REPORT

ON

POWER REQUIREMENT

AT

Moorabbin Office Building

AT

360 - 370 South Road, Moorabbin VIC 3189

Revision "B"

March 2024

Prepared For:	Prepared By:
[redacted]	[redacted]

KEY CONSULT

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1.0 INTRODUCTION

Key Consult has been engaged to undertake an assessment of load for the proposed Office building, in particular, provide an overall overview of the proposed on-site substation as required.

Additionally, the report will aim to provide a detailed overview of the scale and the capacity of any backup generation system, and associated options or alternatives, as well as comment on any ongoing testing procedures which will need to be implemented.

2.0 BACKGROUND INFORMATION

To assess the electrical load of the office building, it is crucial to determine to the type of building, and what standard and requirement the office needs to comply with. Understating specific requirement mandated on the Green Star-Building VI & PCA Grade A office building guide will determine the indoor substation size.

The first step of load assessment is performing a maximum demand calculation based on the type of building and electrical equipment to determine the required electrical supply. The maximum demand calculation will determine the exact load of indoor substation. Subsequently, the size of the generator sets will be determined (based on compliant with the PCA grade A office and Green Star guidelines)

In order to comply with Green Star building VI and PCA grade A office building guide, the relevant requirement has been deducted from the building guidelines to obtain the design's requirements.

2.1 Green Star-Building VI

Accessible energy meters for all common uses, major uses, and major sources must be connected to a monitoring system.

The meters and monitoring systems must:

- Provide continual information (up to 1-hour interval readings).
- Be commissioned and validated per the most current 'Validating Non-Utility Meters for NABERS Ratings' protocol, or National Measurement Institute (NMI) standards.
- Be capable of identifying inaccuracies in the meter network and producing alerts.
- Be sufficient to support future achievement of a NABERS rating.
- Assessment of the building's survivability in the case of a blackout.

2.2 PCA Grade A office building guide

2.2.1 Lifts requirements – new buildings

Code	Parameter	Unit	Grade A buildings
E1	Car capacity	Number of persons	>=16
E3	Waiting time	Seconds during any five minute period	Up peak<= 30 Lunch peak <=30
E5	Good lift	Number	>=1
E6	Good lift	Capacity (kg)	>=1400

When calculating lift metrics, population densities are assumed to be one (1) person per 12 sqm for 100 per cent of the building's NLA and lift cars not being loaded to not more than 80 per cent of their rated capacity.

Passenger demand is defined as the rate at which people request service from the lift system (expressed as a percentage of the total building population based on the density for 100 per cent of the building's NLA) that a lift system can travel during a five-minute peak period, for each group or rise of lifts.
Lift system should serve all office levels.

E1- CAR CAPACITY

Identifies the minimum car capacity for each passenger lift serving all office floors.
For new buildings: The minimum car capacity is based on an average of 75kg per person.

E5 - GOODS LIFT

Identifies the minimum number of dedicated goods lifts. Goods lifts must serve every floor of the building, including loading docks and roof plant room floors, but may exclude sub-loading dock car parking floors. Goods lifts in Grade A buildings less than 30,000 sqm NLA may be a shared service/passenger lift.

E6 - GOODS LIFT

Identifies the minimum capacity (kg) of each goods lift.

2.2.2 Electrical requirements – new buildings

Code	Parameter	Unit	Grade A buildings
F1	Power	VA/sqm (risers)	>=40
F2	Lighting	NCC compliance	Yes
F3	Lighting control	Programmable lighting control zones sqn	<=150
F4	Building management control systems (BMCS)	Type	Full BMCS including on floor control, energy management, comfort control, lift and mechanical metering system, diagnostics and reporting.

F1 – POWER

Identifies the minimum power capacity available to tenanted space within the building. Lighting power efficiency should comply with the supply authority requirements in each state/territory.

F2 -LIGHTING

Identifies whether the requirements of the National Construction Code (NCC) Part J 'Artificial lighting and power have been met.

Part J6.2 (b) sets out the requirements for design illumination power load for office buildings, in addition to figures presented in Tables J6.2 (a) (Maximum illumination power density), J6.2 (b) (Illumination power density adjustment factor for a control device) and J6.2 (c) (Illumination power density adjustment factor for light colour).

Alignment to the requirements of the NCC is based on expected changes to be delivered in NCC 2019. Project proponents are expected to reference the version of the NCC that is current at the time of seeking DA approval.

F3 - LIGHTING CONTROL

For new buildings: Identifies the requirement for programmable lighting zones.

F4 - BUILDING MANAGEMENT CONTROL SYSTEMS (BMCS)

Identifies the minimum level of base building control integrated into the building services of the building. All sensors and VAVs/induction/chilled beam units etc. must be monitored and controlled by the BMCS, and all output devices, i.e. valves, dampers, etc. to be actuated by the BMCS.

2.2.3 Standby Power requirements – Base building

Code	Parameter	Unit	Guideline figure
G1	Lifts	Number of lifts/rise	1 lift per rise
G2	Safety services (other than lifts)	Capacity	100%
G3	House lights and power	Capacity	50%
G4	Central plant	Capacity	-
G5	Tenant supplementary loop	Capacity	100%
G6	Tenant light and power	Capacity	Space for provision for tenant generator/s
G7	Onsite fuel storage	Hours of operation	12

G1- LIFTS

Identifies the minimum base building standby power required for lifts.

G2 - SAFETY SERVICES (OTHER THAN LIFTS)

Identifies the minimum base building standby power required for all essential services including base building ventilation systems.

G3 - HOUSE LIGHT AND POWER

Identifies the minimum base building standby power required for house, (base building) lights and power.

G4 - CENTRAL PLANT

Identifies the minimum base building standby power required to operate central plant including chillers.

G5 - TENANT SUPPLEMENTARY LOOP

Identifies the minimum base building standby power provision required for the tenant supplementary loop.

G6 - TENANT LIGHTS AND POWER

Identifies the minimum base building standby power provision required, and spatial provision for tenant generators capable of supporting 100 percent of tenant light and power, with generator connection points at the main switchboard.

G7- ONSITE FUEL STORAGE

Identifies the fuel storage onsite required to operate the base building standby powerplant at full capacity for the hours nominated.

3.0 Maximum demand calculations

The maximum demand current may be determined by one of four methods – calculation, assessment, measurement, or limitation. For the case of the apartment offices "C2.4.3 Alternative calculation method for commercial and light-industrial applications (AS/NZS 3000:2018)" has been adopted.

The reason for this decision is: The alternative calculation method set out below may be used for commercial and light-industrial applications. This method is based on experience and energy consumption figures for different types of occupancy within installations. Based on the selected calculation method, the "Table C3 MAXIMUM DEMAND" is referred to.

The values shown in table C3 depend on factors such as the climate, occupancy hours and levels, energy management systems, and the degree to which equipment is uniformly distributed in the affected area.

TABLE C3

MAXIMUM DEMAND—ENERGY DEMAND METHOD FOR NON-DOMESTIC INSTALLATIONS

Type of occupancy		Energy demand	
		Range, VA/m²	Average, VA/m²
Offices	Light and power	40–60	50
	Airconditioning:		
	— Cooling	30–40	35
	— Reverse cycle	20–30	25
	— Zonal reheat	40–60	50
	— Variable volume	20	20
Carparks	Open air	0–10	5
	EV charging	5–15	10
	Basement	10–20	15
	EV charging	10–30	20
Retail shops	Light and power	40–100	70
	Airconditioning	20–40	30
Warehouses	Light and power	5–15	10
	Ventilation	5	5
	Special equipment	(use load details)	
Light industrial	Light and power	10–20	15
	Ventilation	10–20	15
	Airconditioning	30–50	40
	Special equipment	(use load details)	
Taverns, licensed clubs	Total	60–100	80
Theatres	Total	80–120	100

NOTE: EV charging relates to charging equipment associated with electric vehicles and should be considered in addition to all other energy demands.

FIGURE 1 - TABLE C3 MAXIMUM DEMAND

Based on E3 criteria on" Property council of Australia Office quality grade matrix- Lifts – new buildings" it is required to have the peak response of maximum 30 seconds.

Considering the height of building (14 floors, lift overrun, and 5 floor basements) the lifts have to travel the height of 73.7m in 30 seconds which requires a lift motor that can provide the speed of

at least 2.45 m/s. Such motor will require about 15 kW, with three phase supply. This will equate to 22 Amps three phase, since there are five lifts, the total load for lifts would be 110 Amps three phase.

The result of maximum demand calculations is as follows:

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MAXIMUM DEMAND CALCULATIONS
BASED ON TABLE C3 OF AS3000 STANDARD

POWER FACTOR		TABLE	Apartment Offices 360 - 370 South Road, MOORABBIN VIC 3189
0.8		C3	
LOAD GROUP		LOAD (Amp)	CALCULATION/COMMENTS
	Tenancy Light and power		
I	Tenant L01	61.06	Total Area 1060m² based on 40 VA/m² as per C3 for Tenancy Light and power
II	Tenant L02	62.90	Total Area 1092m² based on 40 VA/m² as per C3 for Tenancy Light and power
III	Tenant L03	54.95	Total Area 954m² based on 40 VA/m² as per C3 for Tenancy Light and power
IV	Tenant L04	53.16	Total Area 923m² based on 40 VA/m² as per C3 for Tenancy Light and power
V	Tenant L05	53.16	Total Area 923m² based on 40 VA/m² as per C3 for Tenancy Light and power
VI	Tenant L06	53.16	Total Area 923m² based on 40 VA/m² as per C3 for Tenancy Light and power
VII	Tenant L07	52.24	Total Area 907m² based on 40 VA/m² as per C3 for Tenancy Light and power
VIII	Tenant L08	52.24	Total Area 907m² based on 40 VA/m² as per C3 for Tenancy Light and power
IX	Tenant L09	53.16	Total Area 923m² based on 40 VA/m² as per C3 for Tenancy Light and power
X	Tenant L10	53.16	Total Area 923m² based on 40 VA/m² as per C3 for Tenancy Light and power
XI	Tenant L11	52.19	Total Area 906m² based on 40 VA/m² as per C3 for Tenancy Light and power
XII	Tenant L12	52.19	Total Area 906m² based on 40 VA/m² as per C3 for Tenancy Light and power
XII	Tenant L13	53.16	Total Area 923m² based on 40 VA/m² as per C3 for Tenancy Light and power
XIV	Tenant L14	53.16	Total Area 923m² based on 40 VA/m² as per C3 for Tenancy Light and power
	Tenancy Air conditioning - Reverse cycle		
I	Tenant L01	30.53	Total Area 1060m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
II	Tenant L02	31.45	Total Area 1092m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
III	Tenant L03	27.48	Total Area 954m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
IV	Tenant L04	26.58	Total Area 923m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
V	Tenant L05	26.58	Total Area 923m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
VI	Tenant L06	26.58	Total Area 923m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
VII	Tenant L07	26.12	Total Area 907m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
VIII	Tenant L08	26.12	Total Area 907m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
IX	Tenant L09	26.58	Total Area 923m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
X	Tenant L10	26.58	Total Area 923m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
XI	Tenant L11	26.09	Total Area 906m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
XII	Tenant L12	26.09	Total Area 906m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
XIII	Tenant L13	26.58	Total Area 923m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
XIV	Tenant L14	26.58	Total Area 923m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
	Communal Light and power		
I	Communal L00	31.33	Total Area 544m² based on 40 VA/m² as per C3 for Communal Light and power
II	Communal L01	15.84	Total Area 275m² based on 40 VA/m² as per C3 for Communal Light and power
III	Communal L02	24.02	Total Area 417m² based on 40 VA/m² as per C3 for Communal Light and power
IV	Communal L03	3.46	Total Area 60m² based on 40 VA/m² as per C3 for Communal Light and power
V	Communal L04	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Communal Light and power
VI	Communal L05	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Communal Light and power
VII	Communal L06	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Communal Light and power
VIII	Communal L07	6.16	Total Area 107m² based on 40 VA/m² as per C3 for Communal Light and power
IX	Communal L08	6.16	Total Area 107m² based on 40 VA/m² as per C3 for Communal Light and power
X	Communal L09	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Communal Light and power
XI	Communal L10	53.11	Total Area 922m² based on 40 VA/m² as per C3 for Communal Light and power
XII	Communal L11	6.22	Total Area 108m² based on 40 VA/m² as per C3 for Communal Light and power
XIII	Communal L12	6.22	Total Area 108m² based on 40 VA/m² as per C3 for Communal Light and power
XIV	Communal L13	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Communal Light and power
XV	Communal L14	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Communal Light and power
XVI	Roof Terrace	2.80	Total Area 389m² based on 5 VA/m² as per C3 for Open air
	Communal Air conditioning - Zonal reheat		
I	Communal L00	31.33	Total Area 544m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
II	Communal L01	15.84	Total Area 275m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
III	Communal L02	24.02	Total Area 417m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
IV	Communal L03	3.46	Total Area 60m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
V	Communal L04	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
VI	Communal L05	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
VII	Communal L06	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
VIII	Communal L07	6.16	Total Area 107m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
IX	Communal L08	6.16	Total Area 107m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
X	Communal L09	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
XI	Communal L10	53.11	Total Area 922m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
XII	Communal L11	6.22	Total Area 108m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
XIII	Communal L12	6.22	Total Area 108m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
XIV	Communal L13	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
XV	Communal L14	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
	Retail shops		
I	Retail & Café L00	34.33	Total Area 596m² based on 40 VA/m² as per C3 for Light industrial - Light and power
II	Retail & Café L00	17.16	Total Area 596m² based on 20 VA/m² as per C3 for Light industrial - Airconditioning
	Carparks		
I	Basement 01	23.40	Total Area 1625m² based on 10 VA/m² as per C3 for Carparks - Basement
II	Basement 02	23.40	Total Area 1625m² based on 10 VA/m² as per C3 for Carparks - Basement
III	Basement 03	23.40	Total Area 1625m² based on 10 VA/m² as per C3 for Carparks - Basement
IV	Basement 04	23.40	Total Area 1625m² based on 10 VA/m² as per C3 for Carparks - Basement
V	Basement 05	23.40	Total Area 1625m² based on 10 VA/m² as per C3 for Carparks - Basement
VI	EV car charger	234.00	Total Area 8125m² based on 20 VA/m² as per C3 for Carparks - Basement
	Safety services		
I	Fire indicated panel	32.00	Based on the load details
II	Fire pump	120.00	Based on the load details
	Lift		
I	Special Equipment	110.00	Based on the load details
	TOTAL MAXIMUM DEMAND:	2175.12	Total Amps for the whole development

AS3000 calculations show a total of 2175.2 Amps three phase.
This equates to approximately 1510.5 kVA @ 400VAC. In this case, AS3000 calculations is likely to be conservative. We anticipate that a further 25% diversity is likely to reflect the realistic load. At 25% diversity factor, the likely load is 1132.9 kVA.
1132.9 kVA is approximately 1631.4 Amps per phase.

FIGURE 2 - MAXIMUM DEMAND CALCULATION – REV B

Based on the calculations performed in accordance with AS/NZS 3000:2018 the following would be the breakdown of the Maximum demand.

Space	Table C3 MD	25% diversity	kVA after Diversity
Tenancies	1140 Amps	860 Amps	590 kVA
Communal	140 Amps	106 Amps	75 kVA
Retail shops	50 Amps	40 Amps	26 kVA
Carpark	350 Amps	270 Amps	180 kVA
Lifts	110 Amps	82 Amps	60 kVA
Safety Services	150 Amps	115 Amps	80 kVA
Total	1950 Amps	1460 Amps	1020 kVA

Therefore, it is anticipated that for the whole development's electrical demand would be in the range of 1020kVA, the next step transformer would be 1.25MVA (equivalent of 1250kVA).

- The anticipated load for Tenancies would be in the range of 600kVA.
- The anticipated load for Communal (including carpark & EV) would be in the range of 255kVA.
- The anticipated load for Retail Shops would be in the range of 30kVA.
- The anticipated load for Lifts would be in the range of 60kVA.
- The anticipated load for Safety Service would be in the range of 80kVA.

Based on "2.2.3 Standby Power requirements – Base building" the backup power generation is required to have the following capacities:

Parameter	Unit	Grade A buildings	Maximum demand	Backup Generator demand
Lifts	Number of lifts/rise	1 lift per rise	60 kVA	12 kVA
Safety services (other than lifts)	Capacity	100%	80 kVA	80 kVA
Lights and power	Capacity	50%	90 kVA	45kVA
Tenant supplementary loop	Capacity	100%	200 kVA	200 kVA
Tenant light and power	Capacity	Space for provision for tenant generator/s	400 kVA	200 kVA (To be confirmed)

The required backup power for communal would be 140 kVA.
The required backup power for Tenancies supplementary loop (HVAC) would be 200 kVA.
The nominated backup power for Tenancies light and power would be maximum 200 kVA.
So the total backup system would be around 540 kVA.

4.0 ON-SITE SUBSTATION

On-site substation will include both substation and renewable generation system.

4.1 United Energy (UE) Substation Room

Based on a maximum of 2000kVA electrical demand, UE indoor substation room would be 5m x 3.5m (internal clear dimension), noting that the 5m wide fronts to the Council Road. The specific UE requirements for handling a transformer into the room are depicted in figures 3-5.

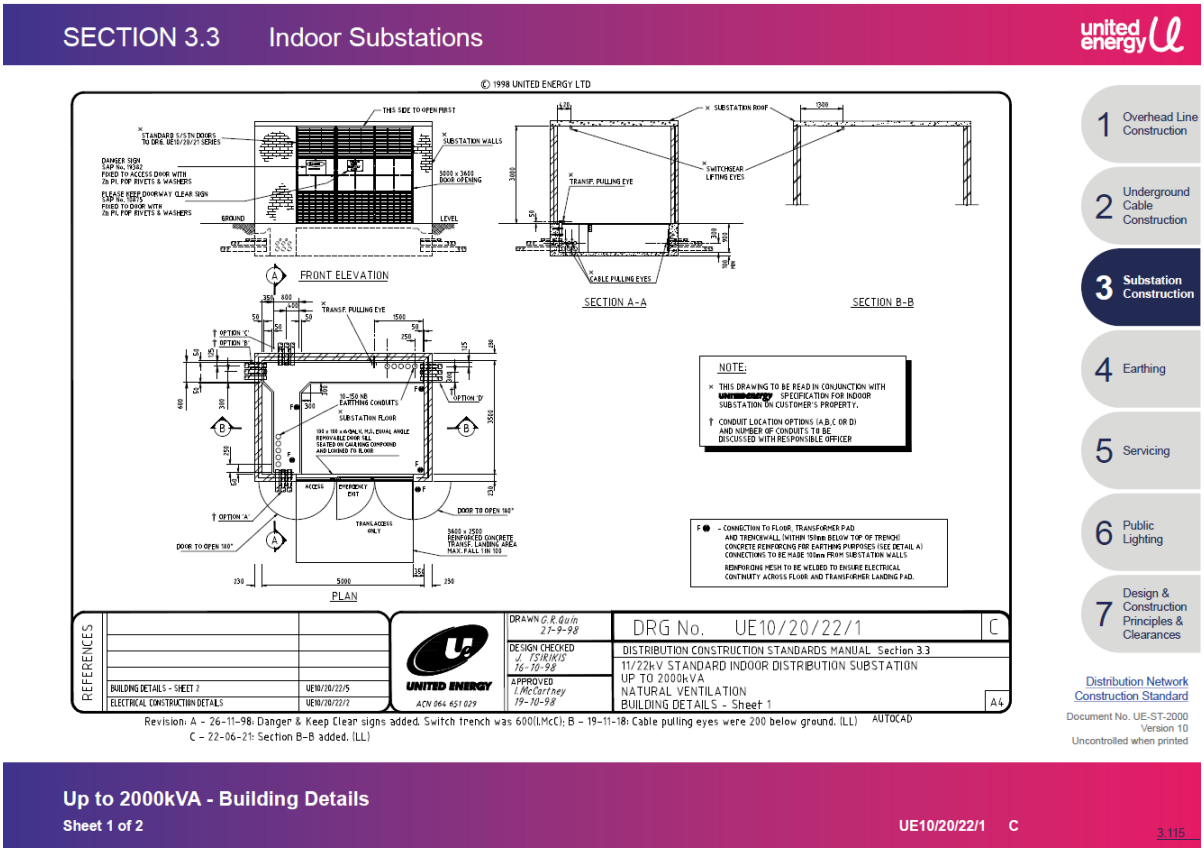

FIGURE 3 - UE INDOOR 2000KVA SUBSTATION PLAN

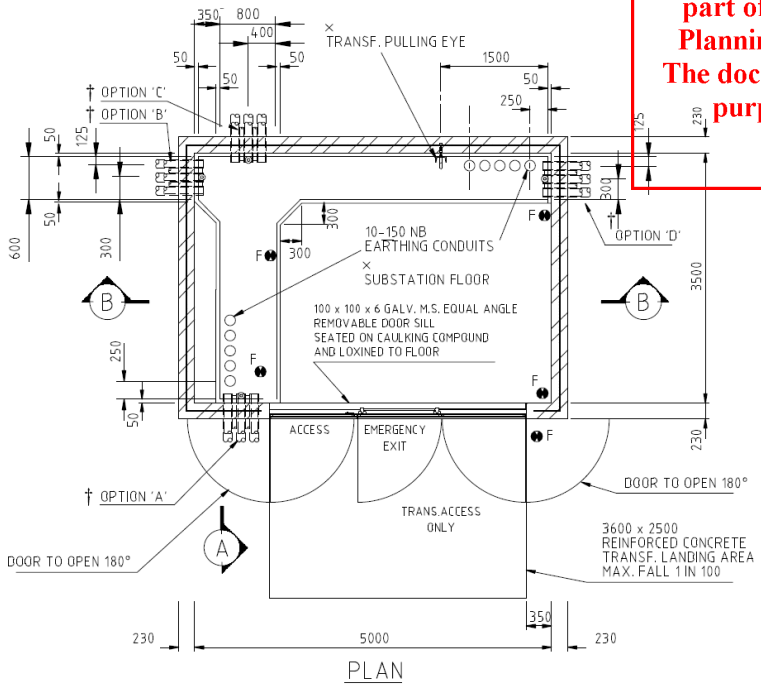

FIGURE 4 - UE INDOOR SUBSTATION PLAN

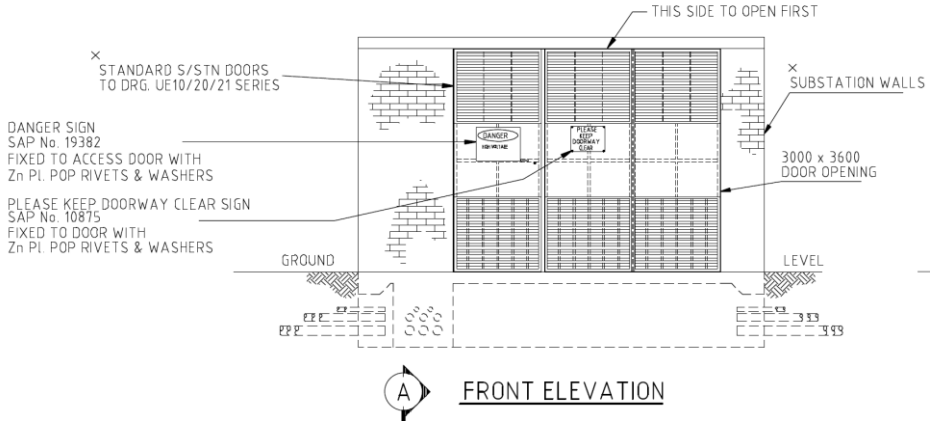

FIGURE 5 - UE SUBSTATION FRONT ELEVATION

4.2 The Switchroom

The switchroom would accommodate the Main Switchboard which would be owned and maintained by the owner's corporation. The Main Switchboard is a private asset, therefore cannot be located within the substation room.

The preferred location of switchroom would be directly behind the substation room, refer Figure 6, noting that this facilitates a cost-effective connection from the transformer to Main Switchboard (via wall bus). Any changes to such arrangement will need to be discussed and approved by UE.

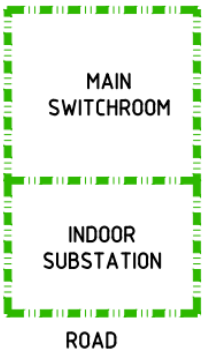

FIGURE 6 - INDOOR SUBSTATION AND SWITCHROOM LOCALITY

The Main Switchroom ideally would be minimum 5m (along the rear of substation) x 4.5m. Some of the communal systems (security / telecommunications could be allocated to this room).

Due to the size / fault rating of the switchboard, the room will require 2 x doors. (opening of door must be more than 0.9 x 2.2m) – this is the minimum opening dimensions, not door size, so the door will need to be 920 x 2400.

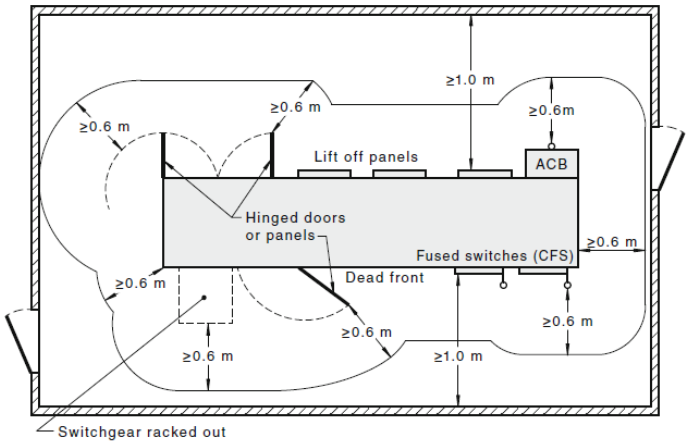

FIGURE 2.19 ACCESS TO SWITCHBOARDS—
FREESTANDING SWITCHBOARD WITH SWITCHGEAR RACKED OUT
FIGURE 7 - ACCESS TO SWITCHBOARDS (AS/NZS 3000:2018)

The need for a second door could be deleted but the room will need to be larger. (must maintain 3m in front of the switchboard to delete 1 of the doors).

(iii) A minimum of two emergency exit paths, spaced well apart, where a switchboard—

(A) is rated as a circuit with a nominal capacity of not less than 800 A per phase; or

(B) is more than 3 m in length.

Exception: Where a clear space of at least 3 m is provided in front of the switchboard and its equipment, including switchboard doors, in all normal positions of operating, opening and withdrawal, only one emergency exit path need to be provided. See Figure 2.24.

FIGURE 8 - EXCEPTION OF TWO EMERGENCY EXIT PATHS (AS/NZS 3000:2018)

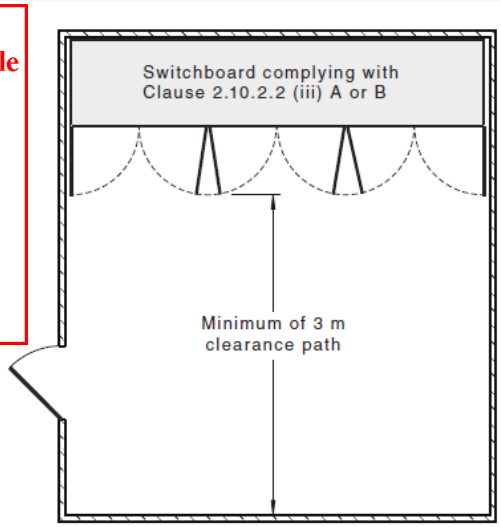

FIGURE 2.24 EXAMPLE OF EXCEPTION TO CLAUSE 2.10.2.2(iii)
WHERE ONLY ONE EXIT PATH NEEDS TO BE PROVIDED
FIGURE 9 - VISUAL EXCEPTION OF TWO EMERGENCY EXIT PATHS (AS/NZS 3000:2018)

The switch room shall preferably be free from obstruction such as vertical columns.

4.2.1Main Switchboard (MSB)

Main Switchboard (MSB) is located inside the Main Switchroom and approximate measurement would be 4-5 m wide, 2.1 high, 0.6m deep.

The MSB would be fitted with a generator backup open transition switching.

It is recommended that the site is arranged as local energy network (formerly referred to as Embedded Network), to enable a more straightforward connection of generator through the distribution chassis (minimises interlocks).

4.3 Renewable generation system and inverter

The inverter is suggested to be located inside the main switchroom, or it could potentially be positioned on roof but ideally located away from direct sunlight.

The inverter station subject to size of solar system would be maximum of 1.4m wide x 1m high x 0.5m deep (based on 2 inverters and some wall mounted controls).

We suggest some wall space for a wall communal battery. This could be within the communal basement space or main switchroom, around 1.4m wide x 1m high x 0.5m deep.

5.0 BACK-UP POWER SYSTEM

5.1 Backup Generator Size and location

Noting the maximum demand calculations is based on the draft architectural layout, this demand is subject to change.

Based on the calculations on maximum demand and the PCA – Grade A rating requirements, the back-up generators would be based on the following:

- Communal backup generator: 140 kVA
- Tenancies (HVAC, and light and power) backup batteries: space for 400 kVA (optional) apportioned as indicated below.

Tenant	Area (m^2)	Anticipated Load in Amps	Anticipated Load in kVA
Tenant L01	1,060	45.8	31.8
Tenant L02	1,092	47.2	32.8
Tenant L03	954	41.2	28.6
Tenant L04	923	39.9	27.7
Tenant L05	923	39.9	27.7
Tenant L06	923	39.9	27.7
Tenant L07	907	39.2	27.2
Tenant L08	907	39.2	27.2
Tenant L09	923	39.9	27.7
Tenant L10	923	39.9	27.7
Tenant L11	906	39.2	27.2
Tenant L12	906	39.2	27.2
Tenant L13	923	39.9	27.7
Tenant L14	923	39.9	27.7
Total		570.2	396

The size of the back-up battery would be in the range of 400kVA. Based on the table above, each tenancies require batteries with capacity of 40 - 50 Amps. For comparison, this can be achieved via 6 Tesla batteries which will need to be allocated with ample wall. Considering it is required to supply the tenancies for 12 hours, the anticipated average battery capacity would be 45kWh/day to provide sufficient backup power.

Based on the size of the backup generator required for the communal area, it is suggested to adopt to diesel generator.

The room dimensions for a 140 kVA generator would be around 6m x 3.5m enclosed arrangement (generator would be 4m x 1.2m with supplementary fuel tank below generator)

The optimal placement for standby generator is typically on the ground floor or within basement, facilitating ease of access via forklift.

Conversely, positioning the communal generator at rooftop levels can result in substantially higher installation and maintenance expenses, primarily attributable to accessibility challenges, particularly when dealing with larger main standby generators.

The other consideration would be the consideration of exhaust system. In the case the generator is located within the basement, further investigation is required to obtain detailed information regarding the exhaust system, and heat rejection.

5.2 Backup Generator testing procedures (frequency and duration)

The frequency of testing procedure should be as follows:

- Every 6 months: turning the generator On/Off
- Every 12 months: Blackout testing, to assess the response of generators in blackout event. This will also test the transfer switch mechanism and apply some building load to the generator. The frequency of such test will need to be completed afterhours as it will result in disruption of power.
- Every 24 months: Load Back testing, to validate the correct operational performance of the alternator over time, i.e. to test the generator at full load capacity.

POWER FACTOR		TABLE	Apartment Offices 360 - 370 South Road, MOORABBIN VIC 3189
0.8		C3	
LOAD GROUP		LOAD (Amp)	CALCULATION/COMMENTS
	Tenancy Light and power		
I	Tenant L01	61.06	Total Area 1060m² based on 40 VA/m² as per C3 for Tenancy Light and power
II	Tenant L02	62.90	Total Area 1092m² based on 40 VA/m² as per C3 for Tenancy Light and power
III	Tenant L03	54.95	Total Area 954m² based on 40 VA/m² as per C3 for Tenancy Light and power
IV	Tenant L04	53.16	Total Area 923m² based on 40 VA/m² as per C3 for Tenancy Light and power
V	Tenant L05	53.16	Total Area 923m² based on 40 VA/m² as per C3 for Tenancy Light and power
VI	Tenant L06	53.16	Total Area 923m² based on 40 VA/m² as per C3 for Tenancy Light and power
VII	Tenant L07	52.24	Total Area 907m² based on 40 VA/m² as per C3 for Tenancy Light and power
VIII	Tenant L08	52.24	Total Area 907m² based on 40 VA/m² as per C3 for Tenancy Light and power
IX	Tenant L09	53.16	Total Area 923m² based on 40 VA/m² as per C3 for Tenancy Light and power
X	Tenant L10	53.16	Total Area 923m² based on 40 VA/m² as per C3 for Tenancy Light and power
XI	Tenant L11	52.19	Total Area 906m² based on 40 VA/m² as per C3 for Tenancy Light and power
XII	Tenant L12	52.19	Total Area 906m² based on 40 VA/m² as per C3 for Tenancy Light and power
XII	Tenant L13	53.16	Total Area 923m² based on 40 VA/m² as per C3 for Tenancy Light and power
XIV	Tenant L14	53.16	Total Area 923m² based on 40 VA/m² as per C3 for Tenancy Light and power
	Tenancy Air conditioning - Reverse cycle		
I	Tenant L01	30.53	Total Area 1060m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
II	Tenant L02	31.45	Total Area 1092m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
III	Tenant L03	27.48	Total Area 954m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
IV	Tenant L04	26.58	Total Area 923m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
V	Tenant L05	26.58	Total Area 923m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
VI	Tenant L06	26.58	Total Area 923m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
VII	Tenant L07	26.12	Total Area 907m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
VIII	Tenant L08	26.12	Total Area 907m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
IX	Tenant L09	26.58	Total Area 923m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
X	Tenant L10	26.58	Total Area 923m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
XI	Tenant L11	26.09	Total Area 906m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
XII	Tenant L12	26.09	Total Area 906m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
XIII	Tenant L13	26.58	Total Area 923m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
XIV	Tenant L14	26.58	Total Area 923m² based on 20 VA/m² as per C3 for Tenancy Air conditioning - Reverse cycle
	Communal Light and power		
I	Communal L00	31.33	Total Area 544m² based on 40 VA/m² as per C3 for Communal Light and power
II	Communal L01	15.84	Total Area 275m² based on 40 VA/m² as per C3 for Communal Light and power
III	Communal L02	24.02	Total Area 417m² based on 40 VA/m² as per C3 for Communal Light and power
IV	Communal L03	3.46	Total Area 60m² based on 40 VA/m² as per C3 for Communal Light and power
V	Communal L04	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Communal Light and power
VI	Communal L05	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Communal Light and power
VII	Communal L06	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Communal Light and power
VIII	Communal L07	6.16	Total Area 107m² based on 40 VA/m² as per C3 for Communal Light and power
IX	Communal L08	6.16	Total Area 107m² based on 40 VA/m² as per C3 for Communal Light and power
X	Communal L09	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Communal Light and power
XI	Communal L10	53.11	Total Area 922m² based on 40 VA/m² as per C3 for Communal Light and power
XII	Communal L11	6.22	Total Area 108m² based on 40 VA/m² as per C3 for Communal Light and power
XIII	Communal L12	6.22	Total Area 108m² based on 40 VA/m² as per C3 for Communal Light and power
XIV	Communal L13	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Communal Light and power
XV	Communal L14	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Communal Light and power
XVI	Roof Terrace	2.80	Total Area 389m² based on 5 VA/m² as per C3 for Open air
	Communal Air conditioning - Zonal reheat		
I	Communal L00	31.33	Total Area 544m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
II	Communal L01	15.84	Total Area 275m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
III	Communal L02	24.02	Total Area 417m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
IV	Communal L03	3.46	Total Area 60m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
V	Communal L04	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
VI	Communal L05	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
VII	Communal L06	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
VIII	Communal L07	6.16	Total Area 107m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
IX	Communal L08	6.16	Total Area 107m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
X	Communal L09	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
XI	Communal L10	53.11	Total Area 922m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
XII	Communal L11	6.22	Total Area 108m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
XIII	Communal L12	6.22	Total Area 108m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
XIV	Communal L13	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
XV	Communal L14	5.24	Total Area 91m² based on 40 VA/m² as per C3 for Air conditioning - Zonal reheat
	Retail shops		
I	Retail & Café L00	34.33	Total Area 596m² based on 40 VA/m² as per C3 for Light industrial - Light and power
II	Retail & Café L00	17.16	Total Area 596m² based on 20 VA/m² as per C3 for Light industrial - Airconditioning
	Carparks		
I	Basement 01	23.40	Total Area 1625m² based on 10 VA/m² as per C3 for Carparks - Basement
II	Basement 02	23.40	Total Area 1625m² based on 10 VA/m² as per C3 for Carparks - Basement
III	Basement 03	23.40	Total Area 1625m² based on 10 VA/m² as per C3 for Carparks - Basement
IV	Basement 04	23.40	Total Area 1625m² based on 10 VA/m² as per C3 for Carparks - Basement
V	Basement 05	23.40	Total Area 1625m² based on 10 VA/m² as per C3 for Carparks - Basement
VI	EV car charger	234.00	Total Area 8125m² based on 20 VA/m² as per C3 for Carparks - Basement
	Safety services		
I	Fire indicated panel	32.00	Based on the load details
II	Fire pump	120.00	Based on the load details
	Lift		
I	Special Equipment	110.00	Based on the load details
	TOTAL MAXIMUM DEMAND:	2175.12	Total Amps for the whole dvelopment.

AS3000 calculations show a total of 2175.2 Amps three phase.
This equates to approximately 1510.5 kVA @ 400VAC. In this case, AS3000 calculations is likely to be conservative. We anticipate that a further 25% diversity is likely to reflect the realistic load. At 25% diversity factor, the likely load is 1132.9 kVA.
1132.9 kVA is approximately 1631.4 Amps per phase.