points; and cable routes of main and submains.
- vi) Lighting layout plans showing location, identification number, type, and the supply circuit of all light fittings; and controlling switchboard/distribution board.
- vii) PA system layout plans showing location, identification number, type and loudspeakers and call stations; location and identification of control panels and other equipment.

2 HIGH VOLTAGE INSTALLATION

2.1 GENERAL

- 1) General: Provide all equipment and materials necessary for the connection, transformation and distribution of High Voltage (HV) electricity supply.
- 2) Comply with the following:
 - a) AS/NZS 3000: Electrical installations (Wiring Rules).
 - b) AS 2067: Substation and high voltage installation exceeding 1kV a.c.
 - c) AS/NZS 2344: Limit of electromagnetic interference from overhead a.c power lines and high voltage equipment installations in the frequency range of 0.15 to 1000 Mhz.
- 3) Allow for coordination with the installation of the high voltage transformers, cabling, and low voltage cabling fed from the substations.
- 4) Allow for works as required by the local authorities for a fully functioning low voltage system.

2.2 SWITCHGEAR ASSEMBLIES

2.2.1 GENERAL

- 1) Comply with the following:
 - a) AS 2981: High voltage a.c. switchgear and controlgear (vacuum interrupters).
 - b) AS 62271: High voltage switchgear and controlgear.
- 2) Construction: Modular construction based on standard module width; fixed and non-withdrawable type.
- 3) Degree of protection: IP2XC for indoor use to AS 60529.
- 4) Insulation and breaking medium: Vacuum withdrawable or SF6. Provide separate breaking medium so as not to corrupt the integrity of the insulation medium.
- 5) Compatibility: All new equipment shall be fully compatible with the existing equipment.
- 6) Operating mechanism:
 - a) Centralised control: Centralise all control devices required for the unit operating mechanism on the front panel.
 - b) Operating mechanism: Independent-operation, opening or closing by spring charged lever.
- 7) Indication: Provide indications for the following:
 - a) Circuit close.
 - b) Circuit open.
 - c) Auto tripping.
- 8) Remote fault indication: Provide aux contacts for interface with BMS for remote fault indication.
- 9) Ring Main Units (RMU): Self-contained totally insulated single metal enclosure unit, complete with:
 - a) 630A network switch-disconnectors at incomings and outgoings.
 - b) 200A circuit breaker for tee-off with system powered protection unit.
- 10) Voltage indicator: Provide voltage indicator lamps on all circuit breakers and switch-disconnectors.
- 11) Cable testing bushings: Provide cable testing bushings. Access to the cable testing bushings shall be interlocked with the earthing switch.

2.2.2 SPARES CABINET

- 1) General: Provide a spares cabinet with non-lockable door in each substation, sized for storing equipment, tools and spares necessary for the operation and maintenance of the installation.
- 2) Spare fuses: Provide 3 spare fuse links for each rating of fuse link on each switchgear assembly.
- 3) Accessories: Provide one set of raking tool for circuit breakers, and special tools.
- 4) Label: Label the cabinet 'SPARES CABINET'.

2.3 POWER TRANSFORMERS

2.3.1 GENERAL

- 1) Comply with the following:
 - a) AS 2374: Power transformers
- 2) Type: Oil filled sealed type or cast resin dry type as documented.
- 3) Sound level: To AS 2374, Table A2 'Specially Reduced Sound Levels'.
- 4) Type test: Carry out type tests to AS 2374 or certify that type tests have been carried out on a transformer of identical design.
- 5) Certificates: Provide manufacturer's type test certificates.

2.3.2 DESIGN

- 1) Windings: Provide separate 3-phase HV and LV windings for connection to a 3-phase 50 Hz supply system.
- 2) Impedances: Normal impedances measured or converted to the values at 75°C:
 - a) 1000 kVA: 5.5%.
 - b) 1500 kVA: 6%.
 - c) 2000 kVA: 6.5%.
- 3) Impulse levels: 11 kV windings: 95 kV BIL.

2.3.3 CONSTRUCTION

- 1) Oil filled transformers:
 - a) Oil: High flashing point oil (270°C and over) to AS 1767, 'Beta Oil' by ABB or equivalent.
 - b) Oil tank construction: Construct the transformer tank to withstand, without damage, the mechanical stresses and internal pressures that may occur in service or during lifting and transport.
- 2) Dry type transformers:
 - a) Type: Cast resin.
 - b) Thermal class: F.
 - c) Cooling: ANAF Transformer to be designed for natural air-cooling operation, with the ability to increase the capacity by 40% using forced air fan cooling.
- 3) Metal enclosure: IP31 metal enclosure.
- 4) Lifting lugs: Capable of supporting the transformer and its filling oil.
- 5) Earthing lug: Welded to the outside of the tank.
- 6) External finish: Suitable for the installation location.
- Tap changing: Provide an off-circuit tap changing switch operable from the outside of the tank, clearly marked to indicate each switch position, and a means of padlocking the switch in each position.

- 8) Bushing: To relevant Australian Standards AS/NZS 60137 for voltage above 1000 V, and otherwise suitable for the insulation levels and the degree of atmospheric pollution.
- 9) Cable boxes: Provide cable boxes, sized to permit the cable cores to be manipulated and terminated within the box, of air insulated construction with removable front cover plate.
- 10) LV busbars connection: Provide LV bushings with terminal contact surfaces suitable for connection via flexible links to busbars. Fix a flanged surround to the transformer tank, suitable for the connection of a busbar trunking.
- 11) Indicators: Provide the following:
 - a) Oil level indicator.
 - b) Temperature indicator.

2.4 HV CABLING

- 1) General: Multi-stranded polymeric insulated copper conductor cables with equal size neutral, to AS 1429. Provide cable with steel armour for direct unground installation.
- 2) Rating: Apply manufacturers' data for compliance with fault level rupture capacity.
- 3) Location marking of underground cable: Comply with Clause 3.7 Underground Services
- 4) Install cabling so as to achieve maximum EMF Field mitigation.

2.5 EARTHING

General: Provide a separate earthing system for the HV installation within the substation with removable link sized to carry the HV fault current.

2.6 TECHNICAL REQUIRMENTS

Refer to the High Voltage Project Specification for further technical HV requirements.

3 LOW VOLTAGE INSTALLATION

3.1 GENERAL

- 1) General:
 - a) Provide a complete Low Voltage (LV) installation (including extra low voltage installation) for lighting and power, commencing at the LV terminals of transformer or the LV supply point.
 - b) Provide a safe and reliable low voltage installation to supply all electrical equipment.
- 2) Install all LV equipment an infrastructure to minimise the effects of EMF in surrounding occupied areas to a maximum of 10 milligauss at 1m above the floor and 1m from perimeter walls.
- 3) General standards: Comply with the following:
 - a) AS/NZS 3000: Electrical installations (Wiring Rules).
 - b) SAA/SNZ HB 301: Electrical installations Designing to the wiring rules.
 - c) AS/NZS 3013: Electrical installation Classification of the fire and mechanical performance of wiring system elements.
 - d) AS/NZS 3008.1.1: Electrical installations Selection of cables.
 - e) AS/NZS 4961: Electric cables Polymeric insulated.

3.2 CONSUMERS MAINS

- General: Provide consumers mains which meet the relevant authority requirements between the transformer LV terminals and the main switchboard. Cables grouped to minimise the effects of EMF.
- 2) Types: Provide consumers mains selected from the following types:
 - a) Fire rated cables supported by cable ladder/tray rated to WS53 of relevant Australian Standards.
 - b) Fire rated cable in underground conduits.
 - c) Busbars in an appropriate fire-rated enclosure provided with suitable mechanical protection.

3.3 SWITCHBOARDS

3.3.1 GENERAL

- 1) General: Provide proprietary switchboard assemblies, or custom-built assemblies that are type tested.
- 2) Comply with the following:
 - a) AS/NZS 60947: Low-voltage switchgear and controlgear.
 - b) AS/NZS 61439: Low-voltage switchgear and controlgear assemblies.

3.3.2 DESIGN

- 1) Service conditions: Normal service conditions.
- 2) Short-circuit capacity: Rate main circuit supply and function units as follows:
 - a) Back-up protective device not provided: Rated short-circuit current for one second.
 - b) Back-up protective device provided: Rated short-circuit current for the maximum opening time of the associated protective device.
- 3) Tested levels: Do not use equipment at fault levels higher than tested levels, unless provided with current-limiting back-up protection.

- 4) Degree of protection:
 - a) In plant rooms: IP 42.
 - b) Outdoor use: IP 56.
- 5) Segregation: Segregate emergency equipment from non-emergency equipment by means of metal partitions designed to prevent the spread of a fault from non-emergency equipment to emergency equipment.
- 6) Spare capacity: Provide at least 25% spare capacity for load, and at least 25% spare capacity for space, unless it is documented otherwise.
- 7) Solar PV: All new Main Switchboards must contain at least two empty three-phase circuit breakers for future Solar PV installations. These must be sized in accordance with the requirements listed within the NCC and approved by Scentre Group.
- 8) Cable entry:
 - a) Indoor cable entries: Top or bottom.
 - b) Outdoor cable entries: Bottom.
- 9) Mounting:
 - a) Floor mounted: Assemblies generally.
 - b) Wall mounted: Front access assemblies with frontal area < 2 m².

3.3.3 CONSTRUCTION

- 1) General: Provide rigid, ventilated, insect-screened enclosures consisting of panels, doors giving the designated enclosure separation and degree of protection.
- 2) Compartments: Separate shipping sections, subsections, cable and busbar zones, functional unit modules and low voltage equipment compartments using vertical and horizontal steel partitions which suit the layout and form of separation.
- 3) Steel enclosures:
 - a) General: Minimum 1.6 mm thick zinc-coated steel coating class Z200.
 - b) Outdoor assemblies: Coating class Z450.
- 4) Insect proofing: Cover ventilation openings using non-combustible and non-corroding 1 mm mesh.
- 5) Equipment spacing: Provide sufficient thermal, mechanical and electrical clearance between equipment to ensure proper functioning.
- 6) Ventilation: Provide natural ventilation or mechanical ventilation if necessary, to maintain design operating temperatures at full load.
- 7) Earth continuity: Effectively bond equipment and assembly cabinet metal frame to the protective earth conductor.
- 8) Cable entry: Provide cable entry facilities within assembly cable zones for incoming and outgoing power and control cabling. Provide sufficient clear space within each enclosure next to cable entries to allow incoming and outgoing cables and wiring to be neatly run and terminated, without undue bunching and sharp bends.
- 9) Cover plates and gland plates: 5 mm thick aluminium cover plate and gland plate to maintain the degree of protection.
- 10) Doors and covers:
 - a) Maximum dimensions: 900 mm wide and 1.2 m² surface area.
 - b) Adjacent door: Space adjacent doors to allow both open to 90° at the same time.
- 11) Floor-mounting: Provide mild steel channel plinth, galvanised to class Z600, with toe-out profile, nominal 75 mm (high) x 40 mm (wide) x 6 mm (thick), for mounting complete assemblies on site.

- 12) Lifting provisions: For assemblies with shipping dimensions exceeding 1800 mm high x 600 mm wide, provide fixings in the supporting structure and removable attachments for lifting.
- 13) Facilities for interface with BMS: Provide wiring terminals, relays, contactors and other accessories which are necessary for interface with the BMS for control and monitoring of electrical services equipment.

3.3.4 FINISH

- 1) Extent: Apply protective coatings to internal and external metal surfaces of assembly cabinets including covers, except to stainless steel, galvanised, electroplated, or anodised surfaces and to ventilation mesh covers.
- 2) Finish coats: Full gloss enamel finishing coats.
- 3) Comply with the following:
 - a) AS 2700: Colour standards for general purposes.

3.3.5 FORMS OF SEGGREGATION

Unless higher form of construction is necessary to meet the authority's requirements, comply with the following:

- 1) Main Switchboards: Form 3B.
- 2) House / Tenant Distribution Boards: Form 2.
- 3) Distribution Boards (within tenancies): Form 1.
- 4) Mini Majors: To the tenant's specification.
- 5) Service Protective Devices (SPDs).

3.3.6 COLOURS

- 1) Doors and covers:
 - a) Essential services supply: Signal red, Ref. No. R13.
 - b) House supply: Golden yellow, Ref. No. Y14.
 - c) Tenants supply: Lilac, Ref. No. P23.
- 2) Plinth: Galvanise
- 3) Other external surfaces: Orange, Ref. No. X15.
- 4) Internal surfaces: White

3.3.7 BUSBARS

- 1) General: Provide main circuit supply busbars within assemblies, extending from incoming supply terminals to the line side of protective equipment for outgoing functional units and for future functional units.
- 2) Comply with the following:
 - a) AS/NZS 61439: Low-voltage switchgear and controlgear assemblies.
- 3) Material: Hard-drawn high-conductivity electrolytic tough pitched copper alloy bars, designation 110.
- 4) Temperature rise limits active and neutral conductors: Maximum rated current temperature rise limits: 65 ± 1.5 °C by type test.
- 5) Maximum current density rating 1.55 A/sq mm.
- 6) Maximum short-circuit withstand current temperature rise limits: 160 °C by calculation to AS/NZS 61439.

- 7) Busbars: rated to min 65kA. Neutral and phase busbars to be grouped in close proximity to minimise the effects of EMF.
- 8) Phase sequence: For main busbars and connections to switching devices, set out phase sequence for phases A, B and C, from left-to-right, top-to-bottom and back-to-front when viewed from the front of the assembly.
- 9) Colour coding:
 - a) General: Provide 25 mm minimum width colour bands permanently applied to busbars at 500 mm maximum intervals with at least 1 colour band for each busbar section within each compartment.
 - b) Active busbars: Red, white and blue respectively for the A, B and C-phase.
 - c) Neutral busbar: Black.
 - d) MEN link: Green-yellow and black.
 - e) Protective earth busbar: Green-yellow.
 - f) Restrictions: Do not use adhesive type colour bands.

3.3.8 INTERNAL WIRING

- 1) Cable type: Provide 0.6/1 kV copper cables. Use V-90HT insulation where directly connected to active and neutral busbars.
- 2) Cable entries:
 - a) General: Neatly adapt one or more cable entry plates, if fitted, to accept incoming cable enclosure. Use the minimum number of entry plates to leave spare capacity for future cable entries. Do not run cables into the top of weatherproof assemblies.
 - b) Single core cables rated >100A. Pass separately through non-ferrous gland plates. Do not use metal saddles.
- 3) Cable Terminations:
 - a) Connection to circuits $\leq 6 \text{ mm}^2$: Provide DIN-type tunnel terminal blocks.
 - b) Connection to circuits > 6 mm²: Provide stud type terminals \geq 5 mm diameter, sized to continuously carry the load.
 - c) Tunnel terminals: Provide insulated sleeve ferrules to flexible cables terminated in tunnel terminals.
 - d) Identification: Identify cables at both ends using neat ring-type ferrules.
 - e) Arrangement: Terminate internal wiring to one side of the terminal block, leaving the other side for outgoing circuits.
 - f) Grouping: Provide separate terminal groups for final subcircuits and control wiring. Provide oversized barriers between each group of terminals having different voltages and terminal size.
- 4) Control and indication circuits: Minimum size: 1 mm² with 32/0.2 stranding.
- 5) Control and indication circuits: Cable colours: Colour code wiring as follows:
 - a) A phase: Red.
 - b) B phase: White.
 - c) C phase: Blue.
 - d) Neutral: Black.
 - e) Earthing: Green-yellow.

3.4 SWITCHGEAR AND CONTROLGEAR

3.4.1 GENERAL

- 1) Comply with the following:
 - a) AS/NZS 3000: Electrical installations (Wiring Rules).
 - b) AS/NZS 60947: Low-voltage switchgear and controlgear.
- 2) Rated making capacity (peak): \geq 2.1 x fault level (r.m.s.) at assembly incoming terminals.
- 3) Utilisation category:
 - a) Circuits consisting of motors or other highly inductive loads: At least AC-23.
 - b) Other circuits: At least AC-22.
 - c) Fuses:
 - i) Distribution/general purpose: gG.
 - ii) Motors: gM.
- 4) Coordination: Select and adjust protective devices to discriminate under over-current and earth faults.

3.4.2 SWITCHGEAR

- 1) Comply with the following:
 - a) AS/NZS 60947: Low-voltage switchgear and controlgear.
- 2) Operation: Independent manual operation including positive 'ON/OFF' indicator.
- 3) Operation: Independent manual operation including positive 'ON/OFF' indicator.
- 4) Locking: If specified, provide for padlocking in the 'OFF' position.

3.4.3 CONTROL AND TESTING SWITCHES

- 1) Comply with the following:
 - a) AS/NZS 60947: Low-voltage switchgear and controlgear.
- 2) Degree of protection: At least the degree of protection of the assembly.
- 3) Push buttons
 - a) Type: Oil-tight, minimum 22 mm \emptyset , or 22 mm x 22 mm.
 - b) Rated operational current: At least 4A at 240 V a.c.
 - c) Marking: Identify functions of each push-button. For latched 'STOP' or 'EMERGENCY STOP' push-buttons, state instructions for releasing latches.
 - d) All illuminated push buttons shall be of the LED illumination type.
- 4) Rotary switches:
 - a) Type: Oil-tight, minimum 22 mm \emptyset , or 22 mm x 22 mm.
 - b) Rated operational current: At least 4A at 240 V a.c.
 - c) Marking: Identify functions of each push-button. For latched 'STOP' or 'EMERGENCY STOP' push-buttons, state instructions for releasing latches.

3.4.4 MOTOR STARTERS

- 1) Comply with the following:
 - a) AS/NZS 60947: Low-voltage switchgear and controlgear.
- 2) Type:
 - a) General: Direct-on-line starter.
 - b) Power rating exceeding 75 kW: Electronic starter with soft starting.
- 3) Performance:
 - a) Rated duty: Intermittent class 12.
 - b) Utilisation category: AC-3.
 - c) Mechanical durability: \geq 3 million cycles
 - d) Electric durability: \geq 1 million operations at AC-3
- 4) Motor protection: Provide:
 - 1) Over-current protection.
 - 2) Single-phase protection.
 - 3) Thermal protection.
3.5 METERING

3.5.1 METER TYPES

1) Meters shall be NMI pattern approved and of the following type:

Туре
Single Phase: EDMI Mk7C, EDMI Revenue grade meter class 0.2
Three Phase: EDMI Mk10E, EDMI Revenue grade meter class 0.2
Single Phase: EDMI Mk7C, EDMI Revenue grade meter class 0.2
Three Phase: EDMI Mk10A, EDMI Revenue grade meter class 0.2
Schneider Powerlogic PM8240 or approved equivalent
Schneider Powerlogic PM5560 or approved equivalent
Schneider IEM3255 Energy Meter or approved equivalent

Table 2: Meter Types

- 2) Meter arrangements Electricity supply shall be metered as follows:
 - a) Embedded Network Parent Meters: Type A1
 - b) Embedded Network Orphan Meters: Type B1
 - c) Embedded Network House Meters: Type A1
 - d) MSB Incoming Supply Meters: C1
 - e) House Supply Meters: Type A1
 - f) House Power Meters: Type C2
 - g) House Submeters: Type C3
 - h) Tenants including telecom equipment room for telecom carriers: Type B1
- All type A1 meters are to be supplied & installed by Scentre Group's Nominated Meter Provider (Currently Mondo Power) or an approved equivalent and linked to the associated web metering portal.
- 4) All metering installations are to be provided by the Electrical Contractor. This includes the engagement and management of any third-party providers e.g. Mondo.
- 5) All metering installations are considered delivered and complete when readings can be taken from the meter (remotely and locally).

3.5.2 METER LOCATIONS

Locate meters as follows:

- 1) Parent, Gate or House Meters (Type A1): Main switchroom.
- 2) Power Meters (Type C1 & C2): Main switchroom / MSB.
- 3) House Submeter (Type C3): Switchroom where the house switchboard is located.
- 4) Major Tenant Revenue Meter: Switchroom where the tenant's main switchboard is located.
- 5) Specialty shops and Mini Majors Revenue Meters: Switchroom where the main tenancy switchboard meter panel is located.
- 6) Miscellaneous (for ATMs, vending machines, storerooms, signage, etc.): Switchroom.
- 7) Telecommunications Network Operator: Main switchroom or MDF/telecom equipment room.

3.5.3 REVENUE GRADE METERS

Provide revenue grade meters (house and tenant) for check metering and billing purposes. Meters shall provide local and remote monitoring of tenant and house usage within embedded and non-embedded network installations.

Metering to be in full compliance with standards and requirements as if it was connected to the supply authority network, and should be a complete system (including fuses, current transformers, wiring and accessories, etc).

The Contractor is to make allowance for all type A1 & B1 meters to be supplied & installed by Scentre Group's Nominated Meter Provider (Currently Mondo Power) or an approved equivalent and linked to the associated web metering portal. Meter quantities to be based on (but not limited to) the reference information included on the MLPs, TSPS and Single Line Diagrams.

All metering installations are considered delivered and complete when readings can be taken from the meter (remotely and locally).

3.5.4 POWER METERS

Provide Multi-Function Modbus Digital Power Meters for power supply management purposes. Power meters shall provide real-time local monitoring, and capable of remote monitoring via BMS or Meter Reading systems. Surface mount power meters on electrical switchboards:

- 1) Comply with the following:
 - a) AS 1284: Electricity metering
 - b) AS 62052: Electricity metering equipment (AC)
- 2) Metering Points:
 - a) At the MSB Incoming Supply: Meter shall be type C1.
 - b) At each House Supplies leaving the MSB: Meter shall be type C2.
 - c) Locally at each MTDB (Main Tenant DB): Meter shall be type C2.
 - d) At each Major Tenant Supply leaving the MSB: Meter shall be type C2.
 - e) At Standby Power Supply Circuits leaving the MSB: Meter shall be type C2.
 - f) At Solar PV Connection Points leaving the MSB: Meter shall be type C2.
 - g) At Mechanical Services equipment (> 200A) leaving the MSB: Meter shall be type C2.
 - h) At Vertical Transportation Services leaving the MSB: Meter shall be type C2.
 - i) Supplies to be metered as part of the NCC requirements: Meter shall be type C2.
- 3) Power meter to be supplied complete with current transformers, wiring looms and accessories.
- 4) Local display: Panel mounted anti-glare back-light LCD screen. Energy parameters to be monitored: Minimum data output of:
 - a) kWh.
 - b) kW and max. kW.
 - c) kVA and max. kVA.
 - d) Voltages.
 - e) Currents.
 - f) Phase power factors.
 - g) Frequency.
 - h) THD currents.

3.5.5 SUBMETERS

- 1) Provide the following house submeters for energy management purposes. The submeters shall provide real-time local monitoring:
 - a) Submeters for car park lighting and power.
 - b) Submeters for mall lighting and general power.
 - c) Meter Type: All these meters shall be type C3.
- 2) Comply with the following:
 - a) AS 1284: Electricity metering.
 - b) AS 62052: Electricity metering equipment (AC).
- 3) Submeter to be supplied complete with current transformers, wiring and accessories.
- 4) Local display: Panel mounted LCD screen.
- 5) Energy parameters to be monitored: Minimum data output of:
 - a) kWh.
 - b) kW.

3.5.6 DEMOLITION / REMOVAL OF METERING

Where existing metering is to be removed or decommissioned (embedded network or non-embedded network), the Contractor is to make allowance for all labour, materials and fees associated with the disconnection works.

3.5.7 EQUIPMENT SUPPLIED BY OTHERS

- 1) By services provider:
 - a) General: Install equipment supplied by the services providers, and provide wiring to complete the installation.
 - b) Tariff meter compartment: Install the tariff meter equipment supplied by services providers in a separate sealed meter compartment or separate meter panel.
- 2) By other contractors: Install measurement accessories supplied by others such as BMS/Metering contractor, on to switchboards in accordance with the recommendation of the supplier.

3.5.8 MARKING

- General: Provide labels including control and circuit equipment ratings, functional units, notices for operational and maintenance personnel, incoming and outgoing circuit rating, sizes and origin of supply and kW ratings of motor starters.
- 2) Labels on assembly exteriors:
 - a) Manufacturer's name: Required.
 - b) Assemblies: Label with essential markings.
 - c) Designation labels: For other than main assemblies, provide designation label stating source of electrical supply. Identify separate sections of enclosures.
- 3) Assembly controls: Label controls and fault current limiters, including the following:
 - a) Circuit designation for main switches, main controls and submains controls; and
 - b) Fuse link size.
- 4) Labels on assembly interiors: General: Provide labels for equipment within assemblies. Locate so that it is clear which equipment is referred to, and lettering is not obscured by equipment or wiring.

- 5) Danger, warning and caution notices:
 - a) Fault current limiters: In assembly sections containing fault current limiter fuses provide caution notices fixed next to the fault current limiters, stating that replacement fuse links are to match as-installed fuse link ratings, make and characteristics. Provide separate label stating fault current limiting fuse ratings.
 - b) Externally controlled equipment: To prevent accidental contact with live parts, provide warning notices for equipment on assemblies not isolated by main switch or local main switch.
 - c) Stand-by power: Provide warning notices stating that assemblies may be energised from the stand-by supply at any time.
 - d) Custom-built assemblies: For insulation or shrouding requiring removal during normal assembly maintenance, provide danger notices with appropriate wording for replacement of insulation shrouding before re-energising assemblies.
 - e) Positioning: Locate notices so that they can be readily seen, next to, if impracticable, on busbar chamber covers of functional units, and behind the front cover of functional units. Provide circuit identification labels in the cabling chamber of each functional unit, located next to external terminations.
- 6) Schedule cards: Provide schedule cards with written text showing the following as-installed information.
 - a) Submain designation, rating and short-circuit protective device.
 - b) Equipment item numbers and current ratings, cable sizes and types and areas supplied.
 - c) Mounting: Mount schedule cards in a holder fixed to the inside of the assembly or cupboard door, next to the distribution circuit switches. Protect with hard plastic transparent covers or laminated.
- 7) Single-line diagrams: Provide single-line diagrams in each main switchroom showing the asinstalled power distribution system. This includes any updates to legacy single line diagrams provided to the Contractor by Scentre Group. All new/modified single line diagrams are to be reviewed approved by Scentre Group prior to display in switchrooms.
 - a) Format: Non-fading print, at least A1 size.
 - b) Mounting: Enclose in a non-reflective glazed metal frame and wall mount.
 - c) Circuit Breakers: To include all circuit breaker size and settings.
 - d) Cables Specification: To include all cable details, e.g. size, type, rating, etc.
 - e) Spares: Rating of spare cubicles / frames.

3.6 EMBEDDED NETWORK

3.6.1 GENERAL

- 1) Definitions:
 - a) Embedded network refers to Scentre Group operating as the energy retailer on site and on sell electricity to tenants. Tenants have the option to buy electricity from Scentre Group or an alternate retailer.
 - b) Parent or gate meter is a market meter that act as a master authority meter and records the consumption of electricity consumed in that section of the embedded network.
 - c) Child meters are those that measure electricity for tenants that have opted not to buy their electricity from Scentre Group. They are designated as "children" of the "parent" meter.
 - d) Orphan meters are those that have opted to buy their electricity from Scentre Group.
- 2) Compliance:
 - a) The embedded network metering system must adhere to federal and state legislated design guidelines for accuracy requirements, on-board data storage, meter class, security/tamper proofing requirements, including any other standards (including the state specific Service and Installation Rules) relating to the installation of embedded electricity networks.
 - b) For all meter types defined above, the embedded network metering installation must be installed to the same standards and requirements as the authority metering standards, as if it was connected to the supply authority network.
 - c) The metering installation is to be signed off and approved by an AEMO accredited metering provider (specific to that class of metering).
- 3) Tenant Metering:
 - a) Major Tenants are to be excluded from the Scentre Group Embedded Network and connected to the authorities' networks directly (where possible and economically feasible), in such a manner as to allow an unmetered network connection.
 - b) Where an embedded network is installed, Scentre Group is the electricity retailer for the purposes of all specialty shop metering.
- 4) Execution The following shall be allowed for in the new embedded network metering system:
 - a) Modifications to and/or replacement of existing switchboards, supply and installation of meter panels and meters, as necessary to provide metering to tenants as specified on the TSPS.
 - b) Current transformers, test blocks, sealable potential fuse sets complete with fuse and peripherals.
 - c) A metering installation is considered complete once the meter can be remotely read using the associated data platform.
 - d) Works to enable remote meter reading:
 - i) Provision of translators for each meter on the RS485 bus. The translators are to provide both an EDMI Command-Line interface (for reading the meters for billing purposes, performing time syncing, etc.) and a MODBUS interface (for connection to the local BMS).
 - ii) Provision of copper data cables between each meter with RJ45 connectors. Cables must be sufficiently flexible to cope with switchboards being opened and closed.
 - iii) A maximum of 32 metering devices are to be connected to each daisy-chain bus.
 - iv) Conduits and ducts for data cabling interconnecting the metering devices.
 - v) Connection of RS485 metering bus to GSM/GPRS Modems and all peripherals to remotely read the meters via GSM or GPRS. This will include provision of: modem, RS232-to-RS485 converters, aerial, patch cables between meters, extended terminal cover, modem bracket, Duo-Translator break-out board, etc. for each metering bus/group.

- e) Installation of any 240V (AC) essential supply general purpose outlets and low-voltage power supplies as required to service metering or meter-reading equipment.
- f) Provision of a suitably sized plastic or powder coated steel enclosure for the modem, translator break-out box, RS485-to-RS232 adapter and future Modbus ethernet adapter and associated power supply.
- g) Maintain segregation between power and communications services throughout installation.
- h) Terminate all communications cabling using appropriate methods, i.e. RJ45 or Krone IDC blocks (Electrical terminal strips not acceptable).
- Installation to be of highest quality. Cables to be labelled and made neat using appropriate cable ties. Refer to communications cabling quality specification for detail. For cables installed inside meter panels there shall be sufficient cable lengths allowing for escutcheon to be fully opened.
- j) Provision of remote meter programming / reading tools specific to the selected meter type.
- k) Commissioning, testing and validation of all meters, including current (calibration certificate dated within the last 3 years) NATA endorsed calibration reports for each meter. Meters without current calibration certificates are to be rejected.
- Provision of Operation and Maintenance manual, including As-Built drawings. As-Built drawings shall include electrical single line diagrams which show all meter locations and their associated NMI numbers (where applicable).

3.6.2 EMBEDDED NETWORK METERS

- Implementation of an embedded network using remotely read interval meters (Type 4), certified by the Australian Energy Market Operator for use in the Australian Energy market and complying with the National Electricity Rules, and the current Electricity Customer Metering Code (including the state specific Service and Installation Rules as if it was connected to the supply authority network).
- 2) Where a new or replacement NMI Parent meter is required, contractor is to liaise with Scentre Group's Nominated Meter Provider (currently Mondo Power) to provide an approved meter fitted with an optional SCADA (MODBUS) card capable of reading the following parameters:

Parameters (Units)		
Voltage (V)	Total energy – Peak (Whrs)	Voltage total harmonic distortion
Current (A)	Total energy – Shoulder (Whrs)	Current total harmonic distortion
Real power (W)	Total energy – Off peak (Whrs)	Max demand over 30 minutes (monthly)
Apparent power (VA)	Total peak rate energy (Whrs)	Time at start of 30 minutes max demand
Reactive power (Var)	Total shoulder rate energy (Whrs)	
Frequency (Hz)	Total off peak rate energy (Whrs)	
Phase angle (Deg)	Cumulative total energy taken from grid	
Power factor	Cumulative total energy provided to grid	

Table 3: NMI Parent Meter Parameters

- 3) Refer to separate meter clause section above for approved list of meters.
- 4) Allow for new orphan meters to all tenants except for tenants who elect to remain in the Embedded Network and have child meters installed by their respective electricity retailer.
- 5) Meters shall be provided with tamper proof seals.
- 6) Refer to single line diagrams / drawing package for meter location and details.

3.7 HOUSE AND TENANT POWER

3.7.1 PROVISIONS

- 1) House / Tenant distribution boards Provide the following:
 - a) General:
 - i) Provide House distribution boards complete with circuit breakers for general lighting and power of malls and common areas.
 - ii) Provide Tenant distribution boards complete with circuit breakers as required for the efficient distribution of power to all tenancies.
 - b) Main Switchrooms: A 63 A single-phase 12-pole load centre, which will supply the electrical equipment and the general lighting and power.
 - c) MDF/BD Room: Provide a 63 A single-phase 12-pole load centre, which will supply the general lighting, air conditioning and power of the room.
 - d) Mobile DAS Room: Provide a minimum 63A three-phase metered supply (complete with a 35mm earth cable + earth bar) fed from nearest MTDB to a 24-pole load centre for each carrier. The supply details must be reviewed and approved by SDC to ensure each of the carrier requirements are met. General power and lighting for DAS Room (including A/C and shared DAS infrastructure) to be fed from nearest HDB.
 - e) Spares: Provide 25 % spare space complete with switchgear.
- 2) Distribution boards within tenancies: Refer to the Lessor Tenancy Services and Provisions Schedule (TSPS) and single line diagrams for allowances and provide the following:
 - a) Non-Food Premises: 63A single-phase supply, 12-pole distribution board complete with a 10A double socket outlet below the distribution board protected by an RCD.
 - b) Non-Food Premises (>300m²): 100A three-phase supply, 36-pole distribution board complete with a 10A double socket outlet below the distribution board protected by an RCD.
 - c) Non-Food Premises (>1000m²): 200A three-phase supply, 72-pole distribution board complete with a 10A double socket outlet below the distribution board protected by an RCD.
 - d) Food Court / Food Market: 100A three-phase supply, 36-pole distribution board complete with a 10A double socket outlet below the distribution board protected by an RCD.
 - e) Restaurant: 300A three-phase supply, 36-pole distribution board complete with a 10A double socket outlet below the distribution board protected by an RCD (Unless a nominated supply size is detailed within the TSPS or tenant specification).
 - f) Kiosk: 63A single-phase supply, 12-pole distribution board complete with a 10A double socket outlet below the distribution board protected by an RCD.
 - g) Food Kiosk: 100A three-phase supply, 36-pole distribution board complete with a 10A double socket outlet below the distribution board protected by an RCD.
 - h) Mini Majors: Refer to requirements as outlined in the TSPS.

3.7.2 INSTALLATION

- 1) All tenancy distribution boards are to be mounted on the rear wall of the tenancy in accordance with the designated services location as shown on the lease plans. The contractor is responsible to check and verify correct location prior to installation of the board.
- 2) Labelling: Label specialty shop distribution boards with the following letters: 'WARNING: MAIN CIRCUIT BREAKER MUST NOT BE USED FOR SWITCHING LIGHTING CIRCUITS'
- 3) Power Surge Protection Device: Provide cascaded surge protection at switchboards for over voltage protection, surge rating C1 in accordance with AS/NZS 3000.

4) All Meter Panels: Provide adequate spare space in the meter panel and the electrical cabinet so that single-phase supply can be upgraded to three-phase supply without extension of the panel/cabinet.

3.7.3 POWER SUPPLY FOR TENANTS

Provide power supplies to tenants including majors, mini majors, specialty shops, kiosks and casual leasing points. Refer to the Lessor Tenancy Services and Provisions Schedule for further information on Retail Base Building/Fitout Provisions.

- 1) Power supply to Specialty shops shall have 5m of cables coiled up in the ceiling space to enable the switchboard to be relocated in the future, allow to coordinate location prior to installation.
- 2) All submains to tenants, including Major and Mini-Major tenants, form part of the base build contract, and shall be sized to suit the full circuit breaker rating.
- 3) The Contractor is to allow to install all mains to the required capacity as identified by the Lessor Tenancy Services and Provisions Schedule.
- 4) Zone boards, main and sub mains shall be designed to allow for 25% growth over initial installation calculations.

3.7.4 POWER SUPPLY FOR HOUSE INSTALLATIONS

Provide all house power requirements as detailed within the single line diagrams including:

- 1) Mechanical Services: Provide power supply to the mechanical main switchboards. Terminate cables at the connection terminals that are provided by the mechanical services contractor.
- 2) Fire Protection Services: Provide essential power supply to fire protection services and terminate cables at the distribution boards.
- 3) Vertical Transportation Services:
 - a) Provide power supply to escalators and moving walk installations. Terminate cables at the switchboards/controllers that are provided by the vertical transportation services contractor.
 - b) Provide power supply to passenger and goods lift installations. Notwithstanding the requirements of AS/NZS 3000, power supply to passenger and goods lifts shall be supplied from the essential section of the main switchboard and be supplied using fire-rated cabling / support system. Terminate cables at the switchboards/controllers that are provided by the vertical transportation services contractor. For lifts that contain air conditioning systems provide separate power supply (not to be supplied from Lift Control Panel).
- 4) Hydraulic Services: Provide power supply to the hydraulic equipment and terminate cables at the equipment control panels that are provided by the hydraulic services contractor.
- 5) Others: Provide power as noted under the scope of the Interface of Works Matrix requirements.
- 6) All submains are to be sized to the full capacity of the circuit breaker.

3.7.5 POWER SUPPLY WITHIN SUBSTATIONS

Where Scentre Group provides a private High Voltage distribution network:

1) The contractor is to provide a 63A three phase, 24 pole house services distribution board. The board is to be supplied from the substation within which it is located.

The board shall be moulded plastic IP65 rated.

3.8 GENERAL POWER

3.8.1 GENERAL

Provide power for dedicated use and for general purpose, a socket outlet is defined as (one double GPO) for the following:

- 1) Mall:
 - a) Columns: On each column in the mall, provide one socket-outlet at 150 mm above FFL (with selected flush stainless-steel plate).
 - b) Mall Ceiling: Provide one ceiling-mounted socket-outlet adjacent to each column, to match ceiling finish. Where there is no column in the mall, provide one ceiling mounted socket-outlet for every structural grid along the centre line of the mall, or on each side of a void. Where nominated on the architectural drawings add an additional socket outlet for Christmas/decorative displays.
 - c) Hose Reel Cupboard: Provide one wall mounted socket-outlet adjacent to each hose reel cabinet.
 - d) Fire Shutters / Security Shutters: For each fire shutter and security shutter, provide an adequately rated essential power supply that complies with the fire engineering requirements.
 - e) Automatic Smoke Door: Provide one direct connection for each automatic smoke door and wired to the controller for power supply for the electromagnetic door holder.
 - f) Auto Doors: For each automatic door, provide one direct connection above ceiling over the door.
 - g) Mall Entry: At each mall entry, provide one socket-outlet for traffic counter system controller above ceiling over the entry.
 - h) BrandSpace / Casual Leasing Points: Refer to the TSPS, or if not provided provide 3 x 10 A socket-outlets for each BrandSpace / Casual Leasing Point. House the power point in a Scentre Group standard floor box. Connect the socket-outlet to the house distribution board.
 - i) Furniture Pods: Provide one 10 A socket-outlet for each furniture pod, provision one seating pod per 50m of mall. House the power point in a Scentre Group standard floor box. Connect the socket-outlet to the house distribution board. Allow for cabling from the floor box to two double power outlets, outlets to be complete with integrated USB outlets.
 - j) ATM: Provide a direct metered connection for each ATM.
 - k) Public Telephones: Provide one direct connection to each public telephone.
 - I) Power for Vending Machines. Allow four outlets per mall entry.
 - m) Event Space: Refer to the TSPS, or if not shown provide two 10 A, one 20 A and one 32 A (3ph) socket-outlets for each Event Space (allow two per floor). House the power in a Scentre Group standard floor box. Connect the socket-outlet to the house distribution board.
 - n) Miscellaneous Equipment: Provide one 10 A socket outlet (single) for each 200 m of mall. House the power point in a Scentre Group standard floor box. Connect the socket-outlet to the house distribution board.
 - i) This allowance is for equipment such as:
 - (1) Massage Chairs,
 - (2) Toy Vending Machine
 - (3) Photo Booths
 - (4) Kids Play Areas
 - (5) Sculptures requiring power
 - (6) Interactive Media

- 2) Cleaner Room:
 - a) One weatherproof socket-outlet at 1,500 mm above FFL adjacent to the entry;
 - b) One 20 A single-phase direct connection at high level for hot water unit at high level; and
 - c) For main cleaner room, one 32 A three-phase 5-pin socket-outlet for each floor scrubber recharger at 1,500 mm above FFL.
- 3) Parents Room:
 - a) Two socket-outlets for general purpose;
 - b) One direct connection for each hand dryers;
 - c) One socket-outlet for each television set at high level;
 - d) One socket-outlet for milk warmer above bench;
 - e) One socket-outlet for each microwave oven above bench;
 - f) One socket-outlet for each chilled water unit under sink; and
 - g) One socket-outlet for each automatic door.
- 4) Rest Room and Toilet:
 - a) One direct connection for each hand dryer, an allowance of one hand dryer per basin;
 - b) One 20 A single-phase direct connection at high level for hot water unit;
 - c) Disabled toilet: One direct connection for automatic door;
 - d) One socket outlet below each hand basin for tap sensor; and
 - e) One socket outlet for each automatic flushing cistern.
- 5) Loading Docks Serving Specialty Shops and Mini Majors:
 - a) One 32 A three-phase 5-pin socket-outlet for each roller shutter at high level;
 - b) One 32 A three-phase direct connection for each compactor, location to be decided on site; and
 - c) One 20 A single-phase direct connection for hot water unit at high level.
- 6) Store Room and Other General Areas:
 - a) Provide one socket-outlet at 150 mm above FFL for general purpose. For store rooms over 10m2 floor area allow one socket outlet at every 3 m of wall length.
 - b) Auto doors: For all automatic doors, provide one direct connection above ceiling over the door, including automatic doors into service corridors.
- 7) Green Walls
 - a) One socket outlet for each 25 m of Green Wall.
- 8) AHU Room: Provide the following industrial type socket-outlets:
 - a) One socket-outlet for general purpose; and
 - b) One socket-outlet dedicated for BMS controller at 1,500 mm above FFL.
- 9) Chiller Plant Room and Boiler Room: Provide the following industrial type socket-outlets:
 - a) Two socket-outlets for general purpose; and
 - b) One socket-outlet dedicated for BMS controller at 1,500 mm above FFL.
- 10) Cooling Tower Compounds: Provide the following weatherproof socket-outlets:
 - a) One socket-outlet for general purpose;
 - b) One socket-outlet dedicated for BMS controller at 1,500 mm above FFL; and

c) One socket-outlet dedicated for water treatment system at 1,500 mm above FFL.

11) Main Switch Rooms and Switch Rooms: Provide the following industrial type socket-outlet:

- a) One socket-outlet for general purpose;
- b) One socket-outlet for room A/C unit at HL;
- c) One socket-outlet dedicated for BMS controller at 1,500 mm above FFL;
- d) Two 15A direct connections with isolators for each communications rack, each on a dedicated circuit;
- e) One socket-outlet dedicated for evacuation lighting system controller at 1,500 mm above FFL; and
- f) One socket-outlet dedicated for MATV amplifiers at 1,500 mm above FFL.
- 12) MDF Room: Provide the following industrial type socket-outlets:
 - a) Two 32A direct connections with local isolator switch for each communications rack, each on a dedicated circuit; and
 - b) General power and lighting (including A/C) to be fed from nearest House DB.
- 13) Main Comms / IT Room: Provide the following industrial type socket-outlets:
 - a) Two 32A direct connections with local isolator switch for each headend equipment rack, each on a dedicated circuit; and
 - b) General power and lighting (including A/C) to be fed from nearest House DB.
- 14) Generator Room: Provide the following industrial type socket-outlets:
 - a) One socket-outlet for general purpose; and
 - b) One socket-outlet dedicated for BMS controller at 1,500 mm above FFL.
- 15) Fire Control Room:
 - a) One socket-out for general purpose;
 - b) One 20 A single-phase direct connection for Fire Indicator Panel (essential supply);
 - c) One 20 A single-phase direct connection for Fire Fan Control Panel (essential supply); and
 - d) One 20 A single-phase direct connection for Master Emergency Control Panel (essential supply).
- 16) Sprinkler Valve Room:
 - a) One industrial type socket-outlet for general purpose, mounted at 1,500 mm above FFL adjacent to the entry.
 - b) One industrial type socket-outlet for data gathering panel.
- 17) Sprinkler Pump Room and Fire Hydrant Pump Room:
 - a) One industrial type socket-outlet for general purpose, mounted at 1,500 mm above FFL adjacent to the entry.
 - b) One industrial type socket-outlet for data gathering panel.
- 18) Grease Arrestor Room:
 - a) Provide one industrial type socket-outlet for general purpose, mounted at 1,500 mm above FFL adjacent to the entry.
 - b) Where a DAF system is being used provide a 32 A Three phase outlet.
- 19) Diesel Tank Room and Diesel Pump Room:
 - a) Provide one socket-outlet dedicated for BMS controller adjacent to the pump controller at 1,500 mm above FFL.

20) Specialty Shop:

- a) Provide one socket-outlet and connected to the 20 A RCD protected circuit in the tenant distribution board. Locate the socket-outlet below the tenant distribution board.
- 21) Socket-outlets and Direct Connection:
 - a) All socket-outlets and direct connections shall be 10 A single-phase, and shall be mounted at 150 mm above FFL unless otherwise specified.
 - b) Car parking area: Sufficient number of waterproof socket-outlets for general purpose at approximately 30 m spacing and mounted at 1,500 mm above FFL.
 - c) Car park entrances and exits: One 32 A single-phase direct connection for each roller shutter at car park entry/exit.
 - d) Provision of space for a 63 A single-phase supply, at each house distribution board, for the connection to the car park system.
- 22) Signage (Power Provisions to be broken out separately):
 - a) Interior signage: For each interior illuminated signage, provide one single-phase 20 A singlephase direct connection. Fix the power point on the ceiling or the soffit of the roof. Provide one power point at each mall entry /exit (including carpark) and every 25 m length of the mall.
 - b) Carpark Valet signage: For the valet parking area, allow five 20 A single-phase direct connections for designated valet signage. Exact locations to be confirmed with final valet layout.
 - c) Exterior façade signage: For each exterior illuminate sign allow one single-phase 20 A supply and isolator. If no signs are shown on the drawings allow the following as a minimum: one Scentre Group logo per entry and each building corner, one sign per building face for any Major or Mini-Major tenant.
 - d) Pylon / Car park Signage: For each pylon sign allow a minimum of three-phase 63 A supply and isolator. If no pylons are shown allow one per main car park entry.
 - e) Interactive and Static Directory boards: For each directory board, provide one direct connection. If directory boards are not shown on the Drawings, provide one at each end of the mall and at every junction of malls.
 - f) Display Unit: Provide one 10 A socket outlet (single) for each display unit, allow one per 100 m of mall. House the power point in a floor box of stainless-steel body with water sealed lid (when closed). Connect the socket-outlet to the house distribution board. (The floor box shall be selected to accommodate telecommunication outlets.)
- 23) Water Feature (Power Provisions to be broken out separately):
 - a) A single 63 A three phase supply submain, to board supplied by Mechanical Services Contractor.
- 24) Brand Media Smart Screens:
 - a) Provide as per technical specification by Brand Media in APPENDIX D.

3.8.2 EARTH LEAKAGE PROTECTION

Provide RCD protection for all final sub-circuits in accordance with the requirements of AS/NZS 3000.

3.8.3 CIRCUITING ARRANGEMENT

- 1) Ceiling mounted socket outlets in malls: Allow for these to be on independent circuits and controlled via time clock schedules within the BMS.
- 2) Maximum number of 10 A socket-outlets and direct connections per final sub-circuit:
 - a) Ceiling mounted socket-outlets in malls: 20
 - b) Socket-outlets in malls at low level: 10
 - c) Others: As per AS/NZS 3000

3.8.4 FLOOR BOXES

Where floor boxes are required, the following is to be provided:

- 1) Scentre Group standard Floor Box types are as follows:
 - a) Single Phase Round Floor Box: 3 Power Outlets supplied by ECD (Refer V180725E-D14)
 - b) Three Phase Round Floor Box: 1 32A Outlet supplied by ECD (Refer V180725E-D15)
- 2) All floor boxes:
 - a) Must meet the above specifications (or be an approved equivalent)
 - b) Must have trafficable type lids and have the ability to withstand commercial maintenance and/or access equipment.
 - c) Must be provided with temporary protection during the construction works.
 - d) Shall be IP44 in any areas where they may be exposed to water or maintenance procedures that use water.

3.8.5 HAND DRYERS

- 1) Supply and install of hand dryers to be by the Electrical Contractor.
- 2) Parents Room & Accessible Amenities: Hand dryer to be Dyson Airblade V Electric Hot Air Hand Dryer, Wall Mounted with Nickel finish (or approved equivalent).
- 3) Male & Female Amenities: Hand dryer to be Dyson Airblade Wash and Dry Short/Tall Hand Dryer, with Stainless Steel finish (or approved equivalent).
- 4) Refer to Amenities drawing package for further details (e.g. quantities, locations, etc.).

3.8.6 FITOUT OF CENTRE MANAGEMENT FACILITIES

Provide electrical fitout, including general lighting, emergency escape lighting and exit signs, general power, communications and television system for:

- 1) Concierge Desks
- 2) Centre Stage
- 3) Centre Management Office
- 4) Security Office
- 5) Car Park Office
- 6) Valet Parking
- 3.8.6.1 CONCIERGE DESKS
- 1) Provide the following socket-outlets¹ unless otherwise shown on the Drawings:
 - a) One socket-outlet for work station above bench;
 - b) One socket-outlet for printer above bench;
 - c) One socket-outlet for battery charger under bench;
 - d) One socket-outlet for LAN equipment under bench;
 - e) One socket-outlet for CCTV monitors above bench;
 - f) One socket-outlet for CCTV workstation under bench; and
 - g) One socket-outlet for general purpose above bench.

¹ A socket outlet is defined as a double general purpose outlet (DGPO).

3.8.6.2 CENTRE STAGE

Provide facilities for installing mobile stage lighting and sound reinforcement equipment by the production company. Facilities include:

- 1) Stage lighting and sound system: Allow for two 63 A three-phase 24-pole load centre located adjacent to the stage. The distribution board to be completed with the following supplies:
 - a) Twelve 16 A single-phase double pole RCD circuit breakers.
 - b) Two 32 A three-phase RCD circuit breakers.
 - c) Two 32 A three-phase 5-pin socket outlets.
 - d) Lighting bars and socket outlets for luminaires.
 - e) A connector panel.
 - f) A FOH connection point.
 - g) Wiring.
- 2) Connector panel: Provide a connector panel next to the power supply distribution board. The panel shall be completed with:
 - a) 10 A sockets for stage lighting luminaires; quantity to match the sockets of the lighting plates; and
 - b) A DMX socket for dimmer control.
- 3) FOH connection point: Flush wall mounted with stainless steel plate or fixed in a floor box at location as shown on the Drawings. The following connectors shall be provided:
 - a) A 10 A socket for the mobile control console; and
 - b) A DMX socket for dimmer control.
- 4) Wiring: provide the following:
 - a) Power cables between sockets of lighting plate and connector panel.
 - b) Control cable between DMX sockets at the FOH connection point and connector panel.

3.8.6.3 CENTRE MANAGEMENT OFFICE

Provide a dedicated distribution board sized to suit the requirements as following.

- 1) Provide the following socket outlets unless otherwise shown on the Drawings:
 - a) Conference room: Four socket-outlets for general purpose.
 - b) Managers' offices: One socket-outlet for the workstation and one socket-outlet for general purpose.
 - c) General office: One socket-outlet for each work station, and socket-outlets for photocopiers and print machines.
- 2) Reception:
 - a) Two socket-outlets above reception desk for general purpose; and
 - b) One socket-outlet under reception desk for the work station.
- 3) Kitchen: Provide the following:
 - a) Two socket-outlets for general purpose, one above bench;
 - b) One single-phase 20 A direct connection for hot water unit, location to be decided on site; and
 - c) One 15 A single-phase direct connection to the under bench boiling and chilled water unit.

- 4) Toilets: Provide the following in each toilet:
 - a) One direct connection for hand dryer at 1500 mm above FFL; and
 - b) One single-phase 20 A direct connection for hot water unit, location to be decided.
- 5) Services equipment: Provide socket-outlets for the following building services equipment:
 - a) One socket-outlet for public address control panel Marketing Manager Office;
 - b) One socket-outlet for BMS server Equipment room;
 - c) One socket-outlet for EWIS panel Reception;
 - d) One socket-outlet for fire alarm repeater panel Reception;
 - e) One socket-outlet for traffic counter controller Facility Manager Office/Equipment room;
 - f) One socket-outlet for emergency escape lighting controller Facility Manager Office / equipment room;
 - g) One socket-outlet for LAN patch panel Equipment room; and
 - h) Two 32A direct connections with local isolator switch per communications rack, each on a dedicated circuit.
- 6) Skirting duct: Provide 3-way skirting ducts for wiring in the centre management office. The skirt duct shall be manufactured with heavy gauge anodized aluminium, 150 mm minimum height, and complete with all fittings and accessories.

3.8.6.4 SECURITY OFFICE

Provide a dedicated distribution board sized to suit the following requirements.

- 1) Provide the following socket-outlets unless otherwise shown:
 - a) Two socket-outlets above each desk for general purpose
 - b) One socket-outlet under each desk for the work station
 - c) Two socket-outlets for each CCTV monitoring screen
 - d) Four socket-outlets for general purpose
- 3.8.6.5 CAR PARK OFFICE / WORKSTATIONS

The Contractor is to coordinate and liaise with the Parking and Communications Contractors for all works as required for the fit out of the Car Park Office / workstations in accordance with the below.

Workstation and Screen Layout

Refer to the "SKP-004 Car Park Office Workstation Standard Layout" listed in APPENDIX D.

- 1) Controlled Parking Workstation Control PC / CCTV Pop Up / Intercom.
 - a) Two (2) workstation positions per Car Park Office, with one (1) PC and two (2) monitors per workstation position.
- 2) Car Park CCTV Workstation CCTV Car Park areas monitoring, playback and control.
 - a) One (1) PC and two (2) monitors share between car park operators.
- 3) Westfield Workstation Reporting / Email / Admin (to be provided by SCG IT).
 - a) One (1) PC and one (1) monitor per workstation position.

Electrical Services

- 1) Provide electrical fit-out for the Car Park Office.
- 2) The Contractor is to coordinate and liaise with the Parking Contractor for all works as required for electrical requirements for the Car Park Control Workstations in accordance with the below.

- 3) Provide power and outlets as required to suit the Contractor equipment, wired from the nearest house distribution board. Ensure provisions are made for the following as a minimum unless otherwise shown on the Drawings:
 - a) One socket-outlet for SG monitor above bench;
 - b) One socket-outlet for SG workstation under bench;
 - c) One socket-outlet for printer above bench;
 - d) One socket-outlet for battery charger under bench;
 - e) One socket-outlet for LAN equipment under bench;
 - f) One socket-outlet for each Car Park monitor above bench;
 - g) One socket-outlet for each Car Park workstation under bench;
 - h) One socket-outlet for each CCTV monitor wall mount;
 - i) One socket-outlet for each CCTV workstation under bench;
 - j) One socket-outlet for general purpose above bench; and
 - k) Two socket-outlets for general purpose perimeter wall.
- 4) Refer to "SKP-004 Car Park Office Workstation Standard Layout" and relevant architectural drawings for details.
- 3.8.6.6 VALET PARKING
- 1) Provide fifteen (15) socket-outlets for general purpose and one 20 A Captive Outlet (unless otherwise shown).

3.9 WIRING AND CABLING

3.9.1 GENERAL

- 1) Comply with the following:
 - a) AS/NZS 3000: Electrical installations (Wiring Rules).
 - b) AS/NZS 1668.1: The use of ventilation and air conditioning in buildings Fire and smoke control in buildings.
 - c) AS/NZS 3013: Electrical installations Classification of the fire and mechanical performance of wiring system elements.
 - d) Suspended ceiling space: Thermoplastic insulated and sheathed cable fixed directly to the soffit.
 - e) Plant rooms: Unsheathed cable in heavy duty UPVC conduit, or in tray or in duct.
 - f) Lift machine rooms: Unsheathed cable in metallic conduit.
 - g) Plastered or rendered surface: Cable in UPVC conduit chased into wall.
 - h) Stud walls without bulk insulation: Thermoplastic insulated and sheathed cable.
 - i) Underground: Thermoplastic insulated and sheathed cable in heavy duty UPVC conduit.
 - j) Other exposed areas: Cable in UPVC conduit.
- 2) Tagging: Identify multi-core cables and trefoil groups at each end using stamped non-ferrous tags clipped around each cable or trefoil group.
- 3) Marking: Identify the origin of all wiring using legible indelible marking.
- 4) Cable termination: Terminate copper conductors to equipment using compression-type lugs of the correct size for the conductor. Compress using the correct tool or use soldering.
- 5) Redundant equipment and wiring: Remove redundant equipment and wiring, including that in accessible ceiling space, before commencing the installation of new wiring.
- 6) Handling cables: Avoid damage to cable insulation, serving or sheathing. Replace damaged cables.
- 7) Cable joints: Unless unavoidable because of length or difficult installation conditions, run cable without intermediate straight-through joints. If necessary, all cable joints shall be completed within sealed link boxes, located in accessible positions. Obtain approval from Project Manager for all joints prior to the works, and if approved, must be identified on the Work-As-Executed drawings. The works must be carried out in accordance with the manufacturer's recommendations.
- 8) Excess cables: Allow 10 m excess cables on all submains to tenants for possible future relocation. Coil neatly and mechanically secure the cables in ceiling space above the distribution board.

3.9.2 POWER CABLES

- 1) General: Use multi-stranded copper cable.
- 2) Comply with the following:
 - a) AS/NZS 5000: Electric cables Polymeric insulated.
 - b) AS/NZS 3008.1.1: Electrical installations Selection of cables.
 - c) AS 1746: Conductors Bare overhead Hard-drawn copper.
- 3) Current rating of overload protective devices: As nominated, otherwise based on calculated maximum demand in accordance with AS/NZS 3000.
- 4) Should existing cabling be proposed to be reused, the contractor to undertake any remedial works required to ensure cabling is in full compliance with AS/NZS 3000 and AS/NZS 3008.1 (as a minimum), including any protection upgrades, as may be required.

- 5) EMF: Locate and install cables such that no tenant premises are affected by EMF. Switchboards are to be designed to minimise or eliminate EMF, and be installed to minimise any EMF affecting tenancies. Should the Contractors installation cause levels of EMF in excess of the recommended levels within RHS30 (Radiation Health Series 30) and AS/NZS 61000.6.1, the Contractor will then be responsible for any associated EMF shielding works.
- 6) Default sheathing: V-90
- 7) Minimum size:
 - a) Lighting sub-circuits: 2.5 mm².
 - b) Power sub-circuits: 2.5 mm².
 - c) Sub-mains: 6 mm².
 - d) Vertical transportation earthing conductor: 10 mm².
- 8) Neutral conductor: Provide neutral conductor of same size as the live conductor.
- 9) Rating: Use AS 3008.1 for the determination of current ratings and voltage drops.

3.9.3 BUSDUCTS

- 1) General: Use proprietary type-tested systems made up of integral lengths and fittings containing solid copper busbar conductors and housings, assembled in sections to form complete fully enclosed and insulated low impedance power distribution systems.
- 2) Comply with the following:
 - a) AS/NZS 61439.6: LV switchgear and controlgear assemblies Busbar trunking systems.
- 3) Ratings: Select busduct to meet nominated current ratings and, if used as consumer's mains, to match the statutory authority's substation equipment.
- 4) Neutral conductor: The neutral conductor shall be of same size/rating as the live conductors.
- 5) Degree of protection: For complete assembly, at least the following:
 - a) Indoor use: IP40.
 - b) Weatherproof (partial exposure): IP54.
 - c) Outdoor use: IP65.
- 6) Indoor system accessories
 - a) For current ratings ≤ 400 A: Provide fuse, fuse switch or circuit breaker type plug-in connection boxes. Provide interlocks to enable plug-in boxes to be safely installed or removed on an energised system. Provide plug-in boxes whereby earthing to the busduct housing is achieved before connection of active conductors.
 - b) For current ratings > 400 A: Provide bolt on accessible Tee-off boxes.
 - c) Expansion joints: Provide expansion joints in vertical runs, to allow for expansion and contraction of the busduct system.
 - d) End caps: Provide end caps or covers to fully enclose ends of busduct not connected to equipment.
- 7) Horizontal runs: Support Busduct at maximum intervals of 2 m, using adjustable hangers and steel angle supports. Provide runs that are straight and level. Install hangers at least 300 mm from joint centres. Secure Busduct to angle supports using proprietary clamps.
- 8) Vertical runs: Support Busduct using a combination of fixed and spring type hangers to allow for expansion and contraction of Busduct system.
- 9) Fittings: Use elbows, offsets and junctions for changes in direction. If necessary, provide weatherproof covers and gaskets.
- 10) Busduct system suspensions shall comply with the detailed manufacturers recommendations.

11) Labelling: A Live Services label is to be fitted in a clear visible location at 4,000 mm increments along the full length of busduct. This label is intended to be a visual indicator for Contractors working on or near energised electrical services and to ensure any unintended contact from individuals, tools and construction materials is mitigated.

3.9.4 VOLTAGE DROP

- 1) Voltage drop: Size cables based on the following voltage drop requirements:
 - a) General: The value of current used for calculation of voltage drop shall be the current rating of the circuit protective device.
 - b) Total voltage drop: Allow for a total voltage drop of 7%, and 11% for on-site power generation, in accordance with AS/NZS 3000. The standards of the local supply authority will take precedence where they are the more onerous requirement.
 - c) Voltage drop of consumer mains: Maximum 1%.
 - d) Voltage drop from on-site generator to main switchboard: 5%.
 - e) Voltage drop of final sub-circuits of specialty shops: Allow for 2%.
 - f) Voltage drop of mechanical services installation: Allow for 4% after the mechanical services main switchboard.
 - g) Voltage drop of major tenant's installation: Allow for 4% after the tenant's switchboard.
 - h) Voltage drop of mini-major tenant's installation: Allow for 3.5% after the tenant's switchboard.
 - i) Voltage drop of submains: As required to meet the requirement of total voltage drop.

3.9.5 EARTHING SYSTEM

- 1) General: Provide a complete earthing system for the installation.
- 2) Comply with the following:
 - a) AS/NZS 3000: Electrical installations (Wiring Rules).
- 3) Type: A direct earthing system using driven electrodes.
- 4) Connections: Use clamps to AS 1882 for the connection of the main earthing conductor and interconnecting bonding.
- 5) Earth electrodes: Use copper rod type earth electrodes. Locate earth electrode within a pit having removable cover. Size the pit and cover to allow access for testing, and maintenance.
- 6) Earthing and Equipotential Bonding: In addition to required Earthing arrangements in accordance with AS/NZS 3000, the electrical earthing system shall provide equipotential bonding to:
 - a) All exposed metal parts forming part of this installation. Earth connections to equipment with painted or coated surfaces shall be cleaned to bare metal.
 - b) Metal studs of partitions which contain switches or outlets.
 - c) All metal pipes entering or leaving the building.
 - d) Major internal metal piping systems, such as fire sprinklers, reticulated gas systems, water and the like.
 - e) IT equipment racks and cabinets.
 - f) Pool/Water Feature plant room equipment, pool structure reinforcement, and metal pool fixtures.

3.10 UNDERGROUND SERVICES

3.10.1 PROPOSED INSTALLATION REQUIRMENTS

- 1) General: It should be noted that the default procedure for all proposed installations is to reticulate electrical services using surface mounted conduit, or cable management systems fixed to the underside of slabs. <u>Under NO circumstances shall conduits be cast-in slabs</u>.
- 2) Methods of Installation:
 - a) Services are to be reticulated via surface mounted conduit or cable management systems fixed to the underside of slabs (e.g. suspended slab).
 - b) Conduits reticulated for rooftop services (e.g. car park pole lights) may be run in slab within beams (if water ingress is an issue), subject to approval by the Project Services Manager, or preferably shall be run in ceiling space of the level below, fixed to the underside of slab (where an existing installation is being modified). All conduits shall have an upturn and penetration directly beneath each service with appropriate measures taken to waterproof the slab.
 - c) On-ground concrete slabs are to strictly have conduits installed beneath the slab (e.g. trenching required) with a depth of cover in compliance with AS/NZS 3000. Conduits are to be installed within a "services zone" and run parallel to each other and building grids, instead of using the shortest possible (or diagonal) routes. Access pits to be located within mall areas at every change of direction.
- 3) All works undertaken by the Electrical Contractor are to comply with AS/NZS 3000.
- 4) The Electrical Hazard Identification (EHI) procedure must always be followed. EHI procedure to be completed prior to any works commencing.
- 5) Any request for trenching or coring is to be approved prior to any works being carried out.
- 6) All existing conduits (that are planned to be reused) must be identified to ensure they are intact, not damaged and are to be assessed so that the depth that they are installed at can be confirmed.
- 7) Under no circumstances shall conduits be installed in floor topping or tile beds.
- 8) Under no circumstances shall submains cabling (of all types) be reticulated within column cladding or wall partitions/cavities. Any accemtable general cabling reticulated within column cladding are to be within Heavy Duty PVC (HD PVC) conduit and installed in a straight vertical arrangement, with their location identified at the top of the column or ceiling.
- 9) The Contractor shall provide accurate As-built documentation/drawings showing the location and depth of conduit or cable installations (including number of circuits, cable details, sizes, etc.) as well as a coordination with base building structural elements. These are to be provided in electronic PDF format.

3.10.2 CABLES IN TRENCHES

- 10) Sand bed and surround: Provide clean sharp sand around cables and conduits installed underground.
- 11) Sealing ducts and conduits: Seal buried entries to ducts and conduits using waterproof seals. Seal spare ducts and conduits immediately after installation. Seal other ducts and conduits after cable installation.

3.10.3 CABLE PITS

- 1) Size: Sufficient size for draw-in of cables.
- 2) Construction: Construct walls and bottoms using rendered brickwork or 75 mm thick reinforced concrete. Incorporate a waterproofing agent in the render or concrete.
- 3) Pit covers:
 - a) General: Provide pit covers to suit expected loads. Fit flush with the top of the pit.
 - b) Comply with AS 3996: Access covers and grates.
 - c) Maximum weight: 40 kg for any section of the cover.
 - d) Lifting handles: Provide a lifting handle for each size of cover section.
- 4) Drainage: Provide drainage from the bottom of cable pit, either to absorption trenches filled with rubble or to the stormwater drainage system.

3.10.4 UNDERGROUND CABLE ROUTES

- 1) Survey: Accurately record the routes and depth of underground cables before backfilling.
- 2) Location marking:
 - a) General: Accurately mark the location of underground cables using route markers consisting of a marking plate set flush in a concrete base.
 - b) Location: Place markers at each joint, route junction, change of direction, termination and building entry point and in straight runs at intervals of not more than 20 m.
 - c) Concrete bases: 200 mm diameter x 200 mm deep, minimum.
 - d) Direction marking: Show the direction of the cable run using direction arrows on the marker plate. Indicate distance to the next marker.
 - e) Text: Markers to state 'Electrical Cables Below' or other approved text.
- 3) Plates: Brass, minimum size 75 mm x 75 mm x 1 mm thick. Plate fixing: Waterproof adhesive and 4 x brass or stainless-steel countersunk screws.
- 4) Marker height: Set the marker plate flush with paved surfaces, and 25 mm above other surfaces.
- 5) Draw wire: Provide draw wire for spare conduits.

3.11 ACCESSORIES

3.11.1 GENERAL

- 1) Default mounting heights to centre of accessory plate:
 - a) Outlets: 300mm above finished floor.
 - b) Switches and controls: 1,100mm above finished floor.
- 2) Flush mounting: Provide flush mounted accessories except in concrete or block work walls.
- 3) Common face plates: Mount adjacent flush mounted accessories under a common faceplate.
- 4) Where the number of accessories, in particular switches, is large consider specifying a stainless steel plate as an alternative to plastic.
- 5) Surface mounting: Proprietary mounting blocks.

3.11.2 SWITCHES

- 1) General: Provide switches for isolation and control.
 - a) Type: Single pole, flush rocker or time delay push button type; intermediate or 2-way as appropriate.
 - b) Plate: Moulded plastic flush plate of selected colour. Common plate for grouped switches and associated pilot lights.
- 2) Comply with the following:
 - a) AS/NZS 3133: Approval and test specification Air-break switches.
 - b) AS/NZS IEC 60947.5.5: Low-voltage switchgear and controlgear Control circuit devices and switching elements Electrical emergency stop device with mechanical latching function.

3.11.3 SOCKET-OUTLETS

- 1) General: Provide socket-outlets for general purpose and for permanently connected equipment.
- 2) General purpose plug and socket outlets:
 - a) AS/NZS 3112: Approval and test specification Plugs and socket-outlets.
 - b) AS/NZS 3123: Approval and test specification Plugs, socket-outlets and couplers for general industrial application.
 - c) Type: Switched twin outlets. Industrial type for outlets located in plant room, switch room, pump room, etc.
 - d) Plate: Moulded plastic flush plate of selected colour. Stainless steel plate for outlets located in malls.
- 3) Three-phase outlets:
 - a) Type: 5-pin, switched, high-impact-resistant plastic, weatherproof type with flap lip on the outlet.
 - b) Plug: Provide a matching plug top for each outlet.
- 4) Circuit identification: Provide circuit identification on the inside of the cover plate.

3.11.4 LIGHTING MASTS

- 1) Design: Provide lighting masts of proven design, manufactured and tested by an approved specialist manufacturer, and suitable for installation in the specified environment and location.
- 2) Steel masts: Electro-welded ASTM-A500 Grade C tubing. Minimum yield strength (50,000 psi) after fabrication to AS/NZS 4792.
- 3) Bases: Mounting base shall be manufactured with ASTM-A36 hot rolled steel plate, of minimum yield strength (36,000 psi). Fix mounting base to reinforced concrete footing with hot dip galvanized anchor bolts supplied with two nuts and washers. Anchor bolts shall conform to ASTM-A36, of minimum yield strength 36,000 psi.
- 4) Hand hole: Located 300 mm above the base plate to the centre of the opening. Pole access plate shall be screw fixed with gasket. Poles higher than 6.7 m shall have a re-enforced aperture. House cable connectors (including an earthing lug) and a fuse board inside the hand hole. Provide fuse with enclosed fuse link for individual luminaire.
- 5) Luminaire mountings: Provide adjustable mountings to suit the specified luminaires, and with provision of rigidly clamping each luminaire in position once it is correctly aimed.
- 6) Luminaire lowering facility: For masts higher than 12 m, provide maintenance access to luminaires by a lowering facility with ensured safety to the operator during the raising and lowering operations.
- 7) Wiring: For connections to fuses and luminaires use PVC insulated and sheathed cables of 2.5 mm² minimum conductor size. For masts higher than 3 m, provide a catenary wire cable support system to AS/NZS 3000 for the wiring to luminaire.
- 8) Mast erection: Erect the mast on the footing using steel packers where necessary to install in plumb. After the mast is bolted down, neatly pack the space under the mounting base with sand-cement grout.
- 9) Circuit identification: Provide circuit identification with label of stainless steel plate, engraved with colour infill. Mechanically fix the label to the mast above the hand hole.

4 ACTIVE HARMONIC FILTERING AND POWER FACTOR CORRECTION

- 1) General: To provide combined Active Harmonic Filtering (AHF) & Power Factor Correction (PFC) systems for the power supply system where indicated in the Scentre Group Design documentation.
- 2) Contract documents: The AHFs for the mechanical air conditioning plant will be provided either under the mechanical contract documents or under the electrical contract documents. If the AHFs are included within the electrical contract documents, the AHF will be connected to the main switchboard(s). Confirmation will be required to determine whether the AHFs for the mechanical plant are included within the mechanical contract documents, and if not, make allowance for AHF within the electrical scope of works.
- 3) The AHF and PFC system requirements are as follows:
 - a) Provide AHFs that operate by injecting a 3-phase compensating current equal and opposite in phase, to cancel the harmonics generated by VSDs and other electrical components (e.g. lighting control gear) on the system, that have the potential to generate harmonic distortion.
 - b) Where the AHF equipment has corrected the harmonic distortion, the excess capacity of the AHF shall be used to correct the power factor to as close to unity as the equipment has the capacity to correct.
 - c) Where both AHF and PFC are required, supplementary PFC units using capacitors may be installed when inductive loads are more cost effectively corrected using capacitor technology.
 - d) The AHF is to be in control of the supplementary PFC equipment and shall always be in control of the power quality.
 - e) Provide calculations by means of computer analysis to determine the correct size of active harmonic filters required to compensate fully for the harmonic distortion caused by VSDs.
 - f) Where existing air conditioning plant is being connected to a new main switchboard and there are no VSDs on the air conditioning system, a dedicated PFC system is the correct technology to improve the power factor.
 - g) Provide interface for monitoring by the BMS.

4.1 ACTIVE HARMONIC FILTERING

- 1) The combined Active Harmonic Filtering and Power Factor Correction System shall be designed, manufactured, commissioned and installed to limit the harmonic distortion at each main switchboard in accordance with:
 - a) AS/NZS 61000.3.3
 - b) AS/NZS 61000.3.5
 - c) AS/NZS 61000.3.11
- 2) AHFs to include: Capacitors, inductors, resistors chosen for filter design to be controlled by 6pulse (or higher) thyristor bridge for continuous operation without steps.
- 3) The AHFs shall use instantaneous measurement with:
 - a) Very fast signal processing (using complex algorithms)
 - b) Very fast electronic switching
 - c) Inductive energy storage to produce instantaneous and reliable correction of the harmonic content.
- 4) Current injection: Equal and opposite to the harmonics that have been put onto the system by all of the VSD and other current distorting electrical components.
- 5) Chiller plant: To be supplied with active front end filtering and do not require further filtering to achieve compliance.

6) VSDs: To be installed by the Mechanical Contractor and shall be provided with an average 4% DC link at the VSD, and these filters will provide a minimal level of filtering. The bulk of the filtering shall be implemented at central locations by the AHFs.

4.2 POWER FACTOR CORRECTION

- 1) General Requirement: Where active harmonic filtering is not required (due to the absence of current distorting equipment), provide a power factor correction system to maintain the system power factor between 0.95 and 0.99 lagging under all load conditions. No leading power factor at any time.
- 2) The power factor correction system shall include the following:
 - a) Main isolation circuit breaker if required and busbar tags for the termination of incoming cabling;
 - b) DIN fuses for each step busbar mounted;
 - c) Contactors rated for capacitor duty;
 - d) 50, 25 or 12.5 kVAr capacitor steps;
 - e) Each 50, 25 or 12.5 kVAr step with reactor, contactor and stage fuse to be mounted on a single modular tray to allow easy access and future system expandability;
 - f) Programmable power factor control relay with integral digital power factor indicator; and
 - g) All necessary fuses, flexible wiring using tinned copper and associated equipment for correct functioning of power factor correction system.

4.2.1 POWER FACTOR CORRECTION SYSTEM

- 1) Power factor correction shall be required to maintain the electrical systems power factor at the minimum level required by the electrical utility provider, therfore space provision should be allowed for within the electrical services design.
- 2) Upon project completion, the complete installed electrical system to be measured, commissioned and tested by the electrical contractor, and the results to be presented to Scentre Group for review. An assessment is to be made by Scentre Group to determine if the power factor is sufficient, or whether power factor correction equipment is to be installed (at the nominated switchboards). A provisional sum shall be allowed for to cover the costs associated with the power factor correction/automatic harmonic filter system.
- 3) General
 - a) Provide power factor correction and or harmonic filtering to the system as follows:
 - i) If a part of an embedded network: for the whole power supply system.
 - ii) Otherwise: for house installation only.
- 4) Rating of System: Provide sufficient capacitors which are required to improve power factor to 0.95 lagging (as a minimum) at the rated load of the controlling switch.
- 5) The Power Factor Regulation system will comprise capacitors, inductors, resistors chosen for the filter design and controlled by 6 pulse or higher thyristor bridge for continuous operation without steps.
- 6) Power factor correction unit to have over temperature shutdown, BMS fault alarm output and fan forced cooling.
- 7) Capacitors to have harmonic detuning reactors, installed in a separate chamber from the capacitors.
- 8) Capacitors to have a rated voltage of 525V minimum, be gel filled and metal cased and have a mean life expectancy of at least 25 years.
- 9) Alpes Capacitors are not to be used.
- 10) Or alternatively, provide combined power factor correction and active harmonic filtering for the system.

11) The Combined Active Harmonic Filtering and Power Factor Correction System shall be designed, manufactured, commissioned and installed to limit the harmonic distortion at each main switchboard in accordance with AS/NZS 61000.3.3, AS/NZS 61000.3.5 and AS/NZS 61000.3.11

4.2.2 ENCLOSURE

The power factor correction cabinet(s) shall be manufactured in modules of 600x600x 2175mm high and have the following features:

- 1) Be manufactured from a minimum 2mm sheet steel for indoor cubicles and 2mm Zincseal for outdoor cubicles both being powder coated to a paint thickness of 70 micron.
- 2) Outdoor cubicles to be manufactured to IP54 rating with galvanised base channels.
- 3) Doors to have lift off type hinges and to be locked with quarter turn locks.
- 4) Free standing, front access with top entry. 2 mm thick aluminium cable gland plates shall be provided.
- 5) Have sufficient natural ventilation without forced cooling, unless detuning reactors fitted; Cubicle heat rise test must be available to prove there is no undue heat stress to the capacitors.
- 6) Well ventilated and vermin proof.

4.2.3 CAPACITORS

- 1) Comply with the following:
 - a) IEC 60831-1
 - b) IEC 60831.2
- 2) Type: Dry type with low loss and self healing attributes.
- 3) Automatic overpressure disconnection: Required.
- 4) Capacitance tolerance: Within -5% to +10%.
- 5) Continuous Over Current: 30%
- 6) Over Voltage:
 - a) 10% for 8 hours
 - b) 20% for 5 minutes
 - c) 30% for 1 minute
- 7) Construction: Cylindrical with single capacitor unit per can.
- 8) Dielectric rating: ≥ 525V r.m.s. at 50 Hz selected to accommodate the series reactor voltage.
- 9) Discharge resistance: Required.
- 10) Loss: < 0.5 W/kVAr (low loss type).
- 11) Removal: Arranged to permit removal of faulty module while the remaining capacitors continue to function normally.
- 12) Surface temperature: Rated to achieve < 60°C.
- 13) Terminals: Tunnel or post type.
- 14) Connections between capacitors shall be designed to minimise the transfer of short circuit forces on the terminals.
- 15) Have a design life of 15 years minimum.

4.2.4 CONTACTORS

- 1) Type: Step-switching.
- 2) Utilisation category: for capacitor switching AC-6b (low loss, low inductance capacitance.

- 3) Rating: For capacitor switching duty at \geq 1.5 times the capacitor step full load current.
- 4) Operations: Contactors shall be capable of minimum of 100,000 operations.

4.2.5 POWER FACTOR CONTROL RELAYS

- 1) The cubicle shall be fitted with an automatic power factor control relay. This relay shall include the following features:
 - a) Suitable for connection to 110-440V + 10%, 50Hz, 3 phase, 4 wire supply.
 - b) suitable for connection to a/1A or -/5A, class 1 current transformer installed in the main switchboard.
 - c) minimum 6 stage switching.
 - d) output contact max. rating 8A, AC11 minimum.
 - e) adjustable power factor setting. Range 0.7 inductive to 0.7 capacitive.
 - f) adjustable sensitivity to prevent hunting.
 - g) automatic disconnection of all capacitors in case of power outages of longer than 20ms.
 - h) variable time delay for switching between stages. Programmable from 1s to 18h.
 - i) variable time delay after restoration of power supply to switching in of first stage. Programmable from 1s to 120s or 1min and 120min.
 - j) capable of reliable operation in temperature range of -20°C to 70°C.
 - k) selection of 'manual' or 'automatic' operation.
 - I) the controller shall monitor and control a programmable ambient temperature in the enclosure by switching a cooling fan.
 - m) over-voltage, under-voltage, over-temperature and THD V protection trips.
 - n) flush mounted on door of switchgear compartment.
 - o) indication for energisation of each capacitor stage.
 - p) all possible programmable switching sequences (e.g. 1:1:1, 1:1:2:2, 1:2:2:2, 1:2:4:4, 1:1:2:4, 1:2:4:8, etc. or any other customer programmable sequence).
 - q) programmable switching modes (i.e. linear, circular, progressive, direct, integral, normal).
 - r) integral digital power factor display.
 - s) displayed system parameters to include Volts, Amps, THD A, THD V, kVA, kW kvar, PF and Temperature; plus % THD I, THD V and individual harmonics up to the 49th.
 - t) monitoring of the above parameters with the capability of logging if pre-set minimum and maximum values are exceeded.
 - u) auto-adaptation to phase rotation, and a programmable angular setting to displace the current signal in case the CT is fitted to the incorrect phase.
 - v) be insensitive to harmonics.
 - w) accuracy of better than 1% of full scale.
- 2) The power factor control relay shall be capable of remote control or integration into a BMS system via an RS-232 serial port or RS-485 Modbus Adaptor.

4.2.6 REACTANCE

1) Reactors shall be designed in accordance with AS/NZS 61558 and AS/NZS 60076. Type test certificates are to be available on request.

- 2) The reactors shall:
 - a) be rated for series connection in a detuning circuit tuned to 189Hz, for operation on a 415V, 50Hz supply;
 - b) be three phase, iron core type. To minimise vibration and noise, and to ensure long-life, the core laminations shall be secured with bolts which penetrate the core. The laminations shall not be held by a clamping arrangement;
 - c) be designed with multiple miniature air gaps to minimise straying fields and minimise losses;
 - d) be designed with a $\pm 3.0\%$ tolerance;
 - e) be designed with suitable linearity to prevent saturation during switching such that L = 1.9 x Ln;
 - f) be designed with an allowance for fundamental over-voltage and harmonics over-voltages of V3 = 0.5%, V5 = 6.0%, V7 = 5.0%; V11=3.5% and V13=3%
 - g) have a temperature class of T50/F;
 - h) be designed for application under an average ambient temperature of 50°C;
 - i) be designed such that Ith is rated suitably higher than Irms;
 - j) have fundamental losses of less than 125W;
 - k) be impregnated in resin under vacuum and over-pressure conditions to temperature class H;
 - I) have coil windings of type, aluminium band to minimise losses;
 - m) have terminals of type, copper bars (DIN 46 206);
 - n) be tested in accordance with IEC 76/3 (i.e. core to coil 3.0kV for 1 minute).

4.2.7 INSTALLATION

- 1) Current transformer: Provide a 5 A secondary, 10 VA class 1, PFC current sensing transformer installed in the relevant switchboard.
- 2) Protection: Provide protective devices to grade and discriminate with upstream devices. Individually protect each kVAR step.
- 3) Capacitors
 - a) Insulation: Insulate all live parts.
 - b) Layout: Arrange capacitors for easy removal and replacement.
 - c) Mount capacitors in separate cubicle compartment, segregated from inductors, fuses and switchgear. Cubicles shall have adequate strength to withstand an internal electrical fault. Fire retardant filling material shall be incorporated in the cubicles.
 - d) Ventilation: Separate capacitors by > 25 mm of air space.
- 4) Inductors: Mount inductors in separate cubicle compartment, segregated from capacitors, fuses and switchgear.
- 5) Cubicle
 - a) Enclosure: Rigid sheet metal cubicle with front access, top and bottom cable entries, matching the enclosure of the main switchboard.
 - b) Degree of protection: IP 54.
 - c) Ventilation: Ventilate the PFC cabinet so internal temperature rise is < 5°C above ambient in each cabinet compartment. Provide mechanical ventilation with thermostatic control if necessary.

5 LIGHTING

5.1 GENERAL

- 1) Provide proprietary luminaires complete with lamps, luminaire control equipment, lighting control equipment, and accessories as documented.
- 2) Comply with the following:
 - a) AS/NZS 4783: Performance of electrical lighting equipment.
 - b) AS/NZS 60598: Luminaires.
 - c) AS/NZS 1158: Lighting for roads and public spaces.
 - d) AS CISPR 15: EMC compliance.

5.2 LUMINAIRES

Proposed luminaires shall be Scentre Group Standard Luminaire selections and be identified on the 'Scentre Group Project Luminaire Schedule'.

- 1) All LED luminaires should be supplied with drivers / power supplies / control gear that has been recommended by the manufacturer.
- 2) Where control gear is addressable, a lighting control system capable of addressing the fittings shall be supplied.

5.2.1 ALTERNATIVE LUMINAIRES

- 1) While alternatives may be considered, at the time of tender the Contractor shall base their price on the standard selection identified within the Scentre Group Luminaire Schedule.
- 2) Any offer of alternative luminaires, to those specified in the Project Luminaire Schedule or nominated within Scentre Group Standard Luminaire selections, must be submitted to Scentre for approval, to a maximum of one alternative fitting per scheduled fitting.
- 3) The Contractor shall:
 - a) Provide full details of energy consumption, electrical characteristics, light source, colour temperature, Colour Rendering Index (CRI), lamp life, efficacy, photometric characteristics including polar curves, dimensions, material and finishes of the alternative luminaires
 - b) Provide a comparison table presenting all criteria against the specified product performance. All criteria must be backed with published data and NATA verified IES files
 - c) Declare the benefits (financial, ease of installation or early delivery) of the alternative luminaires.
 - d) Submit samples as required by Scentre.
- 4) Scentre Group has the discretion to accept or not to accept any or all of the alternative luminaires.

5.2.2 LED

To ensure consistency with quality and performance, LED lamps proposed shall meet the following minimum performance criteria:

- 1) Maximum lamp degregation of L70, B10 @ 50,000 hours with TM-21 test data.
- 2) Minimum Colour Rendering Index (CRI) of:
 - a) Indoor Carparks 80+
 - b) General Malls 85+
 - c) Food Areas 90+
- Colour Consistency: Maximum 3-step MacAdam Ellipse or Standard Deviation Colour Matching (SDCM) of 3 or lower.

- 4) Warranties are to be a minimum unlimited of:
 - a. Indoor Carpark 7 years
 - b. External Carpark 5 years
 - c. General Lighting 5 years
 - d. Emergency and Exit Lighting 5 years

5.2.3 BALLASTS, DRIVERS & CONTROL GEAR

- 1) Provide ballasts for lighting systems selected to be compatible with the lamp and control method.
- 2) Comply with AS/NZS 61558.1: Safety of transformers, reactors, power supply units and combinations thereof.
- 3) Where remote ballasts, drivers or control gear are specified, provide suitable mounting in a location which will not compromise the operation of the ballast/control gear. The component must not be left lying on the ceiling surface.
- 4) Provide a driver specifically suited to the LED luminaire including dimming function where required. The driver must be installed in an accessible location. Install to ensure sufficient heat dissipation from product heat sinks. The driver will comply with IEC harmonic standards and will be placed as close as possible to the driven luminaire.

5.2.4 LIGHT POLLUTION

Prevent light pollution into the night sky:

- 1) Direct light beam, generated from within the building or outside of the building boundary, must not be directed at any point in the sky;
- 2) The path of any direct light's angle of incidence directed to the sky must be obstructed by a nontransparent surface;
- 3) The lighting design shall comply with AS4282.
- 4) The outdoor spaces shall not exceed the minimum requirements of AS1158 for luminance levels.
- 5) Pole lights shall not be above 9m of height on roof top areas.
- 6) Pole lights shall not be above 12m of height.

5.2.5 OBTRUSIVE EFFECT OF LIGHTING

- 1) Objective: Control obtrusive effects of lighting in accordance with relevant Australian Standard AS4282.
- 2) Technical parameters:
 - a) Comply with the maximum values of both Ev (vertical illumanance) and I (Level 1 control).
 - b) Application conditions: Pre-curfew.
 - c) Areas: At boundary of commercial and residential areas.
 - d) Critical location: Adjacent properties
 - e) Luminaires: Type C cut-off floodlight fittings are preferred where control of obtrusive lighting is critical.
- 3) Supporting document: Provide the following document to support the proposed measures of control.
- 4) Plans illustrating the geometric relationship between the locations of luminaires and critical locations considered in the design.
- 5) Calculated values of the relevant lighting parameters and other information needed to support the basis of the design.

- 6) Luminous intensity distribution data for the luminaires used and aiming angles adopted in the design.
- 7) Ensure lighting is designed and/or treated to prevent heat build-up and back spill lighting.

5.2.6 LIGHTING FOR ESCALATORS AND MOVING WALKS

Escalators and moving walks are complete with LED lighting in skirtings in compliance with AS1735.5, to be supplied by Vertical Transport Contractor.

Lighting installed above escalators and moving walks must be reviewed and approved by Scentre Group.

5.2.7 LIGHTING TO TRANSITION AREAS

Entry and exit points of car parks, loading docks and any other such area that transitions from a covered space into natural lighting must comply with AS1158/1680. This transition lighting is also to be applied above car park boom gates and/or pay station.

Additionally, any car park area that goes from being covered to uncovered is to be treated as a transition area, regardless of whether or not it is an entry or exit.

5.2.8 EXTERNAL LIGHTING

External lighting and associated transformers are to be IP rated suitable to their proposed purpose, exterior lighting shall have minimum of IP65 rating, with increased rating for submersible fittings to IP68. Due consideration should be given to transformer locations to avoid transformers with high IP ratings, where possible.

Areas where people may walk are to have factory fitted anti-slip glass lens coverings.

5.3 LIGHTING FOR CENTRE MANAGEMENT FACILITIES

5.3.1 GENERAL

Provide general lighting, emergency escape lighting and exit signs for:

- 1) Concierge Desks
- 2) Centre stage
- 3) Centre Management Office
- 4) Security Office

5.3.2 CONCIERGE DESKS

Lighting for Concierge Desks will be primarily served by mall lighting, and with supplementary task lighting as required.

5.3.3 CENTRE STAGE

Provide facilities for installing mobile stage lighting and sound reinforcement equipment by the production company. Facilities include:

- 1) Lighting bars:
 - a) Quantity: Allow 2 off curved lighting bars.
 - b) Position: Over, at the front and sides of the stage.
- 2) Industry standard, 49.4 mm diameter steel lighting bars for luminaires mounting. Fix lighting bars to structure elements securely to support the mounting of at least 12 luminaires per bar.
- 3) Lighting plates: Provide two lighting plates for each lighting bar for connection of luminaires. Each lighting plate shall have four 10 A sockets. Lighting plates shall be close to lighting bar, flush with the wall/ceiling and mounted on standard back box.

- 4) Connector panel: Provide a connector panel next to the power supply distribution board. The panel shall be complete with:
 - a) 10 A sockets for stage lighting luminaires; quantity to match the sockets of the lighting plates; and
 - b) A DMX socket for dimmer control.
- 5) FOH connection point: Flush wall mounted with stainless steel plate or fixed in a floor box at location as shown on the drawings. The following connectors shall be provided:
 - a) A 10 A socket for the mobile control console; and
 - b) A DMX socket for dimmer control.
- 6) Wiring: provide the following:
 - a) Power cables between sockets of lighting plate and connector panel.
 - b) Control cable between DMX sockets at the FOH connection point and connector panel.

5.3.4 CENTRE MANAGEMENT OFFICE

Provide general lighting and emergency escape lighting and exit signs as required and to types as specified under Table 4 Lighting Requirements

5.3.5 SECURITY OFFICE

- 1) Provide general lighting and emergency escape lighting and exit signs as required and to types as specified under Table 4 Lighting Requirements.
- 2) Lighting is also to be designed with such as anti-glare controls as required to ensure that the viewing of the Security Monitors is not compromised.

5.3.6 VALET PARKING

- 1) Provide transition lighting at the carpark drop off and pick up zones, if not shown on the drawings allow 60m2 for each zone.
- 2) Provide general lighting and feature lighting to valet reception, waiting and office areas.

5.4 TRANSFORMERS

- 1) Extra Low Voltage (ELV) transformers
 - a) General: For extra-low voltage tungsten halogen lamps provide one transformer for each
 - b) Type: Electronic with in-built thermal cut-out.
 - c) Transformer regulation: 5%.
 - d) Output voltage: Not in excess of the nominal rated lamp voltage at a load of 75% of nominal transformer rating.
- 2) Neon and cold cathode transformers:
 - a) Type: 240 V single phase, double wound with centre tapping and balanced secondary.
 - b) Provision: 1 transformer for maximum 30 m tube.
 - c) Rating: 15 kV, 30 mA.
 - d) Protection: Provide each transformer with open circuit monitor that opens the supply to the transformer in the case of secondary open circuit.
 - e) Provide local accessible isolation switch at each transformer for disconnection of power to the transformer.

5.5 POWER FACTOR CORRECTION

- 1) General: Provide power factor correction on all luminaires to a minimum power factor of 0.93 lagging.
- 2) Capacitors: To AS 61048 and AS 61049. Rated to temperature within the fitting when continuously operated.
- 3) Integral fuses: Provide integral fuses for high intensity discharge (HID) lamp ballasts.

5.6 INSTALLATION

- 1) General: All luminaires shall be at a minimum, installed to manufacturer installation instructions. Mount luminaires on proprietary supports and brackets using battens, trims, noggings and roses as necessary.
- 2) Suspension:
 - a) Rods: Steel pipe suspension rods fitted with gimbal joints.
 - b) Chains: Electroplated welded link chain.
- 3) Levelling: Adjust the length of suspension rods or chains so that the lighting system is level and even.
- 4) Surface mounted luminaires:
 - a) General: Fit packing pieces to level luminaires and prevent distortion of luminaire bodies. Use packing strips to align end to end luminaires.
 - b) Fixing: For linear luminaries use 2 fixings, one at each end. A single fixing at each end in conjunction with 1.6mm backing plates may be used for narrow luminaires.
- 5) Recessed luminaires: Install recessed luminaries in trimmed openings in the suspended ceiling.
- 6) Lighting tracks: Locate associated low voltage transformers within 600 mm of the track.
- 7) Earth leakage: All light fittings shall have a residual earth leakage current of less than 0.5mA per fitting at all frequencies. Connect a maximum of 30 light fittings to a 30mA RCD protected circuit. Use only RCDs/RCBOs that incorporate a high frequency filter to eliminate high frequencies from ballasts as a source of tripping.
- 8) Wiring and Cabling:
 - a) General: Allow to connect all luminaires to a 10A single plug base socket outlets.
 - b) Flexible cords: Provide recessed luminaires with an external ≥ 1.5 m length of 0.75 mm² 3-core V75 (minimum) PVC/PVC flexible cord, connected to a 10 A 3-pin moulded plug to AS/NZS 3112. Other fittings flexible cord cross sectional area: ≥ 1 mm².

5.7 LIGHTING CONTROL

5.7.1 GENERAL

- 1) The Contractor shall provide a Lighting Control System of one of the following approved types:
 - a) Philips Dynalite
 - b) Schneider Electric Clipsal C-Bus
 - c) DALI Control System
 - d) KNX System
- 2) Lighting shall be controlled by the Lighting Control System (LCS) in accordance with the Lighting requirements Table, lighting controllers to be located in Electrical Switchrooms.
- 3) Provide lighting control panels comprising terminal blocks, relays and contactors for interface with LCS for automatic switching and control.
- 4) Provide an 'AUTO-ON-OFF' panel for each group of lighting controlled by the same control channel.

- 5) Provide local override control points at even intervals through the Mall areas (adjacent entry points) to enable temporary after hours local override for cleaning / security purposes.
- 6) All lighting control components are to communicate via the lighting control system communication network (e.g. DALI, Dynalite, KNX or C-Bus communication network). Non-networked 240V control or switching components are not acceptable.
- 7) Should DALI control gear be supplied as standard with the fittings, a compatible lighting control system shall be used to allow effective control of the fittings.
- 8) All zones are to be able to be represented and controlled seamlessly via the BMS system.
- 9) Commissioning of the lighting control system shall be carried out by an approved systems integrator familiar with Dynalite, DALI, KNX and C-Bus.

5.7.2 CIRCUITING

Minimum circuiting requirements are as follows:

- 1) Provide a minimum of two circuits in any area;
- 2) Amenities, minimum of two circuits for each block;
- 3) Car park lighting circuits, in minimum of two circuits in any area;
- 4) Indoor and outdoor car park zones circuited separately;
- 5) Circuits for different floors/levels;
- 6) Decorative lighting, one circuit for 50 m length of mall;
- 7) Internal signage circuits.
- 5.7.3 SWITCHING ZONES

To minimise energy consumption and to allow for diversity, divide the building into the following different lighting zones so that they can be controlled individually. The zones will be controlled by the LCS.

Minimum zoning is as follows:

- 1) Mall general lighting dimming levels: 25%, 50%, 75% and 100% general lighting with evenly distributed luminaries, additionally each of the following shall be controlled individually:
 - a) Dimming of all LED luminaires.
 - b) Dimming where scheduled on other fittings.
 - c) Decorative lighting.
 - d) Dimming of general lighting for areas under each skylight, via daylight harvesting sensors. Sensors to be located on each side of the skylight, to dim each side down to 20% (ie not off) in response to the daylight levels of the associated daylight sensor. Lighting to dim gradually over a period of 5 minutes.
 - e) Internal signage circuits.
 - f) Security Lighting.
- 2) Amenities: Dimming of lighting to down to 10% after twenty minutes of no activity (controlled by motion detector and LED drivers pre-programmed with dimming capability). On detection of an occupant, lighting is to be 100%.
- 3) Car park transition lighting zones, at entry, exit points and any transition area:
 - a) Controlled to meet AS1680 requirements via local daylight sensor.
- 4) Retail zones: 'Normal trading' and 'extended trading' zones.
- 5) Roof top car park lighting
 - a) From end of normal trading until dawn, set the luminaires at 30% dim to provide adequate security lighting, energy savings and to extend the working life of the installation.

- b) From end of normal trading hours until dawn the luminaires shall be automatically brought up to full design brightness if the movement of vehicles and/or persons is detected. This is to ensure that the lighting design complies with AS1158.3.1 Cat. P11(a)/P12 at all times.
 - i) Program the dimmers to slowly bring up the luminaires to full brightness (over a period of 3 seconds).
 - ii) Program the system to maintain the lighting level for 10 minutes after activity has ceased, and then to fade the lighting to 30% over 5 minutes.

5.7.4 BACK OF HOUSE, CARPARK AND SERVICE AREAS

Wiring and control of these areas is to be designed as follows:

- 1) All fittings to be LED.
- 2) Fittings to be controlled by motion detectors, which on detection of movement will turn on surrounding luminaires (radius 60m), communication either via wireless or lighting control system.
- 3) Lighting to remain 'ON' for 10 minutes after last motion detected, then dim down to 30% over a period of 30 seconds, then stay at 30% indefinitly once no further movement is detected. Lighting is not to turn 'OFF' completely for safety reasons.
- 4) Lighting near perimeter areas open to external:
 - a) To be overridden via local daylight sensor, to prevent activation of the above fitting when adequate daylight is available. <u>As per requirements in Section J.</u>
- 5) Lighting in back of house corridors to be controlled via motion detector located within the corridor. Upon motion detection, lighting to the entire corridor to be illuminated.

This is not to be used in plant rooms, or areas where this control may not be deemed safe or appropriate as determined by Scentre Group.

5.7.5 DALI

Should the contractor use DALI the contractor is to provide a DALI BASIC system for connection to luminaires.

- 1) The DALI system is to be a DALI 5-wire system to provide:
 - a) Power to luminaires;
 - b) Gathering of data from occupancy sensors and for dimming control purposes; and
 - c) Broadcast DALI is acceptable for zone lighting control, although space shall be provided for future provisioning of full addressable DALI.
- 2) Provision is to be made for a central dimming control system(s) for the control of the DALI luminaires.
- 3) A full DALI interface, complete with a Graphical User Interface, is to be provided to allow for easy control and reprogramming of all the DALI light fittings.

5.7.6 SECURITY LIGHTING

- 1) 24-hour security lighting shall be provided for the following, via dimming of all fittings:
 - a) Malls;
 - b) Covered car parks;
 - c) Indoor loading docks; and
 - d) Passages, corridors and stairs.
- 2) Night time security lighting circuits for the following, using fittings of general lighting, to provide sufficient light for safe movement:
 - a) Outdoor and roof car park;

- b) Outdoor loading dock; and
- c) Perimeter of building.

5.7.7 INDIVIDUAL/LOCAL CONTROL

Provide individual control of types and to areas as noted following:

- 1) Generally Local manual switch:
 - a) All fittings to be LED.
 - b) Provide local manual switch for plant rooms adjacent each access door.
 - c) All local control (switches and control devices) to be connected to the lighting control system network, 240V control devices are not acceptable.
- 2) At any change in floor level (e.g. step, ladder, etc.).
- 3) The following fitting should be provided in addition to the general/switched lighting within the room, this fitting should not be used in calculation of the lighting level within the space.
 - a) Fittings to be LED.
 - b) A fitting that will have an individual motion detector, which on detection of movement will turn on the luminaire.
 - c) The luminaire is to remain "ON" for 10 minute after last motion detected before turning "OFF".

5.7.8 CABLING AND NETWORK EQUIPMENT

5.7.8.1 GENERAL

- 1) The structured cabling system and network infrastructure are to be used as the communications path for all non-essential life safety services.
- 2) The Contractor is to provide their own horizontal structured cabling system between any field devices (e.g. Lighting control panels and such) and the nearest IT equipment rack (Edge Termination Point) comprising of the following:
 - a) Horizontal copper CAT6 cabling
 - b) Termination RJ45 jacks and connectors
 - c) Patch Panels
 - d) Patch Cables (fibre and copper) as required
 - e) Cable management systems
 - f) Cable labels
- 3) Test and terminate both ends in compliance with cabling regulations/standards and cabling manufacturers requirements for full 20 year manufacturer's warranty.
- 4) The Contractor is to utilise the same manufacturer/brand of Structured Cabling as the Communication Services to achieve consistency. Liaise with the Communications Contractor to ensure the correct cabling is used.
- 5) Provide detailed labelling on the cabling and patch panels to clearly highlight which individual contractor are utilising the patch panel, port and IT equipment rack (Edge Termination Point).
- 6) All cables are to be provided on support systems and must comply with the Installation requirements of this specification.
- 7) All cabling systems shall meet AS3080 and AS/ACIF, S009:2006 cabling requirements.

5.7.8.2 NETWORK SWITCHES

1) The BMS shall utilise the SCG's CSN for all network connections between IP devices (e.g. controllers, gateways and servers).
- 2) CSN network equipment to be provided by SCG IT.
- 3) Contractor is to allow to coordinate with SDC / SCG IT for numbers and locations of all IP devices requiring network switches for connections to the CSN.
- 4) The Contractor is to assist SCG IT with installation, patching and commissioning of CSN network equipment on site, such as site and room access, ladder for high level areas, and troubleshooting of any network connectivity issues relating to structured cabling

5.8 STANDARDS

Implement the lighting design based on the following criteria, in conjunction with the project brief and any guidance documentation provided:

Location ²	Illuminance	Uniformity	Reference Standard		Switching		Luminaire	Comments
	Lux (Average)	Min/Average		LCS	Local	Sensor/ Timer Override		
Mall open space	200	0.3	AS/NZS 1680	~			Refer schedule	
Mall open space (Adjacent day lit spaces)	400	0.3	AS/NZS 1680	~			Refer schedule	Lighting to integrate with daylight controls
Circulation areas	150	0.3	AS/NZS 1680	~			Refer schedule	
Public corridors	150	0.3	AS/NZS 1680	~			Refer schedule	
Service corridors	100	0.3	AS/NZS 1680			~	Refer schedule	
Security Lighting	20 (50 Max)		AS/NZS 1680	~			Uses general lighting fittings	24 hour operation
Restrooms/ Amenities	150	0.5	AS/NZS 1680	~			Refer standard amenities drawings.	
Signage	NA			~			Refer to Signage Package and TSPS.	Compliance to local council district planning and bylaws for spill light and ensure spill light is contained within the site boundary
Main entrance	400	0.5	AS/NZS 1680	~			Refer schedule	
Other public entrances/ transition spaces	400	0.5	AS/NZS 1680	~			Refer schedule	
Pedestrian ramps	150	0.5	AS/NZS 1680	~			Refer schedule	
Mall decorative	N/A		AS/NZS 1680	~			Refer schedule	
Centre management work spaces	340	0.7	AS/NZS 1680		~	~	Refer schedule	Measured at 0.7m.

² Levels are maintained averages and are measured at floor level unless otherwise stated in AS/NZS Standards which should take preference, while at the same time considering ESD requirements and Part J of NCC Compliance

Location ²	Illuminance	Uniformity	Reference Standard	Switching		Luminaire	Comments	
	Lux (Average)	Min/Average		LCS	Local	Sensor/ Timer Override		
Store rooms	150	NA	AS/NZS 1680			~	Refer schedule	
Accessible Plenums	40	NA			~		LED fittings complete with diffuser	
Stairs	180		AS/NZS 1680			✓	Refer schedule	
Lift lobbies	250	0.4	AS/NZS 1680	~			Refer schedule	
Plant rooms	160	0.5	AS/NZS 1680		~		LED fittings complete with diffuser	Local Switching
Switch rooms	160	0.5	AS/NZS 1680		~		LED fittings complete with diffuser	Local Switching
Gas room/ Grease Trap Room	160	0.5	AS/NZS 1680		~		Lighting for hazardous areas	Classification of room required. Compliant switch to be located outside of room
Loading dock	180	0.5	AS/NZS 1158	~				With 40lux vertical illumination
Car park indoors	80	0.4	AS/NZS 1158/1680	~				IP56 rated LED fitting
Car Park Transitions (Entry/Exit)	800-160		AS/NZS 1158/1680	~		~		IP56 rated LED fitting
Car park Outdoors			AS/NZS 1158	V			LED fittings complete with diffuser	Ensure spill light is contained within the site boundary. Back light integral shields to be used where applicable Design must demonstrate vertical illuminance
Car park Rooftop			AS/NZS 1158	~			Refer to lighting schedule	Ensure spill light is contained within the site boundary. Back light integral shields to be used where applicable Design must demonstrate vertical
Car park car wash boundary	300		AS/NZS 1158	✓ ✓	✓			Illuminance Local switching for increased light levels during operating hours
External pathways / Terraces	14 (P7)		AS/NZS 1158	~			LED fittings complete with diffuser	Lighting to category P6 Design must demonstrate vertical illuminance

SCENTRE GROUP

Location ²	Illuminance	Uniformity	Reference Standard		Switching		Luminaire	Comments
	Lux (Average)	Min/Average		LCS	Local	Sensor/ Timer Override		
Street frontage	200		AS/NZS 1158	~			LED fittings complete with diffuser	Compliance to local council district planning and bylaws for spill light and ensure spill light is contained within the site boundary
Facade	NA		AS/NZS 1158	~			LED fittings complete with diffuser	Compliance to local council district planning and bylaws for spill light and ensure spill light is contained within the site boundary
Landscape	NA		AS/NZS 1158	~			LED fittings complete with diffuser	Ensure spill light is contained within the site boundary
Private Roads	P3 and V4		AS/NZS 1158				LED fittings complete with diffuser	Compliance to local council district planning and bylaws for spill light and ensure spill light is contained within the site boundary

Table 4: Lighting Requirements

6 EMERGENCY ESCAPE LIGHTING AND EXIT SIGNS

6.1 GENERAL

- 1) Provide effective emergency escape lighting and exit signs in compliance with AS/NZS 2293 and the NCC, to alleviate panic and to permit safe evacuation of the building occupants.
- 2) Reflect the NATA Certified C0 and C90 ratings of all emergency escape and exit luminaires on all submissions and shop drawings.
- 3) Issue emergency lighting and exit signage drawings to the Building Certifier for approval.
- 4) Comply with the following:
 - a) AS/NZS 2293: Emergency lighting and exit signs for buildings.
 - b) AS/NZS 60598.2.22: Luminaires Particular requirements Luminaires for emergency lighting.
- 5) Certification: Certify all luminaires by a NATA registered agent.

6.1.1 SYSTEM REQUIREMENTS

- 1) For base building areas (e.g. malls, amenities, car parks, back off house, stairwells, corridors and all non-lettable areas):
 - a) Provide a centrally monitored addressable system with self-contained single point luminaires, connected back to a central headend.
 - b) All new exit and emergency lighting systems shall be a Clevertronics Zoneworks XT HIVE system, or an equivalent that has been reviewed and approved by Scentre Group.
 - c) All emergency lighting units are to be standalone, not intergrated with general light fittings.
- 2) For shops and mini-majors:
 - a) Provide a single point, non-monitored self-test emergency lighting system (Clevertronics Selftest system or equal) within each shop and mini major. The self-test fittings shall automatically discharge every 6 months and provide a pass / fail indication.
 - b) In addition to the self-testing luminaires, the fittings shall be wired back to a test switch at tenant's shop distribution board and must comply with AS2293.
 - c) No alternate system for shops or mini-majors will be accepted or considered unless of an identical design and type (to be approved by SDC).
- 3) Major tenants shall provide their own Emergency Lighting and Illuminated Exit Signage systems which shall not interface with the base building system. If the Major tenants' system utilises a central monitoring platform, it shall be stand-alone system located within their allocated tenancy space (and to their preferred specifications).
- 4) At the time of tender the Contractor must provide the supplier details for the selected systems that have been proposed for a Scentre Group project to obtain preferred rates.

6.1.2 LUMINAIRES

Unless otherwise shown on the drawings, select luminaires based on the following:

Area	Туре	Mode of operation
Malls, offices, areas with suspended ceiling	Recessed LED with remote power pack	Non-maintained
Passages, plant rooms, areas without suspended ceiling	Surface mounted LED in surface mounted rectangular enclosure	Non-maintained
Covered car park & loading dock	High Output LED IP Rated (D50 classification) in surface mounted rectangular enclosure	Non-maintained

Table 5: Emergency Luminaire Selection

6.1.3 BACKBONE CABLING

If appropriate, connect the emergency escape lighting and exit signs to a dedicated pair of the Building Services LAN backbone optical fibre cables or Ethernet network for communication back to the Centre Management Office.

6.1.4 LIFT INSTALLATIONS

Emergency escape lighting and exit signage for lift machine rooms, lift wells and lift cars shall be provided for the Vertical Transportation Contractor. These fittings shall be compatible with the existing base building system and connect the monitoring system to the junction at the machine room/space for interface.

6.1.5 EXIT SIGN MOUNTING

Whilst full compliance with AS 2293 is required, the following is provided to assist the Contractor.

- 1) Exit signage for mall areas:
 - a) Mounting height: Maximum 2.7 m above floor (unless approved otherwise). Provide decorative wiring enclosure to wiring to the signs.
 - b) Dimensions: Suitable for viewing distance of 36 m / 24 m, unless specified otherwise.

6.1.6 **PROVISION FOR TENANTS**

1) Lessor Tenancy Services and Provisions Schedule (TSPS) Exceptions:

- a) This exception applies to Specialty tenancies only: The emergency lighting and exit signage provisions are to be as per the quantities noted in this section (below) of the Project Specification, not the allowances indicated in the TSPS.
- b) Shops:
 - i) Design Only: Unless otherwise shown on the drawings, allow 2 recessed ceiling mounted LED emergency escape lights as a minimum for each specialty shop, but in any case comply with AS2293.
 - ii) Pricing Allowance: In the event that the number of lights in a tenancy is in excess of 2, in order for the design to comply and obtain the Construction Certificate, the Contractor is to allow within their price for the supply of 2 lights only.
- c) Mini Majors: Allow emergency escape lighting and exit signs and as required to comply with AS2293 to an open plan layout.

6.2 SINGLE-POINT SYSTEM

- 1) Emergency Luminaires: Energy efficient high power LED
 - a) Visual indicator lights: Provide the following LED indicators:
 - i) Battery charging.
 - ii) Monitoring system in operation.
- 2) Exit Signs: LED luminaires
 - a) Visual indicator lights: Provide the following LED indicators:
 - i) Battery charging.
 - ii) Monitoring system in operation.
- 3) Inverter system: Provide protection of the inverter system against damage in the event of failure, removal or replacement of the lamp, while in normal operation.
- 4) Local test switches: Provide a momentary action test switch, accessible from below the ceiling, on each luminaire to temporarily disconnect the mains supply and connect the battery to the lamp.

5) Common test switches: Provide a common test switch on the local distribution board that disconnects main supply to the luminaires.

6.2.1 POWER FAILURE DETECTION

Provide power failure detection modules to monitor local lighting circuits in each distribution board to initiate emergency lighting system.

6.2.2 BATTERIES

- 1) General: Use lithium batteries capable of operating each lamp at its rated output continuously at least 2 hours during acceptance tests and 1.5 hours during subsequent tests.
- 2) Battery life: At least 5 years when operating under normal conditions, ambient temperature and subjected to charging and discharging at 6-month intervals.
- 3) Marking: Indelibly mark each battery with its date of manufacture.
- 4) Battery charger: 2-rate or variable rate, constant current, constant voltage, and temperature compensated type, with automatic selection of boost and float charging rate.

6.2.3 EXIT SIGNS

- 1) Type: Standard internally illuminated with pictorial elements.
- 2) Light source: LED.
- 3) Pictorial elements: Figure, and directional arrow when it is appropriate.
- 4) For use in car parks, loading docks and for outdoor application: With robust, rustproof housing manufactured from high impact, self-extinguishing, non-corrosive, glass filled polycarbonate material, IP65 protection rating.

6.3 MONITORING SYSTEM

- 1) Type of system: Power line carrier system or wireless system.
- 2) Comply with the following:
 - a) AS/NZS 2293: Emergency lighting and exit signs for buildings.
- 3) System functions: Provide the following minimum functions:
 - a) Perform testing procedures on luminaires; report on lamp status, battery status, and charge and discharge currents.
 - b) Display and initiate printing of test results.
 - c) Maintain a testing database.
 - d) Generate logbook.
 - e) Continuous monitoring and diagnosis of communication network.
 - f) Generate audible alarm in situation of fault.
 - g) Automatic addressing of luminaires during installation and subsequent alteration.
 - h) Graphical display of individual luminaires and their address identification, use the AutoCAD architectural layouts for the graphic.
- 4) Luminaires: Addressable type, with 32-bit address, with communication status indicator.
- 5) Central controller: Provide the following minimum functions:
 - a) View system and luminaires status.
 - b) User friendly window compatible software.
 - c) Password protected operation.

6) There shall only be one emergency monitoring system in each centre. The system shall be monitored from a central base building headend, and where any new luminaires are added to an existing system, they shall match the make/model of the existing system.

6.4 INSTALLATION

- 1) Fixing:
 - a) Wall mounted: With or without bracket of steel tube powder coated white finish.
 - b) Ceiling mounted: With dual steel tubes of powder coated white finish.
 - c) Outdoor: Weather-proof luminaire mounted on hot dip galvanised steel pole for outdoor application.
- 2) Identification of luminaires: For addressable systems, label each luminaire to identify the address of the luminaire. The address must be the same as that shown on the as-installed drawings and on the graphic display of the central control unit.
- 3) Power supply to single-point system: Provide 240 V unswitched active supply to each luminaire and exit sign, connected to the nearest local lighting final sub-circuit.

7 STANDBY POWER SUPPLY SYSTEM

7.1 GENERAL

- 1) General: Provide a standby power supply system comprising factory designed, assembled and tested generating set, fuel tanks and fuel transfer systems.
- 2) Comply with the following:
 - a) AS/NZS 3010: Electrical installations Generating sets.
 - b) AS/NZS 4509: Stand-alone power systems.

7.2 GENERATING SETS

1) General: Provide low noise, low emission and high efficiency generating sets comprising engine, alternator, control and indicating instrument.

7.2.1 GENERATOR

- 1) Comply with the following:
 - a) AS/NZS 3010: Electrical installations Generating sets.
- 2) Capacity: The standby generator shall have the capacity to meet the following minimum requirements:
 - a) Essential Services.
 - b) Lighting and power of fire control room.
 - c) Lighting and power for Centre Management Office, Security Office, and other centre management facilities.
 - d) 50% mall general lighting.
 - e) Car park ventilation fans.
 - f) Smoke Fans (only if required by FER).
 - g) 50% lighting of covered car parks.
 - h) One passenger lift per bank (including goods lift banks).
 - i) The entry roller doors and loading dock roller doors.
 - j) Any other essential fire services or requirements of the Fire Engineering Report.
 - k) Critical infrastructure (including but not limited to pumps, DAF Units, wet wells, etc.)
- 3) Transfer switch: Provide transfer switches such that:
 - a) In situation of power failure, the standby generator will start automatically;
 - b) After 10s-time delay, designated loads will be transferred automatically to the standby generator;
 - c) If fire alarm is also activated, the standby power supply can be manually transferred from the non-essential circuits to the essential circuits; and
 - d) After restoration of normal power for a minimum of 5 mins, electrical loads will be transferred back from the standby generator; the standby generator will automatically shut-down.
- 4) Prime Power (PRP) Rating for varying electrical load for unlimited hours to ISO 8528, with 10% overload capability in accordance with ISO 3046.
- 5) Specification:
 - a) Electrical output: 230/400 V a.c. 50 Hz star connected with neutral terminal.
 - b) Excitation: Permanent magnet.
 - c) Number of poles: 4.

- d) Construction: Single bearing, close coupled.
- e) Insulation: Class H.
- f) Voltage waveform: < ± 5%.
- g) Random frequency variation: $< \pm 0.25\%$.
- h) Voltage regulation: $< \pm 0.5\%$).
- i) Harmonic distortion: < 5% no load to full linear load, < 3% for any single harmonic.
- j) Temperature rise: 150°C.
- k) Winding temperature detectors: Provide.
- I) Anti-condensation space heater: Provide.
- m) Enclosure Classification: Drip proof IP22 in accordance with AS60529 (minimum IP23 for generator set intended for outdoor use).

7.2.2 DIESEL ENGINE

- 1) Comply with the following:
 - a) AS 4594: Internal combustion engines.
- 2) Specification:
 - a) Engine type: 4-stroke, spark ignition.
 - b) Aspiration: Turbocharged and low temperature after-cooled.
 - c) Fuel type: Grade A1 or A2 distillate fuel.
 - d) Fuel system: Direct injection.
 - e) Governor: ISO 8528 Part 1 Class G3.
 - f) Cooling system:
 - i) Integral set-mounted radiator cooling/remote radiator cooling/heat exchanger cooling.
 - ii) Rated ambient temperature: 40°C.
- 3) Accessories:
 - a) Fuel filter: Spin-on fuel filter with water separator.
 - b) Oil filter: Spin-on combination full flow and bypass filter.
 - c) Air cleaner: Dry disposable type.

7.2.3 GAS ENGINE

- 1) General: Low exhaust emission.
- 2) Specification:
 - a) Engine type: 4-stroke, spark ignition.
 - b) Aspiration: Turbocharged, low temperature after-cooled.
 - c) Fuel type: Low pressure natural gas.
 - d) Governor: ISO 8528 Part 1 Class G3.
 - e) Oil filter: Full flow and bypass filters.
 - f) Breather filter: Provide.
 - g) Cooling system: Water cooled with remote radiator or heat exchanger.

7.2.4 CONTROL

- 1) General: Provide a microprocessor-based control panel for simple and user-friendly interface and navigation.
- 2) Operation: Provide automatic and manual modes to start and shut down generating sets in the selected sequence.
- 3) Emergency engine shutdown: Provide for the following conditions to register as audible and visible alarms and to cause each generating set main circuit breaker to open immediately and each generating set to immediately shutdown:
 - a) Emergency stop push-button: Pressed.
 - b) Generating set: Over voltage.
 - c) Generating set protection: Activated.
 - d) Generating set: Over current.
 - e) Engine overspeed.
 - f) Engine oil pressure: Low.
 - g) Jacket water temperature: High.
- 4) Automatic load transfer: Upon mains power failure, the automatic transfer switches will transfer the loads from mains supply to the standby power supply in a pre-programmed sequence after the standby generator has reached its stable operation state; and vice versa after restoration of mains supply.
- 5) Generator controller to incorporate a PLC for load shedding control where necessary.
- 6) Generators connected in parallel:
 - a) Load sharing: Share the load in proportion to their rated kW and kVAR capacities.
 - b) Automatic synchronising: Provide synchronising modules that automatically synchronise each incoming alternator supply frequency and phase angle to the busbars.

7.2.5 BATTERY AND CHARGERS

- 1) General: Provide the following:
 - a) Starting motor(s).
 - b) Floor standing batteries with rack with hold down.
 - c) Battery chargers.
 - d) Charging alternator.
- 2) Comply with the following:
 - a) AS 2149: Starter batteries Lead-acid.
 - b) AS 4044: Battery chargers for stationary batteries.

7.2.6 ENCLOSED SET

- 1) General: Self-contained generating set for outdoor installation, complete with:
 - a) Factory integrated container with internal acoustic insulation.
 - b) Acoustic baffles of air inlet and outlet.
 - c) Access doors with stainless fittings.
 - d) 24 V lighting with timer control.
 - e) Fuel tank.
 - f) Residential grade silencer.

- g) Ventilation: Provide ventilation to the enclosure so that:
 - i) With generating sets running at full rated output the enclosure temperature rise does not exceed 10°C.
 - ii) Hazardous concentrations of toxic or explosive fumes and gases are prevented.
- h) Steel base with anti-vibration mounting.
- i) Noise control shall be provided to ensure compliance with the EPA and any local council D.A conditions.

7.2.7 INSTALLATION

- 1) Mounting: Mount the engine and alternator units on a common structural steel frame to support the generating set assembly and the engine local control board.
- 2) Plinths: Provide reinforced concrete plinths for floor mounted equipment, sized to suit equipment footprints.
- 3) Resilient mounts: Provide resilient mounting blocks with a minimum vibration isolation efficiency of 95%.
- 4) Signs:
 - a) Warning: Provide the following on each side of each generating set:
 - i) 'WARNING: This set may start at any time without notice'.
 - ii) Lettering: 50 mm high, red on white background.
- 5) Drip trays: Provide removable drip trays under those parts of the assembly where fuel or lubricant leakage may occur. Provide overflow outlet pipes taken to a point where a receptacle can be fitted under the pipe outlet.
- 6) Emergency stop push-buttons:
 - a) Generating set < 2 m long: Provide one push-button mounted on the control panel. Other generating set: Provide 2 push-buttons per generating set including one on the control panel.
 - b) Type: 40 mm diameter red, palm operated type mounted in a metal wall box fixed to a free standing 'U' channel pedestal. Wire to disconnect the generator and immediately shut down the engine when the controls are in the automatic or manual mode.
- 7) Fuel connections: Provide stop valves on the fuel connection.
- Cooling system: Provide a complete cooling system consisting of radiators / heat exchanger, fans and pumps. Provide ductwork for air intake and discharge of warm air to an outside location of the building.
- 9) Engine air intake:
 - a) Filters: Provide dry type air intake filters of sufficient capacity to permit continuous engine operation for 200 hours before filter servicing becomes necessary. Provide filter manometers.
 - b) Fans: Provide a supply air fan if necessary, selected for the installed system air pressure drop. Include power absorbed by the fan under site operating conditions when calculating generator output.
 - c) Duct work to comply with AS 4254.
- 10) Exhaust system:
 - a) General: Provide exhaust piping from the engine complete with silencers, piping, ductwork, support and expansion devices.
 - b) Exhaust piping: Grade 321 stainless steel.
 - c) Diameter: Match engine exhaust manifold connection.
 - d) Connection: Provide flanged connections to silencers and pipe interconnections.

- e) Vibration isolation: Provide a stainless steel flexible connection to the engine.
- f) Weather-proofing: Provide weatherproof flashing, sleeves and acoustic seals where the exhaust system penetrates the roof or external walls.
- g) Exhaust drainage: Grade the exhaust line away from the engine to drainage pockets, or connect to a suitable drainage outlet.
- h) Lagging: Lag externally exhaust piping and ductwork using 50 mm calcium silicate insulation, sheathed with zinc-coated steel sheet.
- i) Acoustic treatment: If necessary, provide acoustic treatment to the generator set and the generator room to meet the acoustic requirement of the EPA and any local council D.A conditions.

7.3 FUEL SYSTEM

- 1) Comply with the following:
 - a) AS 1692: Steel tanks for flammable and combustible liquids.
 - b) AS 1940: The storage and handling of flammable and combustible liquids.

7.3.1 DAILY SERVICE TANK

- 1) General: Provide a daily service tank with every generator.
- 2) Minimum capacity: Adequate for the generator to run continuously at full load for 8 hours.
- 3) Construction: Welded construction reinforced around the top edge. Provide a lid fabricated from zinc-coated steel 0.8 mm thick with rolled edge.
- 4) Tank stands: Provide a welded frame stand at least 900 mm high, fabricated from mild steel angle.
- 5) Collection trays: Provide a collection tray fabricated from zinc-coated steel sheet 0.8 mm thick, with a 50 mm upturn and rolled edge.
- 6) Controls: Provide liquid level switches set to start the liquid transfer pump at low liquid level (half full), and cut the pump out at high level (full).
- 7) Provide low level alarm and initiate shutdown of generator to avoid engine stalling and required bleeding of diesel fuel.

7.3.2 MAIN FUEL TANK - GENERAL

- 1) Design: Design tanks to accommodate the static heads equal to the height of the vent pipe above the tank.
- 2) Fittings: Provide the following:
 - a) Personnel access.
 - b) Fill connection with internal pipe connection.
 - c) Dipstick indicating system.
 - d) Suction connection, complete with internal pipe, check valve and anti-vortex device.
 - e) Return connection and internal pipe.
 - f) Remote contents gauge connections.
 - g) Drain connection for above ground tanks.
 - h) High and low level alarms.
- 3) Contents indicators:
 - a) Dipsticks: Form from brass section or anodised aluminium extrusion, with the bottom 100 mm coated with nylon or equivalent non-conducting coating. Stamp or engrave calibrations at intervals of not more than 5% of nominal tank capacity.

- b) Contents gauges: Provide a remote-reading contents gauge and connect to a magnetic base balance chamber in the fuel tank, via a fuel-resistant plastic or neoprene pipe. Locate the gauge next to the filling point.
- 4) Tank supports: Locate supports close to the ends of the tank. Provide doubling plates (120° coverage) fixed to the underside of the tank, of the same material and thickness as the tank. Form box type stools from 6mm mild steel plate, and weld to the doubling plates. Make provision for tank expansion.
- 5) Finish: Preparation: Blast clean steel tanks and associated steel work, including holding-down bolts and strips, to Class 22, and apply coating systems within 4 hours of blast cleaning.

Туре	Coating System
Underground tank	Tar free high build polyamide cured epoxy. Minimum coating thickness: 200 mm
Above ground tank	Inorganic zinc silicate to GPC-C 29/8, following by polyurethane to GPC-C-29/11
Tank enclosed in chamber	Inorganic zinc silicate to GPC-C-29/8
Service tank	Inorganic zinc silicate to GPC-C-29/8

Table 6: Main Fuel Tank – Finish Coating

7.3.3 UNDERGROUND FUEL TANK

Installation of underground tanks shall be in accordance with the manufacturer's recommendation, but in general shell be as follows:

- 1) Excavation and backfilling: Keep excavations free of surface water. After placing the tank, backfill with sand.
- 2) Sand backfilling:
 - a) General: Use chemically inert sand, free from foreign matter such as salt, organic matter and clay lumps, and graded.
 - b) Placing: Place sand backfilling in layers not more than 200 mm thick and compact to a minimum density index of 75% when tested to AS 1289.5.6.1.
- 3) Ballasting: If ballasting is necessary to prevent floatation, fill the tank with water before backfilling. Provide a concrete ballast collar at least equal to the weight of the full tank.
- 4) Trench cover: Provide covers for fuel pipe trenches in concrete floors, of 6mm thick mild steel chequer plate, cut to fit floor trench rebates, galvanised after fabrication.

7.3.4 CATHODIC PROTECTION

- 1) Comply with the following:
 - a) AS 2832.2: Cathodic protection of metals Compact buried structures.
- 2) System: General: Provide a cathodic protection system for underground tanks, using an impressed current, designed and installed by a cathodic protection specialist.
- 3) Characteristics: Provide the following:
 - a) Monolithic insulating couplings in the suction, vent return and fill lines immediately next to the tank.
 - b) Power supply, anodes and interconnecting wiring, incorporating a facility for periodic testing.
 - c) Insulation to the return connection.
- 4) Power supply: Provide solid state regulated D.C. power supply with balanced outputs and ammeter.

7.3.5 PIPING

1) Pipes inside tank: Heavy steel pipe to AS 1074

- 2) Filling and service piping:
 - a) General: Galvanised medium steel pipe to AS 1074.
 - b) Filling: ≥ DN 75.
- 3) Services: ≥ DN 25.
- 4) Joints for steel piping:
 - a) Joint sealing: Seal threads of permanent joints using litharge and glycerine. Make demountable joints using soft jointing compound.
 - b) Comply with AS 1722
- 5) Cleaning: Flush out piping with fuel, only when the system is complete.
- 6) Underground piping: Temporarily support the piping in the trench before backfilling. Provide at least 150 mm of backfilling all around piping.
- 7) Gradients: Lay piping to permit self-draining and avoid air locking, and to the following minimum gradients:
 - a) Fill pipe: 1:50 down in the direction of flow.
 - b) Gravity return pipe: 1:100 down in the direction of flow.
- 8) Corrosion protection: Paint ends of pipes and joints with cold galvanise paint.
- 9) Valves and fittings:
 - a) Provide a check valve and a gate valve at the filling point, and a vertical check valve at the suction connection.
 - b) Provide an automatic shut off valve located outside the generator room and connect to the remote controller at the Fire Control Room for automatic shut-off of diesel supply in fire alarm situation.
- 10) Lock boxes:
 - a) General: Provide 300 mm diameter cast iron boxes with lockable cast iron cover flaps, to each filling and dip point and buried valves.
 - b) Installation: Set boxes with the top 25 mm above the adjacent finished pavement for ground surface. Surround and support the box with concrete, at least 150 mm thick. Provide gravel underlay to drain the box.

7.3.6 FUEL PUMPS

- 1) Type: Self-priming positive displacement internal gear type pumps with mechanical seal and direct driven by totally enclosed motor.
- 2) Mounting: Mount the motor and pump on a common base plate.
- 3) Material: Casing and rotor: Cast iron or cast steel.
- 4) Shaft: Hardened steel, or stainless steel.
- 5) Drip tray: Provide a 50 mm deep drip tray under each pump, of 1.6 mm thick copper with brazed joints.
- 6) Control: Provide:
 - a) Automatic control, and
 - b) Remote control at the Fire Control Room.

7.3.7 LABELS

Provide identification labels to fill and dip boxes, at least 150 mm x 50 mm overall, with lettering at least 25 mm high stating the intended function.

7.3.8 CHARGING

Fill tanks with fuel and top up immediately before completion.

7.4 DIESEL FUEL PUMP

- 1) Provide diesel fuel pump to supply the generator's day tank from the main tank.
- 2) The diesel pump shall be operative on:
 - a) Low tank level; and
 - b) Generator operation.
- 3) Provide one or more diesel fuel meters at each generator set or day tank to monitor the consumption of diesel fuel for statutory reporting purposes.
- 4) Diesel fuel system remote control: Provide a remote controller to be located in the Fire Control Room with the following for interface with the fire alarm and control system:
- 5) An AUTO-OFF selector switch for operation of the diesel pump. When the switch is in the AUTO position, the diesel pump shall be interlocked with the fire alarm and control system so that it cannot operate in the event of a fire (sprinkler or smoke detector activation) within the generator enclosure.
- 6) Terminal blocks for receiving control signal from the Fire Indicator Panel to automatically shut off diesel supply to the generator room.
- 7) Fuel leak interlock: Interface the diesel fuel pump with the BMS so that the pump cannot operate in the event of a leak anywhere the system.
- 8) All fuel tanks are to be dual walled self-bunded.

7.5 GAS GENERATOR

Gas supply will be provided by the Hydraulic Services Contractor, terminated in the generator room at an automatic isolation valve. Connect the generator to the isolation valve and provide pressure regulator if required.

7.6 INTERFACE WITH VERTICAL TRANSPORTATION SYSTEM

Provide a control signal to the lift controller to initiate emergency power drive operation after the lift installation is transferred from normal power supply to standby power supply. The control signal shall be of 240 AC or suitable rate voltage-free contact as required by the vertical transportation services contractor. The control signal shall remain "ON" until the lift installation is reverted back to normal power supply. Terminate the control cables at a junction box at the front of the lift machine room.

7.7 FACILITIES FOR CONNECTION TO TEMPORARY STANDBY GENERATOR

- 1) Provide a generator link box for each main switchboard for connection to temporary standby generator during the period of sustained power failure.
- 2) Generator link box:
 - a) Rating: Rated for 1,200 kVA generator set.
 - b) Construction: In accordance with the Drawing.
 - c) Location: To be located:
 - i) Inside the main switch room if the generator is close to the main switch room; or
 - ii) Adjacent to the generator if the generator is 25 m or further from the main switch room.

8 PUBLIC ADDRESS AND BACKGROUND MUSIC SYSTEM

- 1) General: Provide a Public Address (PA) and Background Music (BGM) system.
- 2) Performance: The system shall be capable of providing high quality background music and speech broadcast to the nominated areas in the shopping centre, suitable for the acoustical environment (high ambient noise level, low absorption coefficient) of the building. Sound distribution throughout the mall shall be uniform, sound intrusion into the shops and adjacent zones should be contained, and conversation among customers should not be unduly hampered by the broadcast.
- 3) System details and requirements:
 - a) For new Public Address (PA) and Background Music (BGM) system installations, refer to the design requirements detailed within the project specific 'Background Music and Public Address Brief'.
 - b) For modifications to existing combined EWIS, PA and/or BGM installations, refer to the General Specification for Fire Services, which details the requirements for combined systems.

9 CONTROLLED PARKING

Electrical requirements for Controlled Parking (Ticketless and PGS) solutions are as follows:

- 1) New Load Centre panel is to be supplied and installed:
 - a) Location:
 - i) Locate inside an Edge Termination Point (ETP) rack, if in external location
 - ii) Locate next to or near an Edge Termination Point (ETP) rack, in secured location such as Switch Room
 - b) Power:
 - i) From a local house distribution board.
 - ii) With dedicated, 24-hour continuous power supply.
 - iii) 32A 3-phase feed, or as specified otherwise.
 - iv) Supply to be sized in accordance with (and to cater to) Contractors' maximum demand assessment.
 - v) All modifications to the existing House Distribution Board are to be carried out by the Electrical Contractor which includes a new cabling, support systems and circuit breakers for a complete system.
 - c) Size: Minimum 18-pole load centre
 - i) Panel is to be installed within an approved lockable stainless-steel enclosure if it is to be installed outside of an ETP Rack and/or in an area with direct access to the public. Approval by Scentre Group is required.
 - d) Include a main isolator switch for the incoming supply, and suitably sized outgoing circuit breakers for each dedicated supply.
 - e) Provide power to end devices that are connected to the racks (by others). End devices include, but not limited to:
 - i) Car Park Rate Boards (CPRB):
 - ii) Entry and Exit Columns;
 - iii) Boom Gates (Barrier Arms);
 - iv) License Plate Recognition (LPR) Cabinets;
 - v) Truck Gates; and

- vi) Transfer Columns.
- Supply and install 2 x 15A dedicated, 24-hour continuous power supplies with RCD protected circuits from associated Load Centre, to 2 x 10A switched surface mounted GPO outlets securely mounted inside the ETP Rack (GPOs provided by Contractor and to be each on a dedicated circuit).
- 3) Supply and install a 10-socket recessed horizontal power outlet rail which is to be powered (plugged-in) by one of the 15A switched GPO outlets mentioned above.
 - a) Selected power rail model/details to be provided to Scentre Group for approval prior to procurement.
- 4) Supply and install 2 x 32A dedicated, 24-hour continuous power supplies with RCD protected circuits from existing House Distribution Board to power rails on Car Park Rack (each supply on a dedicated circuit).
- 5) Contractor to check and ensure the power cord and the rack cabinet provided is compatible with the power GPO's described above.
- 6) Supply and install 1 x 10A dedicated, 24-hour continuous power supply with RCD protected circuit from nearby House DB (or nearby Load Centre) to each APM (Automatic Pay Machine). Allow to terminate the supply at a new 10A double GPO outlet securely mounted inside APM, coordinate with relevant Parking Contractor for access to APM.
- 7) Supply and install 1 x 10A dedicated, 24-hour continuous power supply with RCD protected circuit and isolation point, from nearby House DB (or nearby Load Centre) to each PGS External Signage (Totem Signs). Allow coordination with relevant Parking Contractor for locations of signage and terminations.
- 8) Car park systems circuits NOT to be shared with any other services.
- 9) Clear labelling / signage in accordance with the standards of this specification.
- 10) All power circuits to be installed using cable tray or conduit as required (to Scentre Group standards).
- 11) Refer to the schematic diagrams in Appendix D:
 - a) Car Park Electrical Works Schematic

Car Park Equipment and Cabling Demarcation Schematic

10 HEARING AUGMENTATION – LISTENING SYSTEM

- 1) General: Provide a listening system of audio frequency induction loop system (AFILS) for hearing impaired people. The system shall be an audio frequency induction loop system consisting of:
 - a) Loop amplifier.
 - b) Loop cable.
 - c) Test receiver.
 - d) Microphone.
 - e) Other equipment as required.
- 2) Loop amplifier: Amplifier shall be of transconductance type, have:
 - a) Output current of 10 A continuous into 2 ohms.
 - b) Input compression of 30 dB input: 1 dB output.
 - c) Balanced microphone input with switchable phantom power.
 - d) Balanced line input.
 - e) Output metering.
 - f) Bar graph for output signal.

- g) Separate indication for 8 to 10 dB into compression.
- h) Total harmonic distortion 0.5%.
- i) Frequency response 3 dB 100 Hz 5 kHz.
- j) Min. 6 dB per octave roll off from 6 kHz.
- k) Short circuit protection.
- I) Rack mounted.
- m) Instruction adjacent to the amplifier detailing how the system works and the procedure of testing.
- 3) Loop cable: General: Loop cables shall be insulated Figure 8 cable with a continuous colour identification stripe along the entire length of the cable. The colour identification stripe shall be of a different colour to the colour of the insulation. The loop cable shall be matched to the loop amplifier.
- 4) Notices: Provide the international symbol for deafness in a prominent position at the nominated location to indicate that an assistive hearing system is installed. The symbol shall comply with the AS 1428.2. The size of the sign shall be a minimum of A4.
- 5) Test devices: Provide one test receiver.
- 6) Testing and commissioning are to include:
 - a) Measurement of magnetic field strength.
 - b) Full function testing (including a check of the loop receiver).
 - c) Compliance with AS1428.

11 MASTER ANTENNA TELEVISION SYSTEM

1) Refer to the General Specification for Communications Services.

12 SOLAR PV SYSTEM

- 1) All new Main Switchboards must contain at least two empty three-phase circuit breakers for future Solar PV installations. These must be sized in accordance with the requirements listed within the NCC and approved by Scentre Group.
- 2) Refer to the Solar PV Project Specification for all Solar PV system requirements.

13 DEMAND MANAGEMENT SYSTEM

1) Refer to the Demand Management System Project Specification for all Demand Management System (DMS) requirements.

14 ELECTRIC VEHICLE CHARGING

 All new installations and Main Switchboard design shall provide facilities for Electric Vehicle (EV) charging equipment in line with the requirements listed within the NCC (e.g dedicated distribution boards for EV charging).

15 LIGHTNING PROTECTION SYSTEM

15.1 GENERAL

- 1) Provide a lightning protection system for the building. The system shall comprise air terminals, down conductors, equipotential bonding and earthing terminations, and shall be designed for the following:
 - a) Protection of structure of the building against direct strike;
 - b) Protection of facilities against direct strike (specify facilities, such roof cellular antenna, transmission tower, metal tank, etc.);
 - c) Protection of persons within buildings; and
 - d) Surge protection for the internal systems of the building, refer to clauses of main switchboards and building frame.
- 2) Carry out a risk assessment in accordance with AS/NZ 1768 to determine the level of lightning protection required for protection of structure and facilities. The assessment is to be provided to Scentre Group for review / approval and is also to be included in the O&M manual on completion of the project.

15.1.1 DESIGN REQUIREMENTS

- 1) General: Comply with the overriding design rules of AS/NZ 1768.
- 2) Protection level (PL): Design to PL III in accordance with AS/NZ 1768.
- 3) Carry out risk assessment as per AS/NZS 1768 and issue for approval as a shop drawing.
- 4) Structure of the building: Refer to structural drawings.
- 5) If Dynaspheres or equivalent solution is proposed, the Contractor is to provide necessary certification & design compliance that the system meets performance requirements of the Australian Standards and is equal to or superior to conventional protection.
- 6) Do not mount Dynaspheres or equivalent on poles used for lighting.
- 7) Alternative design: Lightning protection system other than the prescriptive requirement of AS 1768 can be accepted, provided that it is evidenced that the same or better protection than the AS 1768 system can be achieved.

15.2 INSTALLATION

- 1) Air termination: Provide horizontal air termination of copper tape.
- 2) Thermal expansion: Provide expansion loops in horizontal air terminations between fixing points.
- 3) Bonding: Bond to the foundation or footing reinforcement.
- 4) Electrode pits:
 - a) General: Locate driven earth electrodes in dedicated pits.
 - b) Marking: Mark pit covers with the words 'LIGHTNING PROTECTION EARTH'.

DRAWING SCHEDULE

Drawing No.	Rev.	Drawing Title	Scale
ELE-00.0000	A	ELECTRICAL SERVICES COVER SHEET AND DRAWING SCHEDULE	N.T.S
ELE-00.0001	A	ELECTRICAL SERVICES PROJECT SPECIFICATION	N.T.S
ELE-08.0001	A	ELECTRICAL SERVICES LOCATION PLAN PLAN	1: 700
ELE-10.0000	A	ELECTRICAL SERVICES DEMOLITION & PROPOSED LAYOUT	1: 100
	-		
	_		
	-		

COLOUR SCHEME



PROPOSED NEW SERVICES

EXISTING SERVICES TO REMAIN

EXISTING SERVICES TO BE DEMOLISHED

ELECTRICAL LINE STYLE

	POWER CABLE TRAY
<u> </u>	COMMS CABLE TRAY
—— P ——	POWER CONDUIT
C	COMMS CONDUIT
—— HVUG —	HIGH VOLTAGE CABLE UNDERGROUND
—— HVAG —	HIGH VOLTAGE CABLE ABOVE GROUND
LVUG	LOW VOLTAGE CABLE UNDERGROUND
—— LVAG —	LOW VOLTAGE CABLE ABOVE GROUND
	SLD – NEW SUBMAIN/CIRCUIT
	SLD - EXISTING SUBMAIN/CIRCUIT TO REMAIN
× × × ×	SLD - EXISTING SUBMAIN/CIRCUIT TO BE DEMOLISHED



<u>LEGEND - POWER LAYOUT</u>

MECHANICAL SERVICES SWITCHBOARD

(PROVIDED BY OTHERS)

WEATHERPROOF

WP

LEGEND

CIRCUIT BREAKER

ISOLATOR

0 X

0 0

	DISTRIBUTION BOARD	FDP	FINAL DISTRIBUTION FRAME
	MAIN SWITCHBOARD	IDF	INTERMEDIATE DISTRIBUTION FRAME
METER	METER CABINET		
ø	SINGLE PHASE ISOLATOR		
, 🗯	THREE PHASE ISOLATOR		
$ \vdash $	SINGLE GPO	<u>LEGE</u>	ND - SINGLE LI
Å	DOUBLE GPO	8	TRANSFORMER

ABBREVIATION

 \sim

AB	ABOVE BENCH	Kwh	KILOWATT HOUR ME
CM	CEILING MOUNTED	/	SINGLE PHASE
EX	EXISTING	4	THREE PHASE
UR	URINAL POWER OUTLET		POWER METER
HD	HAND DRYER POWER OUTLET	●	TERMINATOR
MW	MICROWAVE OVEN	Ť	EARTH CONNECTION
UB	UNDER BENCH		SURGE DIVERTER
CL	CLEANER POWER OUTLET		
1N/3N	SINGLE PHASE / 3 PHASE		
AXX	POWER OUTLET AMPS		

WARRINGAH MALL C130139 AVAC SEWER PUMP STATION REPLACEMENT



CURRENT TRANSFORMER METER

NGLE LINE DIAGRAM

Å	SURFACE MOUNTED EXIT LIGHT
1 1 1	SURFACE MOUNTED DIRECTIONAL AS SHOWN
٢	RECESSED EMERGENCY SPITFIRE
	SURFACE MOUNTED EMERGENCY SPITFIRE

- COMMUNICATION	EMERGENCY
DISTRIBUTION FRAME	SURFACE MOUNT

PROJECT SPECIFICATION SCENTRE SERVICES CONTRACTS ARE LET ON THE BASIS OF FULL DESIGN AND CONSTRUCT. THE FOLLOWING SPECIFICATION, AND ALL ASSOCIATED CONTRA ARE INTENDED TO PROVIDE GUIDANCE TO TENDERERS ESTABLISHING THE SCOPE OF THE WORK. SYSTEM CONCEPTS, DESIGN PARAMETERS, NATURE OF TH CONTROL AND OPERATION PRINCIPLES AND STANDARDS OF WORKMANSHIP, MATERIALS AND EQUIPMENT WHICH ARE UNIQUE TO THIS PROJECT. PRELIMINARY DESIGN, IN THE FORM OF DRAWINGS, EQUIPMENT SCHEDULES OR THE LIKE, IS PROVIDED FOR TENDER GUIDELINE PURPOSES ONLY AND TO PI INFORMATION TO THE CONTRACTOR AS TO THE PREFERRED INTENT. THE CONTRACTOR WILL HOLD FULL RESPONSIBILITY FOR THE IMPLEMENTATION OF ALL REQUIREMENTS INTO THEIR DEVELOPED DESIGN ON AWARD OF CON ASSUME RESPONSIBILITY FOR THE COMPLETE AND SUCCESSFUL OPERATION OF THE ENTIRE PROJECT, INCLUDING ANY ADJUSTMENTS TO SYSTEMS EQUIPMI CAPACITIES AND OTHER WORKS WHETHER SPECIFICALLY MENTIONED OR NOT TO PROVIDE A FULLY FUNCTIONAL INSTALLATION. ON CONTRACT AWARD THE CONTRACTOR WILL TAKE RESPONSIBILITY FOR. AND PAY FOR. ALL ALTERATIONS OF THE WORKS DUE TO ANY DISCREPANCIES OMISSIONS IN THE WORKING DRAWINGS. TECHNICAL DATA OR OTHER INFORMATION SUPPLIED UNDER THE CONTRACT. WHETHER SUCH PRINTS OF DRAWINGS DATA OR INFORMATION HAVE BEEN REVIEWED OR NOT. THE CONTRACTOR SHALL COMPLY WITH THE GENERAL SPECIFICATION FOR PERFORMANCE, MATERIALS AND WORKMANSHIP WHEREVER APPLICABLE UNLESS SPECIFIED IN THIS DOCUMENT; MUST COMPLY WITH ALL SCENTRE CONTRACT DOCUMENTS. GENERAL 1.1. RESPONSIBILITIES 1.1.1. THIS CONTRACT IS A DEVELOP DESIGN AND CONSTRUCT CONTRACT. A PRELIMINARY DESIGN IS PROVIDED AS PART OF THIS PROJECT SPE CONTRACTOR MUST: 1.1.1.1. DESIGN AND SPECIFY THE WORKS, INCLUDING PREPARATION OF THE DESIGN DOCUMENTS; 1.1.1.2. PROVIDE, INSTALL, TEST AND COMMISSION THE BUILDING SERVICES, INCLUDING ALL LABOUR AND MATERIALS THAT ARE NECESSA COMPLETE AND WORKING INSTALLATION; AND 1.1.1.3. THE CONTRACTOR MUST WARRANT THAT THE WORKS WHEN COMPLETED ARE FIT FOR THE STATED PURPOSE, THIS BEING THAT THE SCOPE OF WORKS AND TECHNICAL REQUIREMENTS AS OUTLINED WITHIN THIS SPECIFICATION, AND COMPLY WITH ALL THE RE THE CONTRACT AND SPECIFICATIONS. 1.2. NATIONAL CONSTRUCTION CODE AND AUSTRALIAN STANDARDS 1.2.1. COMPLY WITH THE NATIONAL CONSTRUCTION CODE (NCC) IN FORCE AT THE TIME OF THE DEVELOPMENT APPLICATION OR CONSTRUCTION MADE, DEPENDING ON THE STATE OF AUSTRALIA IN WHICH THE PROJECT IS BEING UNDERTAKEN. 1.2.2. UNLESS OTHERWISE SPECIFIED, ANY AUSTRALIAN STANDARD (AS) REFERRED TO IN THIS SPECIFICATION AND THE GENERAL SPECIFICATION EDITION THAT IS ADOPTED BY REFERENCE IN THE ABOVE NCC. IF THE AUSTRALIAN STANDARD IS NOT ADOPTED BY THE NCC, THEN THE OF THE STANDARD WILL APPLY. 1.3. CONTRACT DOCUMENTS 1.3.1. THE DOCUMENTS APPLICABLE TO THIS CONTRACT ARE REFERENCED IN THE ATTACHMENT A - SCOPE OF WORKS, AS ISSUED AT THE TIME UPDATED FOR CONTRACT AWARD. 1.4. CONTRACT DRAWINGS 1.4.1. THE CONTRACTOR IS TO ALLOW FOR ALL ITEMS OF WORK, SHOWN OR NOT SHOWN ON THE DRAWINGS, WHICH ARE REQUIRED TO COMPLET COMPLIANCE WITH THE DESIGN REQUIREMENTS. 1.4.2. THE DRAWINGS ARE DIAGRAMMATIC AND INDICATIVE ONLY. THEY ARE NOT INTENDED FOR CONSTRUCTION PURPOSE. IN CONJUNCTION WITH REQUIREMENTS' DESCRIBED IN THIS SPECIFICATION, THE DRAWINGS ARE USED TO INDICATE THE GENERAL CONCEPT LAYOUT OF THE SYS DESCRIBE THE PERFORMANCE REQUIREMENTS. 1.4.3. THE QUANTITY AND SPECIFICATION OF EQUIPMENT SHOWN ON THE DRAWINGS AND THE ASSOCIATED SCHEDULES ARE THE MINIMUM REQUI MAY NOT NECESSARILY BE COMPLETE; THE CONTRACTOR MUST PROVIDE ALL DESIGN REQUIREMENTS TO VERIFY THE EQUIPMENT AND ASS INSTALLATION THAT IS DELIVERED AND MUST DETAIL ALL SUCH EQUIPMENT AS IS REQUIRED FOR A COMPLETE AND WORKING INSTALLA THE SPECIFIED PERFORMANCE. DESIGN BY THE CONTRACTOR 2.1. GENERAL 2.1.1. THE CONTRACTOR MUST DEVELOP THE CONCEPT DESIGN SHOWN ON THE DRAWINGS INTO A FULLY DETAILED CO-ORDINATED FINAL DESIGN COORDINATE WITH THE ARCHITECT, STRUCTURAL ENGINEER AND OTHER CONTRACTORS TO PREPARE DEVELOPED DESIGN DOCUMENTS AND DRAWINGS FOR CONSTRUCTION PURPOSES. 2.2. ALTERNATIVE DESIGN 2.2.1. EXCEPT WHERE SPECIFICALLY PRECLUDED IN THIS SPECIFICATION, THE CONTRACTOR CAN OFFER ALTERNATIVE DESIGN TO THE PROJECT CONSIDERATION. THE ALTERNATIVE DESIGN MUST BE PRESENTED TO SDC FOR APPROVAL AND COMPLY WITH ALL DESIGN REQUIREMENTS 2.2.2. AN ALTERNATIVE DESIGN THAT REQUIRES THE RELOCATION OF ANY DESIGNATED PLANT AREAS AND THE LIKE, AND WILL PRODUCE SIGN MAY BE CONSIDERED BY SCENTRE PROVIDING THE COST IMPACT ON OTHER WORK SCOPES DOES NOT OUTWEIGH THE COST BENEFITS TO 2.3. SAFETY IN DESIGN 2.3.1. THE CONTRACTOR IS TO ENSURE THAT ALL DESIGN ACHIEVES THE OBLIGATIONS FOR SAFETY IN DESIGN AS REQUIRED UNDER THE WORKP AND SAFETY LEGISLATION OF AUSTRALIA AND AS RELEVANT TO THE STATE IN WHICH THE PROJECT IS LOCATED. 2.3.2. IN ADDITION TO THE LEGISLATIVE REQUIREMENTS THE CONTRACTOR MUST ALLOW TO DESIGN, DOCUMENT, COORDINATE AND INSTALL THE ACCORDANCE WITH THE SCENTRE SAFETY IN DESIGN REQUIREMENTS FOR ALL AND ANY WORKS ASSOCIATED WITH THIS TRADE. 2.3.3. MAINTENANCE: THE CONTRACTOR SHALL ENSURE THAT ALL PLANT AND EQUIPMENT WILL BE INSTALLED IN A MANNER THAT ALLOWS FOR REASONABLE AND PROPORTIONATE ACCESS FOR MAINTENANCE TO OCCUR. 2.4. DOCUMENTATION STAGES 2.4.1. DILAPIDATION PHASE 2.4.1.1. A DETAILED INVESTIGATION IS TO BE UNDERTAKEN INTO THE EXISTING SYSTEMS THAT WILL BE IMPACTED BY THE NEW DESIGN WILL BE THE PROVISION OF A DILAPIDATION REPORT TO ENSURE THAT THE NEW INSTALLATION WILL NOT HAVE AN ADVERSE IN OPERATIONAL CENTRE. THE REPORT WILL ALSO PROVIDE ADVICE ON THE LONGEVITY AND CONDITION OF THE PLANT AND EQUIPM 2.4.1.2. THE CONTRACTOR ASSUMES RESPONSIBILITY FOR THE INTEGRATION OF THE NEW AND EXISTING SYSTEMS. THE DILAPIDATION REI PROVIDE DETAIL ON WHAT NEEDS TO BE ADDRESSED PRIOR TO ANY WORKS COMMENCING. SCENTRE GROUP WILL PROVIDE DIREC WORKS IF ANY NEED TO BE CARRIED OUT. 2.4.2. DESIGN PHASE 2.4.2.1. PRELIMINARY DRAWINGS AND RETURN BRIEF INDICATING THE CONTRACTORS DESIGN, IN ACCORDANCE WITH THE CONCEPT DESIGN / SPECIFICATION PROVIDED AT TENDER, WILL BE PROVIDED AS REQUIRED BY THE AGREED DESIGN PROGRAMME 2.4.2.2. ALL CALCULATIONS, REPORTS AND SUBMISSIONS WILL ALSO BE PROVIDED FOR SCENTRE REVIEW AS STIPULATED BY THIS SPECIF WITHIN THE TIMEFRAMES REQUIRED BY THE AGREED DESIGN PROGRAMME. 2.4.2.3. APPROVAL BY AUTHORITIES, OWNERS' NOMINATED INSURER AND/OR ANY OTHER STATUTORY BODIES MUST BE SOUGHT AND OBT SCENTRE, BY THE CONTRACTOR DURING THIS PHASE. 2.4.2.4. COORDINATE AND ACCEPT RESPONSIBILITY FOR THE TECHNICAL AND SPATIAL ASPECTS OF PLANT AND LAYOUTS, INCLUDING CON TOLERANCES. 2.4.3. CONSTRUCTION PHASE 2.4.3.1. DRAWINGS SHALL BE UPDATED AS REQUIRED TO MAINTAIN ACCURACY AND CO-ORDINATION WITH ALL DISCIPLINES. PDF'S ARE T ONTO THE WEB BASED DOCUMENT CONTROL SYSTEM IN USE ON THE PROJECT IN ACCORDANCE WITH THE DETAILED DESIGN PROGE 2.4.4. WORKSHOP DRAWINGS 2.4.4.1. SUBMIT WORKSHOP DRAWINGS IN ACCORDANCE WITH THE DETAILED DESIGN PROGRAMME IN ADEQUATE TIME FOR THE BUILDING PROGRAMME TO BE COMPLIED WITH. ALLOW ADEQUATE TIME FOR THE RETURN OF THE REVIEW BY SCENTRE, ANY AMENDMENTS RESUBMISSION IF REQUESTED 2.4.5. CERTIFICATION 2.4.5.1. SUBMIT DESIGN AND DESIGN DOCUMENTS TO, AND OBTAIN AUTHORITY'S APPROVAL FOR THE DESIGN AND THE DESIGN DOCUMEN A SCHEDULE IS TO BE ESTABLISHED FOR TRACKING PURPOSES BY THE CONTRACTOR OF ALL REQUIRED AUTHORITY APPROVALS SDC ON A REGULAR BASIS. 2.4.5.2. IF REQUIRED BY THE STATE REGULATIONS, THE DESIGN AND DOCUMENTATION MUST BE CARRIED OUT BY REGISTERED PROFESSIO OR PRACTITIONERS. 2.5. TENANCY LEASE PLANS 2.5.1. THE LOCATION OF THE TENANCY SERVICES AS SHOWN ON THE LEASE PLANS WILL TAKE PRECEDENCE OVER THAT SHOWN ON THE BASE FOR CLARITY - ALL INSTALLATIONS MUST COMPLY WITH THE LEASE PLAN AT THE TIME OF TENANCY CONSTRUCTION AND THE CONTRAC RESPONSIBLE FOR ENSURING THAT THE BASE BUILD LAYOUT IS COORDINATED WITH THAT SHOWN ON THE LEASE PLANS. 2.5.2. WHERE ACCESS PANELS ARE REQUIRED WITHIN TENANCIES FOR BASE BUILD SERVICES THIS MUST BE SHOWN ON THE LEASE PLANS 2.5.3. ANY OF THE CONTRACTORS SERVICES NOT SHOWN ON THE LEASE PLAN AND NOT ABOVE THE REQUIRED SERVICES CLEARANCE ZONE ARE RELOCATED AT THE CONTRACTORS COST. 2.6. SCHEDULE OF EQUIPMENT 2.6.1. THE CONTRACTOR SHALL NOMINATE EQUIPMENT IN THE SCHEDULE OF EQUIPMENT TO MEET THE REQUIREMENTS OF THIS SPECIFICATION. IF ALTERNATIVE MANUFACTURE OR MODEL TO THOSE NOMINATED IS OFFERED AFTER THE CONTRACT IS AWARDED, THE ALTERNATIVE EQUIF EQUAL OR BETTER IN QUALITY AND PERFORMANCE 2.6.2. THE BURDEN OF PROOF WILL LIE WITH THE CONTRACTOR TO DEMONSTRATE THAT ANY ALTERNATIVE EQUIPMENT IS EQUAL TO OR BETT PERFORMANCE THAN THAT NOMINATED AND MUST NOT IMPACT ON OTHER TRADES WORKS. ANY SUCH IMPACTS TO OTHER TRADES WILL CONTRACTORS COST. 2.6.3. THE CONTRACTOR EQUIPMENT SCHEDULES NEED TO BE PRODUCED IN ACCORDANCE WITH THE SDC ASSET NAMING CONVENTIONS AND WIL SITE SPECIFIC. A DETAILED LIST OF EQUIPMENT SCHEDULES WILL NEED GO THROUGH THE APPROVAL PROCESS. 2.6.4. THE PROJECT MANAGER HAS THE DISCRETION OF ACCEPTING OR REJECTING THE ALTERNATIVE EQUIPMENT. THE DECISION OF THE PROJECT NOT ENTITLE THE CONTRACTOR TO ANY VARIATION OR EXTENSION OF TIME. 2.6.5. ALL DETAILS REGARDING THE PLANT AND EQUIPMENT UNDER THIS CONTRACT ARE TO BE FORWARDED ONTO THE NFM TEAM FOR INCLUSI CENTRE ASSET REGISTER AND THE COMPUTERISED MAINTENANCE MANAGEMENT SYSTEM (CMMS). 2.7. DOCUMENTATION TOOLS 2.7.1. GENERAL 2.7.1.1. THE CONTRACTOR IS TO DOCUMENT IN AUTOCAD (OR REVIT IF ADVISED BY SCENTRE) TO THE VERSION IN USE AT THE TIME OF BE ADVISED ON CONTRACT AWARD. 2.7.2. AUTOCAD DOCUMENTATION 2.7.2.1. PREPARE PROJECT MODEL WORKING DRAWINGS BASED ON THE ARCHITECTURAL PROJECT DRAWINGS 2.7.2.2. THE SCENTRE GROUP AUTOCAD STANDARDS - AS APPLICABLE TO THE PROJECT. A FULL SUITE OF STANDARDS IS AVAILABLE WILL BE PROVIDED TO THE CONTRACTOR ON CONTRACT AWARD. THE CONTRACTOR'S AUTOCAD DRAWINGS ARE TO BE PRODUCED WITH THESE STANDARDS AND THE CONTRACTOR WILL BE REQUIRED TO COMPLY WITH THESE DOCUMENTATION STANDARDS. 2.7.2.3. THE CONTRACTOR IS TO ENSURE THAT THE TAGGING AND ASSET NAMING CONVENTIONS ARE FOLLOWED WITHIN THEIR DRAWINGS. REGISTER WILL NEED TO BE POPULATED AS PART OF THE EQUIPMENT SCHEDULES FOR APPROVAL BY THE SDC ENGINEERS. 2.7.3. DATA EXCHANGE 2.7.3.1. ALL DATA EXCHANGE SHALL BE CARRIED OUT VIA ACONEX (OR SIMILAR WEB BASED COLLABORATION SYSTEM). THE CONTRACTO AN INTERNET CONNECTION OF SUFFICIENT SPEED / CAPACITY FOR DATA EXCHANGE, INCLUDING BOTH SENDING AND RECEIVING PRO AND DATA. 3. EXECUTION 3.1. CERTIFICATES OF COMPLIANCE 3.1.1. THE CONTRACTOR MUST PROVIDE A CERTIFICATE OF COMPLIANCE SIGNED BY A REGISTERED ACCREDITED ENGINEER ACCEPTABLE TO THE THE PROJECT MANAGER. TO CERTIFY THAT THE ESSENTIAL SERVICES WHICH FORM PART OF THE WORKS. HAVE BEEN DESIGNED IN COMP RELEVANT BUILDING REGULATIONS, AUSTRALIAN STANDARDS AND AUTHORITY'S REQUIREMENTS. THIS ENGINEER MUST CHECK AND SIGN ESSENTIAL DESIGN AND DOCUMENTATION PREPARED BY THE CONTRACTOR. 3.2. TRAINING 3.2.1. CONDUCT TRAINING FOR SCENTRE'S REPRESENTATIVES AT AN AGREED TIME, USING DRAFT 0&M MANUALS – AS A MINIMUM. 3.3. WORKS AS EXECUTED (AS-BUILT) DRAWINGS 3.3.1. GENERAL: AS-BUILT DRAWINGS SHOULD CONTAIN THE FOLLOWING INFORMATION AS A MINIMUM:

3.3.1.1. PROVIDE ALL NECESSARY INFORMATION OF CONTRACTOR'S DESIGNED SYSTEMS NOTING THAT THE AS-BUILT DOCUMENT IS NOT

3.3.1.3. ADD ALL RELATED SHOP DRAWINGS TO AS-BUILT DRAWINGS AS AN APPENDIX TO THE DRAWINGS. MAKE SURE THERE ARE REFERENCES ON THE

3.3.1.2. CONTAIN SUCH INFORMATION AS, BUT NOT EXHAUSTIVE OF AIR FLOW DIRECTION, AIR VOLUMES, INSTALLATION, SIZING, ETC.

ACT DOCUMENTS, HE INSTALLATION,	DRAWING PAGE TO THE APPENDIX. 3.3.1.4. UPDATE THE INDEX SHEET TO SHOW THE LATEST DRAWING CHANGES OR ADDITIONS
ROVIDE	3.3.1.5. AS BUILT DRAWINGS TO BE ISSUED UPON COMPLETION OF THE PROCESS ABOVE. 3.4. OPERATION AND MAINTENANCE MANUALS 3.4.1. GENERAL
NTRACT AND 1ENT AND	3.4.1.1. THE CONTRACTOR SHALL SUBMIT OPERATION AND MAINTENANCE MANUALS ON THE WEB BASED SYSTEM IN U IN ACCORDANCE WITH THE RELEVANT GUIDELINES AND REQUIREMENTS REFERRED TO IN GENERAL SPECIFICATIO
S, ERRORS OR	4. STANDARD REQUIREMENTS
	4.1. FIRE ENGINEERING REPORT 4.1.1. COMPLIANCE WITH THE FIRE ENGINEERING REPORT IS TO BE INTEGRATED THROUGHOUT ALL ASPECTS OF THE DESIGN. 4.2. FIRE SEPARATION REQUIREMENTS
SUTTERWISE	 4.2.1. THE CONTRACTOR IS TO COMPLY WITH THE FIRE SEPARATION REQUIREMENTS AS DETAILED IN THE FIRE ENGINEERING OR FIRE DRAWINGS PROVIDED BY SCENTRE. IT IS INCUMBENT ON THE CONTRACTOR TO ENQUIRE REGARDING THE DIFFE PROJECT AND INCORPORATE THE REQUIREMENTS IN THE DESIGN. 4.2.2. ALL SERVICES PENETRATING THROUGH A FIRE WALL OR FLOOR ARE TO BE SEALED / PROTECTED TO STANDARD AS CONTRACTOR IS TO INCLUDE ALL COST OF THIS WITHIN THEIR PRICE AND ASSUME THAT THIS WILL NOT BE ACHIEVED
ECIFICATION. THE	4.3.1. GENERAL
ARY FOR A	4.3.1.1. THE CONTRACTOR IS TO ALLOW FOR ALL CORE HOLES AND PENETRATIONS AS REQUIRED TO INSTALL THE WO COLLARS, ACOUSTIC SEALING, SMOKE SEALING AND WATER PROOFING OF SUCH PENETRATIONS ARE THE RESP
DESCRIBED BY EQUIREMENTS OF	4.3.2. WATER-PROOFING 4.3.2.1. WATER-STOP FLANGES SHALL BE PROVIDED AROUND PIPES PASSING THROUGH FLOORS AND WALLS SUBJECT THE POSSIBILITY EXISTS FOR WATER LEAKAGE. 4.3.2.2. WATER-STOP FLANGES SHALL BE OF THE SAME MATERIAL AS THE PIPE WITH AN EXTERNAL DIAMETER TWIC
CERTIFICATE IS	FLANGE SHALL BE INTEGRAL TO THE CASTING, OR WELDED, BRAZED, SILVER SOLDERED OR SEALED TO APPR 4.3.2.3. THE CONTRACTOR SHALL PROVIDE OVER FLASHING WHERE SERVICES PENETRATE THE ROOF OR FACADE. ALL
N MEANS THE LATEST EDITION	WATERTIGHT AT THE HIGHEST CONSTRUCTION LEVEL TO PREVENT ENTRY OF STORMWATER DURING AND POS 4.3.2.4. ALL WATERPROOFING SOLUTIONS AND INSTALLATION DETAILS ARE TO BE SUBMITTED FOR APPROVAL BY THI ARCHITECTURAL SPECIALIST.
E OF TENDER AND	 4.4. SURFACE MOUNTED AND CAST IN CONDUITS 4.4.1. THE CONTRACTOR IS TO ALLOW FOR THE ITEMS LISTED BELOW THAT SHALL SERVE AS A GUIDELINE FOR CONDUIT INS GROUP ASSETS, WHICH AS A MINIMUM MUST COMPLY WITH AS/NZS3000.
TE THE WORKS IN	4.4.2. IT SHOULD BE NOTED THAT THE DEFAULT PROCEDURE FOR ALL PROPOSED INSTALLATIONS IS TO RETICULATE ELECTR MOUNTED CONDUIT, OR CABLE MANAGEMENT SYSTEMS FIXED TO THE UNDERSIDE OF SLABS. UNDER NO CIRCUMSTANCE SLABS, UNLESS THE CONTRACTOR HAS OBTAINED WRITTEN APPROVAL FROM THE PROJECT SERVICES MANAGER AND/
H THE 'DESIGN TEMS AND TO	SPECIAL PROJECTS COORDINATOR PRIOR TO THE UNDERTAKING ANY WORKS. 4.4.3. FOR PROPOSED INSTALLATIONS:
IREMENTS AND SSOCIATED	4.4.3.1. UNLESS UTHERWISE APPROVED BY SLENTRE GROUP, SERVILES ARE TO BE RETICULATED VIA SURFACE MOUNT SYSTEMS FIXED TO THE UNDERSIDE OF SLABS. 4.4.3.2. CONDUITS RETICULATED FOR ROOFTOP SERVICES (E.G. CAR PARK POLE LIGHTS) SHALL BE RUN IN SLAB WITH
HUN TU ATTAIN	SHALL HAVE AN UPTURN AND PENETRATION DIRECTLY BENEATH EACH SERVICE WITH APPROPRIATE MEASURE SLAB. 4.4.3.3. SLAB ON GROUND CONCRETE POURS ARE TO HAVE CONDUITS INSTALLED BENEATH THE SLAB.
N AND MUST	4.4.3.4. CONDUITS FOR GROUND LEVEL SERVICES IN MALLS ARE TO BE INSTALLED WITHIN A "SERVICES ZONE" AND RU BUILDING GRIDS. ACCESS PITS TO BE LOCATED WITHIN MALL AREAS AT EVERY CHANGE OF DIRECTION.
) WORKSHOP	4.4.3.5. CONDUITS RETICULATED WITHIN COLUMN CLADDING TO BE HEAVY DUTY PVC (HD PVC) AND INSTALLED IN A S AND HAVE THEIR LOCATION IDENTIFIED AT THE TOP OF THE COLUMN OR CEILING. SUBMAINS CABLING OF ALL WITHIN COLUMN CLADDING OR WALL PARTITIONS/CAVITIES.
MANAGER FOR	4.4.4. FOR PROPOSED INSTALLATIONS WHERE SERVICES CANNOT BE RETICULATED USING THE ABOVE SYSTEMS: 4.4.4.1. IF WRITTEN APPROVAL IS GIVEN TO CAST IN SLABS, CONDUITS ARE TO BE TIED ON BAR CHAIRS WITH A MINI FORMWORK LEVEL AND BE RETICULATED IN BEAMS WHERE POSSIBLE. IN ANY EVENT THE CONDUIT IS TO BE R
IIFICANT SAVINGS, THIS TRADE.	LAYERS OF REINFORCEMENT. 4.4.4.2. CONDUIT PATHWAYS ARE TO PARALLEL TO GRIDS, BETWEEN FITTINGS AND FIXTURES INSTEAD OF SHORTEST
PLACE HEALTH	4.4.4.3. CASTING LUNDOITS IN LULUMINS SHOULD BE AVOIDED. IF THERE IS NO OTHER OPTION, LUNDOITS LAST IN LULU REINFORCEMENT, AND WRITTEN APPROVAL FROM THE PROJECT SERVICES MANAGER SHALL BE OBTAINED. 4.4.5. FOR FURTHER DETAILS, REFER TO ELECTRICAL SERVICES DRAWING ES99.0000.
IR SAFE,	4.5. BUILDERS WORKS IN CONNECTION WITH SERVICES 4.5.1. GENERAL
	4.5.1.1. PRIOR TO CONTRACT AWARD, THE CONTRACTOR IS TO PROVIDE A COMPLETE LIST OF REQUIRED BWIL (INCLUD REQUIREMENTS) THAT HAS BEEN ASSUMED WITHIN THEIR PRICING. THIS LIST WILL DEFINE THE SCOPE OF THE SCENTRE FOR THE CONTRACTOR AND WILL BE INCLUDED AS PART OF THE CONTRACT DOCUMENTS.
THE OUTCOME 1PACT ON THE	4.5.1.2. ANY ITEMS NOT PROVIDED ON THE AGREED LIST, AND REQUIRED FOR THE INSTALLATION OF THE WORKS, WIL THE CONTRACTOR, AT THE CONTRACTOR'S COST. (5.2) ACCESS TO SERVICES
1ENT. PORT WILL TION WHAT	4.5.2.1. THE CONTRACTOR SHALL SUBMIT MARKED UP REFLECTED CEILING PLANS, CONFIRMING CEILING TILES / PANELS COMMISSIONING PURPOSES, TOGETHER WITH ANY PERMANENT CEILING ACCESS POINTS REQUIRED FOR MAINTEN
AND	4.5.2.2. ALL ACCESS PANELS WITHIN TENANCIES THAT ARE REQUIRED FOR THE CONTRACTOR'S ADDITIONAL SERVICES TO BE INDICATED ON THE TENANTS' DESIGN PLANS AND PROVIDED TO THE SCENTRE TENANCY COORDINATOR, AT THE TIME OF PRICING THE TENANT'S FITOUT WORKS.
IFICATION AND	4.5.2.3. ANY ALLESS PANELS OR AREAS THAT ARE TO BE LEFT OUT FOR LOMMISSIONING AND WHILH ARE NOT SHOW A LATER DATE ARE REQUIRED TO BE INSTALLED OR REMOVED AND REINSTATED AS APPROPRIATE, WILL BE (CONTRACTOR'S COST.
TAINED, VIA	4.6. ON-SITE CO-ORDINATION RESPONSIBILITIES 4.6.1. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT ALL WORKS ARE COORDINATED BOTH AT THE DESI NO VARIATION WILL BE PAID FOR THE RELOCATION. MODIFICATION OR OTHERWISE OF ANY SERVICES ONCE INSTALLED
NSTRULTION	PRIOR TO INSTALL. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONDUCT THE SERVICE TO SERVICES CO-ORDIN NEEDS TO BE COMPLETED IN ACCORDANCE WITH THE CONSTRUCTION PROGRAMME. 4.7. INTERFACE WORKS
O BE UPLOADED iRAMME.	4.7.1. ANY MODIFICATIONS OR INTERFACE WORKS TO THE EXISTING CENTRE SYSTEMS SHALL BE UNDERTAKEN IN SUCH A MA IMPACT THE PERFORMANCE, OPERATIONAL OR OTHERWISE, OF THOSE SYSTEMS.
ONSTRUCTION AND	4.7.2. OHEISATION OF AND INTERFACE WITH EXISTING CENTRE STSTERS 4.7.2.1. WHERE THE CONTRACTOR HAS INCLUDED WITHIN THEIR DESIGN TO UTILISE ANY EXISTING SYSTEMS FOR THE I OR EXPANSION THEN THE CAPACITY / ABILITY OF ANY SUCH SYSTEM IS TO BE VERIFIED BY THE CONTRACTOR 4.7.2.2. WHERE THE SCOPE OF WORKS INCLUDES WORKS WITHIN AN EXISTING PART OF A CENTRE, THE CONTRACTOR
TS AS REQUIRED. AND ISSUED TO	TO RELOCATE / RECONFIGURE ANY EXISTING SERVICES, OR MODIFY TO SUIT CONNECTION TO ANY NEW SERVIC REVISED ARCHITECTURAL LAYOUTS AND THE PROJECT DESIGN DOCUMENTATION AND IN ACCORDANCE WITH TH PRELIMINARY OR CONCEPT DESIGN.
ONAL ENGINEERS	4.7.3. HEAD END EQUIPMENT 4.7.3.1. WHERE A NEW SYSTEM IS BEING INSTALLED TO THE AREA OF THE PROJECT, AND THE EXISTING SYSTEM IS E FXISTING CENTRE. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING COMPATIBILITY AND FULL CROSS-TALK F
E BUILD DRAWINGS. CTOR SHALL BE	SYSTEMS. 4.7.4. SHUTDOWN OF EXISTING SYSTEMS 4.7.4.1. WRITTEN APPROVAL MUST BE SOUGHT AND PROVIDED BEFORE COMMENCING ANY SHUT DOWNS TO EXISTING S
E TO BE	NOTICE IN WRITING MUST BE PROVIDED OF ANY INTENDED SHUTDOWN. DO NOT INTERRUPT EXISTING SERVICES SCENTRE. 4.7.5. BRIDGING WORKS
F EQUIPMENT OF PMENT MUST BE	WHERE A CENTRE IS TO REMAIN OPEN AND IS AFFECTED BY AREAS OF THE WORKS, THE CONTRACTOR MUST ALLOW ENSURE THE CONTINUOUS OPERATION OF ANY SYSTEMS IN THOSE AREAS. ANY TEMPORARY WORKS THAT ARE UNDE TO BE REMOVED ON COMPLETION OF THE WORKS AND: 4.7.5.1. THE AFFECTED SYSTEM RE-INSTATED TO FINAL DESIGN. TESTED AND COMMISSIONED IN ACCORDANCE WITH TH
ER IN . BE AT THE	SPECIFICATION. 4.7.5.2. ANY AREAS OF THE BUILDING AFFECTED BY THE TEMPORARY INSTALLATION TO BE MADE GOOD BY THE CONT 4.2. AFECTUFIES CO. OPDINATION
L NEED TO BE	4.8. AESTHETIC CO-ORDINATION 4.8.1. EXTERNAL FAÇADE CO-ORDINATION 4.8.1.1. ALL SERVICES THAT ARE NOT SPECIFICALLY DESIGNED TO BE INSTALLED ON THE EXTERIOR OF THE FAÇADE
T MANAGER DOES	COORDINATED TO AVOID ANY SUCH SERVICES BEING VISIBLE. PARTICULAR ATTENTION SHOULD BE PAID TO AF STREET FRONTAGES. 48.2 INTERIOR AESTHETIC CO-ORDINATION
ION IN THE	4.8.2.1. ANY SERVICES THAT INTERFACE WITH VISIBLE AESTHETIC ELEMENTS – SUCH AS SKYLIGHTS, FEATURE CEILING – ARE TO BE DESIGNED AND COORDINATED TO ENSURE THAT THEY ARE NOT VISIBLE FROM ANY POSITION WI EQUIPMENT, PIPES, CABLES AND SUCH ARE TO BE HIDDEN WITHIN THE STRUCTURE, RECESSED BEHIND CEILINGS
THE PROJECT, TO	AS NECESSARY. 4.8.3. REFLECTED CEILING PLAN COMPLIANCE 4.8.3.1. REFLECTED CEILING PLANS SERVICES LAYOUTS / CONCEPTS ARE SHOWN INDICATIVELY. ALL SERVICES ARE TO
ON REQUEST AND	COMPLIMENTARY OF THE DRAWINGS WHILST MAINTAINING COMPLIANCE WITH THE BUILDING CODE, AUSTRALIAN REQUIREMENTS OF THIS SPECIFICATION. 4.8.3.2. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ALL THE PRECEDING PARAMETERS ARE ACHIEVED AN
) IN ACCORDANCE	CALCULATIONS AND ANY INFORMATION REQUIRED TO DEMONSTRATE TO SCENTRE THAT THE DESIGN COMPLIAN 4.8.4. SERVICES ADJACENT TO BALUSTRADES OR PARAPETS
	4.8.4.1. WHERE SERVICES ARE FIXED TO, RON ALONG OR ADJACENT TO BALOSTRADES OR PARAPETS, THE SERVICES INSTALLED TO ENSURE THAT THE EFFECTIVE HEIGHT OF THAT BARRIER IS NOT IMPACTED. IN THE EVENT THA CONTRACTOR IS TO ALLOW TO TREAT OR CLAD THE SERVICE IN SUCH A MANNER AS TO MAINTAIN THE ORIGINAL DADDIED.
DR WILL REQUIRE ROJECT DRAWINGS	BARRIER. 4.9. CLEARANCE OF SERVICES IN CAR PARK AREAS 4.9.1. THE MINIMUM CLEAR HEAD HEIGHTS IN CAR PARK AREAS, UNLESS OTHERWISE NOTED WITHIN THIS SPECIFICATION, ARE GENERALLY: 2,300MM AFFL;
AUTHORITIES AND	DISABLED CAR SPACE(S) (DIRECTLY OVER): 2,500MM AFFL; AND LOADING DOCK(S): 4,600MM AFFL.
PLIANCE WITH THE	4.10. CLEARANCE OF SERVICES ABOVE TENANT CEILING HEIGHT SPACE 4.10.1. ALL WORKS ARE TO BE INSTALLED AT A HEIGHT SUITABLE TO ENSURE THAT THE REQUIRED CLEARANCE IS ACHIEVED CLEARANCE IS TO INCLUDE THE FREE SPACE REQUIRED FOR THE INSTALLATION OF ANY FITOUT SERVICES AND SHOUL UNLESS OTHERWISE NOTED WITHIN THIS SPECIFICATION.
	4.10.2. THE FIRST 3,000MM OF THE TENANCY SHOULD BE ASSUMED AS HAVING A HIGHER CEILING OF BETWEEN 4,600MM AND THIS SPACE SHOULD THEREFORE HAVE CONSIDERATION TO A RESTRICTED CEILING SPACE OF POTENTIALLY 300MM MAT
A SHOP DRAWING.	4.10.3. WHERE THIS LLEARANCE IS NOT ALHEVABLE THE LOW HEIGHT AREAS MUST BE IDENTIFIED DURING THE PRELIMINARY REVIEW ALTERNATIVE OPTIONS WITH THE CONTRACTOR. 4.10.4. ANY SERVICES THAT REMAIN BELOW 4,000 AFFL, AND ARE APPROVED TO SO BY SCENTRE, NEED TO BE HIGHLIGHTED DOCUMENTATION AND INCLUDED ON THE LEASE PLANS SO THAT THE TENANT CAN BE MADE AWARE FOR THFIR FIT-O

4.11. PLANT AND EQUIPMENT ACCESS DESIGN

USE BY SCENTRE FOR THIS PROJECT

I REPORT AND THE ARCHITECTURAL ERENT FIRE COMPARTMENTS OF THE

REQUIRED BY THE NCC. THE D BY ANY FORM OF BUILDERS WORKS

DRKS. ALL FIRE-SEALING, FIRE ONSIBILITY OF THE CONTRACTOR.

TO WATER INGRESS, OR WHERE

ICE THE DIAMETER OF THE PIPE. THE ROVAL TO THE PIPING. PENETRATIONS SHALL BE SEALED ST CONSTRUCTION. E RELEVANT WATERPROOFING/

NSTALLATIONS WITHIN SCENTRE

RICAL SERVICES USING SURFACE ES SHALL CONDUITS BE CAST-IN)/OR PROJECT MANAGER AND/OR

TED CONDUIT OR CABLE MANAGEMENT HIN BEAMS, OR SHALL BE RUN IN

N IS BEING MODIFIED). ALL CONDUITS RES TAKEN TO WATERPROOF THE

RUN PARALLEL TO EACH OTHER AND

STRAIGHT VERTICAL ARRANGEMENT . TYPES SHALL NOT BE RETICULATED

NMUM 60MM CLEARANCE ABOVE THE RUN BETWEEN THE TOP AND BOTTOM

POSSIBLE (OR DIAGONAL) ROUTES. UMNS TO BE LOCATED WITHIN STEEL

DING ANY ASSOCIATED STRUCTURAL WORKS TO BE PROVIDED BY

L BE UNDERTAKEN BY SCENTRE FOR

LS TO BE LEFT OUT FOR NANCE OF THE CONTRACT WORKS. TO SUIT THE TENANTS' FITOUT, ARE WITH THE FINAL SERVICES LAYOUT,

WN ON THE DRAWINGS, AND THAT AT CARRIED OUT BY SCENTRE AT THE

SIGN STAGE AND ALSO ONCE ON SITE.) DUE TO LACK OF CO-ORDINATION DINATION ON SITE. ALL CO-ORDINATION

ANNER SO AS NOT TO ADVERSELY

PURPOSES OF ANY RE-DEVELOPMENT IS TO ENSURE ALLOWANCE IS MADE ICES, AS REQUIRED TO ACHIEVE THE HE INTENT DEMONSTRATED BY THE

BEING RETAINED WITHIN THE BETWEEN THE NEW AND EXISTING

SYSTEMS. AT LEAST 7 DAYS' WITHOUT THE PRIOR CONSENT OF

FOR ALL WORKS AS IS REQUIRED TO ERTAKEN TO EXISTING SYSTEMS ARE THE REQUIREMENTS OF THIS ITRACTOR.

ARE TO BE DESIGNED AND AREAS ADJACENT ENTRIES AND

NGS, FEATURE WALLS AND THE LIKE VITHIN THE CENTRE, ALL PLANT, GS OR CONCEALED BY OTHER MEANS

TO BE DESIGNED AND INSTALLED STANDARDS, AND THE TECHNICAL ND IS TO PROVIDE REPORTS,

NCE IS MET. S ARE TO BE DESIGNED AND

AT THIS CANNOT BE AVOIDED THE SINAL DESIGNED HEIGHT OF THE

AS FOLLOWS:

ABOVE ALL TENANT CEILINGS. THIS LD BE A MINIMUM OF 4.200MM AFFL

5,200MM. ANY SERVICES CROSSING XIMUM.

DESIGN PHASE SO THAT SDC CAN

ON THE CONTRACTORS OUT DESIGN.

- 4.11.1. THE CONTRACTOR MUST LIAISE WITH THE ARCHITECTURAL AND STRUCTURAL DESIGN TEAM TO ENSURE THAT SUFFICIENT SPATIAL PROVISION IS MADE WITHIN THE DESIGN TO PROVIDE ACCESS TO EASILY AND SAFELY MAINTAIN, OR REPLACE AS REQUIRED, ALL PLANT AND EQUIPMENT WITHOUT MODIFICATION TO THE BUILDING ONCE COMPLETED.
- 4.11.2. THE CONTRACTOR MUST NOT DESIGN OR INSTALL EQUIPMENT IN LOCATIONS THAT INITIATE A REQUIREMENT FOR A CONFINED SPACE PERMIT TO ACCESS THE AREA. 4.11.3. ANY ACCESS OR MAINTENANCE EQUIPMENT, THAT IS REQUIRED TO BE INSTALLED TO ACHIEVE THIS, IS TO BE CERTIFIED BY AN INDEPENDENT ACCESS
- SOLUTIONS PROVIDER INCLUDING THE PROVISION OF ALL NECESSARY TRAINING ON COMPLETION.

4.12. PROVISION OF SAMPLES AND INSTALLATION OF PROTOTYPES 4.12.1. SAMPLES ARE TO BE PROVIDED FOR SCENTRE APPROVAL FOR ANY ITEMS AS NOTED WITHIN THE PROJECT SPECIFICATION OR FOR ANY FITTINGS THAT MAY BE VISIBLE IN ANY AREA.

- 4.13. ACOUSTIC 4.13.1. THE CONTRACTOR SHALL ALLOW FOR ALL ACOUSTIC TREATMENT ASSOCIATED WITH THEIR PLANT AND EQUIPMENT INCLUDING ACOUSTIC TREATMENT TO PLANT ROOMS AS REQUIRED, TAKING THE ARCHITECTURAL DESIGN INTO ACCOUNT AT TIME OF CONTRACT AWARD
- 4.13.2. ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH AS 1055 AND AS/NZS 2107 OR AS OTHERWISE REQUIRED / STIPULATED FOR THE PROJECT. 4.13.3. THE CONTRACTOR SHALL ALLOW FOR ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH ALL AUTHORITY, DA AND ANY ACOUSTIC RESTRICTIONS. THE CONTRACTOR WILL DEMONSTRATE COMPLIANCE AS MAY BE REQUIRED VIA REPORTING AND/OR MONITORING.
- 4.13.4. THE CONTRACTOR IS TO UNDERTAKE AN ASSESSMENT DURING THE COMMISSIONING PHASE OF ALL PLANT AND EQUIPMENT TO VERIFY THAT THE INSTALLATION COMPLIES WITH ALL AUTHORITY AND ACOUSTIC REQUIREMENTS. 4.13.5. THIS CERTIFICATION IS TO BE CARRIED OUT BY AN INDEPENDENT ACOUSTIC CONSULTANT ENGAGED BY THE CONTRACTOR.

4.13.6. ANY AREAS OF NON-COMPLIANCE THAT ARE IDENTIFIED DURING THE CERTIFICATION PROCESS ARE TO BE RECTIFIED BY THE CONTRACTOR AT THEIR COST. 4.14. SEISMIC RESTRAINT 4.14.1. ARRANGE ALL COMPONENTS, OTHER THAN SERVICE ITEMS EXEMPTED IN AS 1170.4, TO RESIST SEISMIC LOADS DETERMINED IN ACCORDANCE WITH AS

1170.4. SECURELY FIX ALL PLANT AND EQUIPMENT TO THE BUILDING STRUCTURE. DO NOT RELY ON GRAV

4.14.2. ANTI-VIBRATION MOUNTS ARE TO BE OF HORIZONTALLY RESTRAINED TYPE 4.15. LABELLING

4.15.1. LABELLING OF ALL PLANT AND EQUIPMENT IS TO BE UNDERTAKEN BY THE CONTRACTOR AND MUST BE NON-CORRODIBLE MATERIAL (E.G. TRAFFOLYTE). 4.15.2. HAND-WRITTEN OR "DYMOTAPE" ADHESIVE LABEL TYPES WILL NOT BE ACCEPTED.

- 4.16. CONVERGED SERVICES NETWORK (CSN)
- 4.16.1. WHERE THE PROJECT/SITE IS A CSN APPROVED CENTRE, A COMMON IT NETWORK SHALL BE IMPLEMENTE BUILDING SERVICES SYSTEMS. REFER TO THE SCG IT BUILDING SERVICES NETWORK STANDARDS AND PR 4.16.2. NETWORK SWITCHES ARE TO BE PROCURED, CONFIGURED AND COMMISSIONED THROUGH SCG IT AS PART
- 4.17. SYSTEMS PROTOCOL 4.17.1. SCENTRE REQUIRES OPEN NON-PROPRIETARY PLATFORMS TO BE USED FOR ALL BUILDING SERVICES SYS SCOPE OF WORKS FOLLOWING.
- 4.18. IN GROUND SERVICES MAPPING 4.18.1. THE ACCURATE MAPPING OF IN GROUND SERVICES IS VERY IMPORTANT FOR THE ONGOING OPERATION A IN GROUND SERVICES MUST BE INCLUDED IN THE AS-BUILT DRAWINGS OF THE PROJECT PROVIDED BY T
- 5. SCOPE OF WORKS
- 5.1. REFER TO PROJECT DRAWINGS FOR SCOPE OF WORKS.
- 6. TECHNICAL REQUIREMENTS
- 6.1. REFER TO PROJECT DRAWINGS AND GENERAL SPECIFICATION FOR TECHNICAL REQUIREMENTS
- 7. TESTING AND COMMISSIONING
- 7.1. GENERAL 7.1.1. THE CONTRACTOR IS TO UNDERTAKE ALL TESTING, COMMISSIONING FOR THE WORKS IN ACCORDANCE WI AS REQUIRED UNDER THE SCOPE OF THIS SPECIFICATION, ANY GENERAL SPECIFICATION REQUIREMENTS A STIPULATED BY SCENTRE OR THE RELEVANT AUTHORITIES.
- 7.2. COMMISSIONING 7.2.1. DESIGN FOR COMMISSIONING:
 - 7.2.1.1. THE CONTRACTOR MUST ALLOW FACILITIES IN HIS DESIGN TO ENABLE PROPER COMMISSIONING THE INDEPENDENT COMMISSIONING AGENT FOR REVIEW AND THE COMMENTS OF THE INDEPENDEN THE FINAL DESIGN DOCUMENTS BY THE CONTRACTOR. 7.2.1.2. COMMISSIONING SHOULD BE IN ACCORDANCE WITH AUSTRALIAN STANDARDS OR RECOGNISED INDU
- COMMISSIONING CODES) 7.3. TESTING
- 7.3.1. FACTORY OR TYPE TEST: FOR EACH FACTORY OR TYPE TEST PROVIDE A CERTIFICATE FROM THE MANUI HAS BEEN TESTED AND MEETS THE SPECIFIED REQUIREMENTS. CERTIFY THAT EACH TYPE-TESTED ITEM ITEM.
- 7.3.2. AUTHORITIES: PROVIDE DEMONSTRATIONS AND TESTS FOR WITNESSING BY THE STATUTORY AUTHORITIE WITNESS TESTING BY THE STATUTORY AUTHORITIES. 7.3.3. WHERE TESTING AND COMMISSIONING OF THE SYSTEM REQUIRE SMOKE TESTS, THE CONTRACTOR RESPON
- GENERATOR (NOT SMOKE BOMBS) FOR ALL TESTING REQUIRED BY SCENTRE AND / OR AUTHORITIES. 7.4. DEFECTS LIABILITY PERIOD 7.4.1. FOR DEFECTS LIABILITY PERIOD (DLP) BUILDING TUNING AND FINAL SYSTEM PERFORMANCE VALIDATION,
- 7.5. SUPPLY OF WARRANTIES 7.5.1. WARRANTIES ARE TO BE PROVIDED AT A MINIMUM UNLESS NOTED ELSEWHERE IN THIS SPECIFICATION OF
- WORKMANSHIP: 1 YEAR MATERIALS: 1 YEAR, OR GREATER IF AVAILABLE FROM MANUFACTURER OR REQUIRED BY NCC 7.5.2. ALL WARRANTIES ARE TO BE PROVIDED USING THE SCENTRE STANDARD FORM OF WARRANTY AND ARE THE PROJECT, OR THE FINAL OPENING DATE - WHICHEVER IS THE LATTER. THE REQUIRED TERM OF WAR

8. MAINTENANCE

DATE.

- 8.1. GENERAL 8.1.1. MAINTENANCE OF ALL WORKS CARRIED OUT AS PART OF THIS CONTRACT SHALL BE UNDERTAKEN BY PERIOD (DLP), AND FOR EXTENDED PERIODS IF IDENTIFIED IN THE REQUIREMENTS OF THIS SPECIFICATION ACCORDANCE WITH THE REQUIREMENTS OF THE MAINTENANCE SPECIFICATION AND TRACKING SCHEDULES
- THE GENERAL SPECIFICATION(S). 8.1.2. THE CONTRACTOR IS TO PROVIDE THEIR MAINTENANCE PLAN (INCLUDING SEASONAL ACTIVITIES) FOR THE AND APPROVAL
- 8.1.3. IT IS INTENDED THAT THE CONTRACTOR SHALL WORK WITH THE INCUMBENT MAINTENANCE CONTRACTOR DLP TO ENSURE THAT THEY UNDERSTAND THE DETAIL AND MAINTENANCE REGIME FOR THIS CONTRACT THEY CAN OPERATE AND MAINTAIN THE ASSETS DESIGNED AND INSTALLED BY THE CONTRACTOR TO T HANDOVER OCCURS SEAMLESSLY.
- 8.1.4. THIS WILL INVOLVE, AS A MINIMUM, MEETING WITH THE INCUMBENT MAINTENANCE CONTRACTOR, THE FM REGULARLY TO WORK THROUGH THE MAINTENANCE PROGRAM AND DISCUSS ANY ISSUES THAT MAY AR RESPONSIBILITY TO ARRANGE AND MINUTE THESE MEETINGS AND TO ENSURE THEY ARE MAINTAINING PROGRAM. MINUTES ARE TO BE ISSUED FOR ACCEPTANCE NO LATER THAN 48 BUSINESS HOURS AFTER 8.1.5. THE FM MAY, AT THEIR DISCRETION, HAVE MULTI-DISCIPLINE MEETINGS RATHER THAN DISCIPLINE SPECIF
- 8.1.6. THE CONTRACTOR SHALL ALSO ALLOW TO ATTEND THE ESSENTIAL SERVICES SYSTEM INTERFACE TEST THE NEW DEVELOPMENT AREA OF THE CENTRE. THESE SHALL BE COORDINATED WITH THE FM. REFER TO FOR DETAILS OF THE SIT REQUIREMENTS.
- 8.2. COMPUTERISED MAINTENANCE MANAGEMENT SYSTEM (CMMS) 8.2.1. SCENTRE GROUP HAS IMPLEMENTED A COMPUTERISED MAINTENANCE MANAGEMENT SYSTEM (CMMS), MAII
 - STAKEHOLDERS TO OPERATE IN A MORE INFORMED AND PLANNED ENVIRONMENT. THIS ALLOWS FOR A M UNDERTAKE INFRASTRUCTURE WORKS AS WELL AS PLANT AND EQUIPMENT ASSET MANAGEMENT WITHIN UTILISES MOBILE TECHNOLOGY FOR CONTRACTORS TO ACTION DEFECTS/MAINTENANCE TASKS.
- 8.2.2. THE CONTRACTOR IS TO ALLOW FOR THE USE OF MAINTENANCE CONNECTION IN RELATION TO THE MANA DURING THE DEFECT LIABILITY PERIOD. SCENTRE GROUP WILL COVER THE COSTS OF THE MAINTENANCE WILL BE LOADED INTO MAINTENANCE CONNECTION BASED ON THE MAINTENANCE SPECIFICATIONS THAT F REGISTER PROVIDED BY THE CONTRACTOR DURING THE DETAILED DESIGN PHASE OF THE PROJECT. 8.2.3. CONTRACTORS WILL BE REQUIRED TO REGISTER EACH INDIVIDUAL USER WITHIN THEIR ORGANISATION WH
- MAINTENANCE CONNECTION ACCESS. UNIQUE EMAIL ADDRESSES ARE REQUIRED FOR EACH USER AND A SI TO BEING GIVEN ACCESS. ALL USERS WILL BE ABLE TO ACCESS MAINTENANCE CONNECTION VIA A SMAR 8.3. PLANNED PREVENTATIVE MAINTENANCE (PPM) 8.3.1. PROVIDE A PLANNED PREVENTATIVE MAINTENANCE STRATEGY IN ACCORDANCE WITH THE SCENTRE MAIN
- SCENTRE. 8.3.2. COMPLETE ALL OF THE SCHEDULES IN THE MAINTENANCE SPECIFICATION AND INCLUDE THESE IN THE TEN
- 8.3.3. LIAISE WITH THE PROJECT SERVICES MANAGER AND FM TO ESTABLISH AN AGREED TRANSITION PROGRA INCUMBENT MAINTENANCE CONTRACTOR ON THE NEW DEVELOPMENT'S SCOPE OF WORKS AND THE SERVI MAINTENANCE CONTRACTOR CAN: 8.3.3.1. SEAMLESSLY TAKE OVER THE MAINTENANCE OF THE SYSTEMS AT THE COMPLETION OF THE DEF
- PROVIDED AS PART OF THIS CONTRACT. 8.3.3.2. ACCEPT RESPONSIBILITY FOR THE WARRANTY AND PERFORMANCE OF THE SYSTEMS INSTALLED
- AT THE COMPLETION OF THE DEFECTS LIABILITY PERIOD. 8.3.3.3. PROVIDE ACCURATE AND COMPLETE COSTS FOR THE CONTINUED MAINTENANCE OF THE SYSTEMS SPECIFICATION THAT FORMS PART OF THEIR CURRENT CONTRACT FOR THE REMAINING DURATION
- 8.4. CORRECTIVE MAINTENANCE 8.4.1. GENERAL: RESPOND TO CALL OUTS FOR BREAKDOWNS OR OTHER FAULTS REQUIRING CORRECTIVE MAINTI MATERIALS AND EQUIPMENT. PROVIDE CONTACT DETAILS INCLUDING AFTER-HOURS AND EMERGENCY MOB EMERGENCY CONDITIONS.
- 8.4.2. REMEDIAL WORK: CARRY OUT ANY REMEDIAL WORK, INCLUDING TEMPORARY WORK, NECESSARY TO REST OPERATION. DO NOT LEAVE SITE UNTIL CORRECT OPERATION HAS BEEN PROVED. DO NOT LEAVE THE PL WARRANTY FOR THOSE ITEMS REPLACED, COMMENCING FROM THE DATE OF REPLACEMENT.
- 8.4.3. TEMPORARY WORK: PROMPTLY REPLACE TEMPORARY WORK WITH PERMANENT RECTIFICATION. 8.4.4. RESPONSE TIME: ATTEND SITE FOR EMERGENCY SERVICE WITHIN 24 HOURS OF NOTIFICATION. SHOULD TH
- THE SPECIFIED RESPONSE TIME, SCENTRE MAY, WITHOUT INCURRING ANY LIABILITY OR OBLIGATION AND PERSONS OTHER THAN THE CONTRACTOR TO UNDERTAKE EMERGENCY WORK ON THE INSTALLATION. THE FOR ANY COSTS INCURRED.
- 8.5. END OF DEFECT'S LIABILITY PERIOD MAINTENANCE 8.5.1. SHOULD THERE BE A REQUIREMENT FOR ANY SEASONAL COMMISSIONING OF EQUIPMENT, THEN THIS IS T PRIOR TO THE ACTUAL DATE REQUIRED - ANY DEFECTS ATTRIBUTED TO THE EQUIPMENT PRIOR TO SEA ADVANCE.
- 8.5.2. MEET WITH THE PROJECT SERVICES MANAGER. THE FM. ENGINEERING SERVICES CONSULTANT AND INCUM COMPLETION OF DLP OR LIST OF OUTSTANDING DEFECTS AND PROGRAMME FOR COMPLETION. RELEASE O OUTCOME OF THIS MEETING.

100
STREET
JP JP
REFER TO ALL MENCING NGS. ONSTRUCTION
Communit
∋d 0 10
S ION
50
ision
A

30 Û











- EXISTING DB-PUMP LOCATED IN SEWER PUMP STATION ROOM TO BE

- EXISTING SUPPLY FROM DBZ1/2 TO REMAIN. ALLOW TO PROVIDE

DISCONNECTED, DECOMMISSIONED, AND REMOVED

— – EXISTING 1X4C25MM XLPE SUBMAIN TO REMAIN.

EXISTING DB-PUMP

NEW TRAFFOLYTE LABELLING.

<u>TION – ELECTRICAL SCOPE</u>
SUPPLY FROM EXISTING DB-Z1/2 IN LEVEL 1 TARGET CARPARK TO REMAIN.
KLPE CABLE TO PUMP ROOM REMAIN. CONTRACTOR TO ALLOW FOR NEW LOAD
ATION TO ASSESS EXISTING SUBMAIN CABLE SIZE CAN BE REUSED.
SE WEATHERPROOF ELECTRICAL DISTRIBUTION BOARD
OOF DOUBLE SOCKET OUTLETS (6-OFF) IN EXISTING PUMP ROOM. COORDINATE
CENTRE FACILITIES TEAM.
LY SUBMAIN TO NEW GRINDER CONTROL PANEL FROM NEW DB-SEWER PUMP
AND LOCATION TO BE CONFIRMED WITH HYDRAULIC CONTRACTOR.
LY SUBMAIN TO NEW CONTROL PANEL FROM NEW DB-SEWER PUMP STATION.
TION TO BE CONFIRMED WITH HYDRAULIC CONTRCATOR.
LS AND POWER SUPPLY TO PUMPS BY OTHERS.
CABLE MANAGEMENT AND ALTERATION TO EXISTING CABLE TRAYS.
CT EXISTING LIGHTING AND POWER CIRCUITS TO NEW DB-SEWER PUMP STATION.
TING, AND EMERGENCY LIGHTING TO REMAIN.



>Пп

CAD Filename - C:\Users\jguan\Documents\SDC_WR_C130139_SHEETS_RVT20_JGuanVVL48.rvt