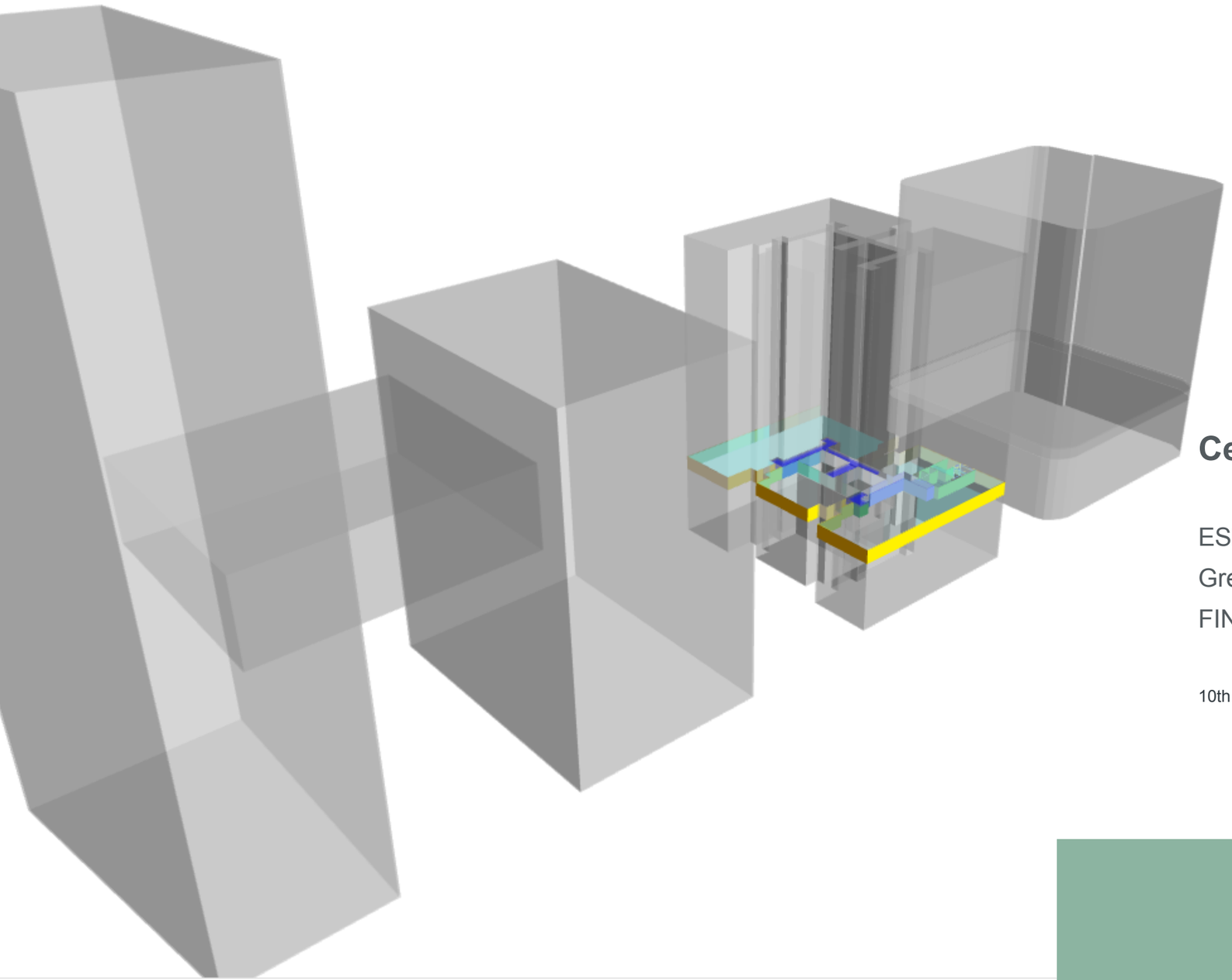

Central Park, Block 1

ESD Report for SSDA

Green Star, BASIX and Section J (Parts J1 and J2)

FINAL

10th July 2014

WSP | Built Ecology

Quality Management

Issue/Revision	Issue 01	Revision 01	Revision 02	Revision 03	Revision 04
Remarks	Draft for comment— BASIX, NatHERS and Section J results to be included in final SSDA report.	Final DRAFT for SSDA—BASIX certificates and apartment references to be included in the final report.	Final Draft for SSDA—ABSA Certificates to be included in the final report	Final for SSDA	
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1. Introduction

Introduction and Purpose of Report

This report details the Ecologically Sustainable Development (ESD) features included in the design of Block 1 proposed building within the Central Park precinct development, Chippendale.

The project involves the construction of a new multi-storey residential and retail building, designed by Foster + Partners; with PTW acting as collaborating local architects. The revised building consists of a plant and loading dock basement level with a further four levels of common basement car parking. A ground floor retail space and lobby area, and a further 17 floors of residential floor space is to be provided in the building.

This report sets out the ESD design criteria adopted in the following areas in order to provide the best environmental outcome for the building:

- Ecologically Sustainable Design (ESD) Initiatives
- Green Star Strategy
- BASIX Certification Strategy and Inputs, including NatHERS thermal comfort modelling parameters
- Section J Part J1 and J2 summary

Planning Requirements and ESD

As a residential development, there are a number of planning tools which are applicable. These include:

- BASIX—The Building Sustainability Index. This is an online tool which replaces relevant Parts of Section J Energy Efficiency of Volume One of the National Construction Code (NCC) Series in New South Wales
- SEPP 65—State Environmental Planning Policy 65 and its associated Residential Flat Design Code (RFDC), which relates to the design quality of residential development amenity

This report does not consider overall compliance with SEPP65. Results for natural ventilation modelling undertaken are included in this report. All other results from the SEPP65 analysis are included in a separate report prepared by Foster and Partners.

The non-residential areas which are mechanically conditioned will also need to comply with:

- Section J of Volume 1 of National Construction Code of Australia 2014 (NCC).

A 5 star Green Star rating under the Multi Unit Residential Tool is also being targeted.

BASIX and Section J

BASIX is an online tool that is used to rate the energy and water efficiency, and thermal comfort performance of residential dwellings in NSW. The tool sets minimum energy and water reduction targets, which must be met through the design of the building and the selection of energy and water efficient fixtures, fittings and appliances.

BASIX applies automatically to all new Class 1 and 2 buildings. Under Part A3.2 of Volume One of the NCC, the residential portion of Block 1 can be categorised as a Class 2 building; a building containing 2 or more sole-occupancy units each being a separate dwelling.

All areas in the building which are mechanically conditioned and are not Class 1 or 2, have to meet compliance with Section J “Energy Efficiency” of Volume One of the NCC Series 2014.

The compliance assessment method applied was as follows:

- Part J1 requires the definition of the building fabric thermal performance requirements in line with the DTS provisions
- Part J2 requires the completion of the Australian Building Codes Board (ABCB) glazing calculator, which assesses façade areas, glazing areas and properties, shading, and orientation in each storey, including any mezzanine

The applicable building elements (building fabric and glazing) are all those which form part of the building envelope (i.e. all building elements that separate conditioned spaces from the exterior or non-conditioned spaces).

Sources of Information

The following sources of information were used:

- SSDA architectural drawings for the tower by Foster and Partners, drawing numbers: PA-A1-1600, PA-A1-1760 to 1766, PA-A1-1775 to 78, PA -A1-1780 to 1787, PA-A1-2050 to 2053, PA-A1-2252 to 2253, PA-A1-3500 to 3503, PA-A1-3770 to PA-A1-3779, dated 20/06/2014.
- Architectural drawings for the basement by PTW: PA-A1-1755 to 1757 (dated 06/13/14), PA-A1-1758 (dated 11/12/13), Pa-A1-1759 (dated 13/06/14)
- The BASIX online tool and help notes: www.basix.nsw.gov.au

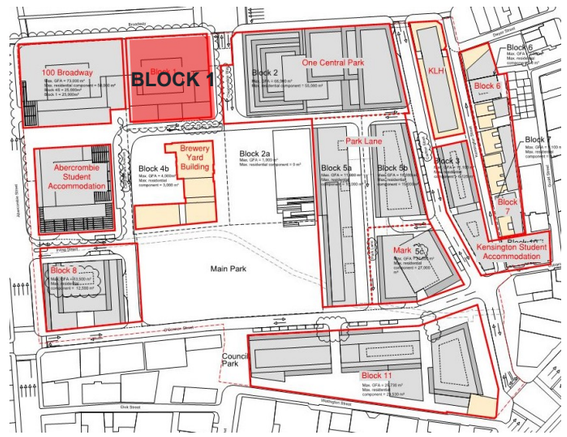


Figure 1: Location of Block 1 in the Central Park Precinct

2. ESD Initiatives—Energy and Water efficiency

A key ESD feature is the location of the building within a precinct that produces a proportion of its own electricity via a tri-generation plant incorporated into a central thermal plant (CTP). Waste heat from the tri-generation plant is used to generate a proportion of the space and domestic hot water (DHW) heating and comfort cooling energy needs of the precinct. In addition, a recycled water treatment plant (RWTP) collects wastewater from all of the buildings in the precinct and provides Grade A water to meet all of the non-potable water uses in the precinct.

Energy Efficiency

The CTP has been designed to supply chilled water (CHW) for comfort cooling, and heating hot water (HHW) for space and domestic hot water (DHW) heating.

The CTP has been optimised to reduce energy and water consumption through the inclusion of a tri-generation system that will reduce reliance on the electricity grid and the utilisation of recycled water from the RWTP to meet the heat rejection requirements, respectively.

CHW and HHW from the CTP will be reticulated around the precinct to individual blocks via an external piping network installed in pre-defined stages. Reticulation routes include buried trench sections and pipework runs exposed within basement levels.

Block 1 will be connected to the CTP to meets its HHW and DHW demands. The electricity used by the base building will also be supplemented by electricity provided by the trigeneration engine. It is expected that this will provide significant GHG emissions savings.

Residential Portion

The requirement for active space heating and comfort cooling has been reduced effectively based on the natural ventilation strategy, location and thermal properties of fixed and openable glazing, thermal properties of the building fabric and external shading.

This is demonstrated by the BASIX (thermal comfort) performance outlined. The target baseline heating and cooling loads under BASIX are estimated to be:

- Maximum heating load: 50 (MJ/m^2)
- Maximum cooling load: 41 (MJ/m^2)

For Green Star Ene Conditional requirement:

- Total average heating and cooling load for all apartments should be at least 10% lower than the maximum BASIX thermal comfort loads, i.e. 81.9 (MJ/m^2).

For Green Star IEQ-5 Thermal Comfort requirement:

- Total average heating and cooling load for all apartments should be less than 30 MJ/m^2 to achieve 1 point.

All apartments will be provided with electricity authority sub-metering to facilitate effective energy monitoring. Subject to implementation of smart metering systems, this supports the ability to affect behavioural change in the way that the occupants utilise air conditioning, lighting, fixtures and fittings.

Non Residential Portion

Electricity sub-metering will be provided for lighting, air conditioning and power based on the tenancy sub-divisions.

Further to this, electricity sub-metering will be provided in line with current Section J requirements, i.e. will individually monitor the energy consumption of ventilation and air conditioning equipment, lighting, power, domestic hot water and other ancillary plant.

Water Efficiency

The RWTP has been designed to meet all non-potable water demands in the precinct. Waste water from toilets, showers, sinks, and also rainwater and sewer mining will be treated to Grade A water quality levels to meet toilet flushing, laundry, cooling tower water make up, irrigation and general washdown demands.

Block 1 will be connected to the RWTP which will lead to high reduction in potable water consumption.

Residential Portion

Water fixtures and fittings will be specified to high Water Efficiency Labelling Scheme (WELS) rating .The minimum WELS ratings of the fittings and fixtures are:

- Showers 3 star (>7.5 but <=9L/min)
- Toilets 4 star
- Bathroom and kitchen taps 6 star

All apartments will be provided with water authority sub-metering to facilitate effective energy monitoring. Subject to implementation of smart metering systems, this supports the ability to affect behavioural change in the way that the occupants utilise fixtures and fittings.

Non Residential Portion

Water sub-metering will be provided for each tenancy. Additionally, sub-metering will be installed for the make-up water lines to the cooling towers and swimming pool.

A rainwater harvesting system will be installed to meet the landscape irrigation demands. The recycled water supply to landscape irrigation will be sub-metered.

The cooling towers will be connected to a recirculating cooling (condenser) water loop. In order to minimise the make-up water requirements to the cooling towers, the blow down will be controlled based on the cycles of concentration of the water.

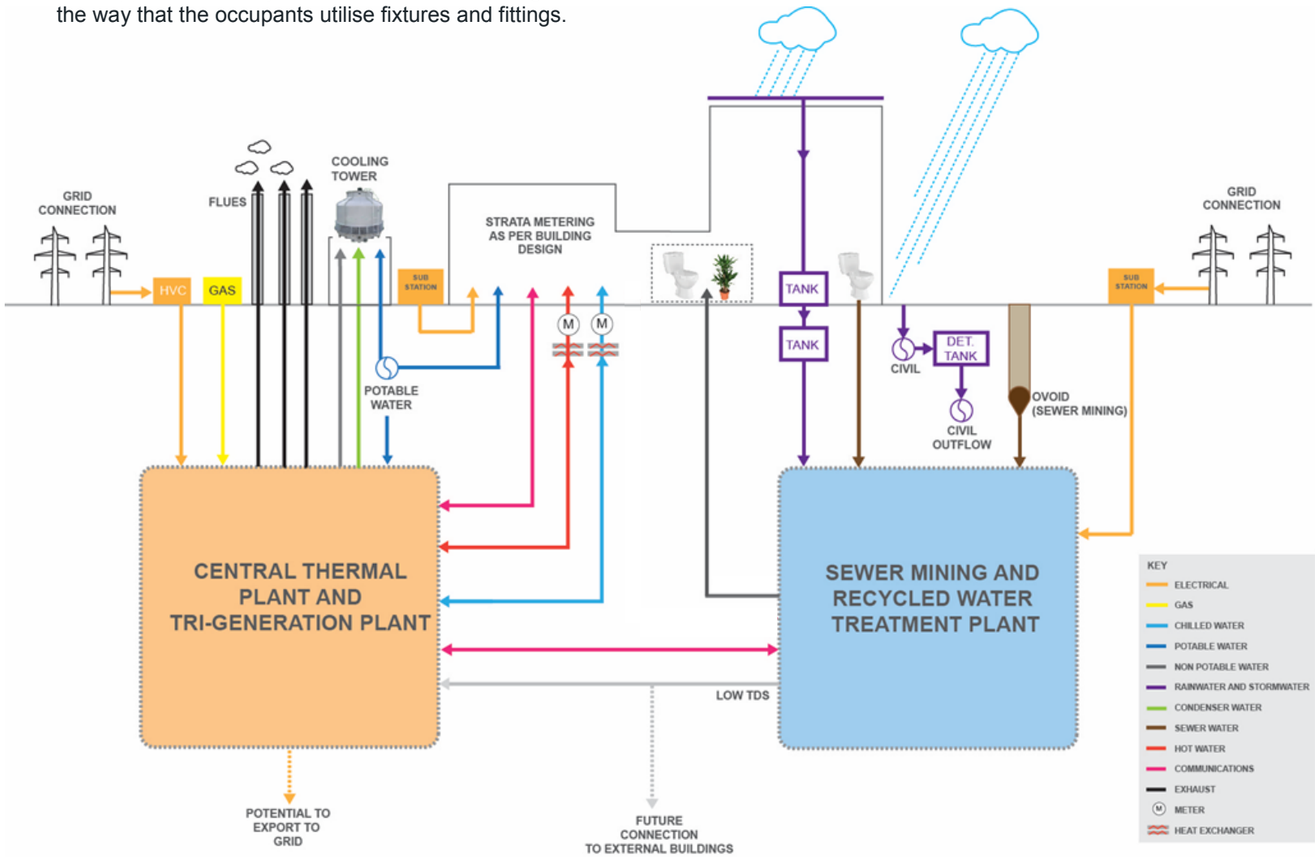


Figure 2: CTP and RWTP Connections

2. ESD Initiatives—Materials, Comfort, Health and Transport

Materials

Where possible, building materials, fittings and finishes will incorporate recycled materials or will be independently certified against a third party environmental certification scheme.

- Concrete, Steel and PVC—by sourcing these materials responsibly the impact on the environment arising form extraction and manufacture of these materials is reduced;
- Sustainable timber—by sourcing timber from sustainable forests, the impact on the environment from deforestation is reduced; and
- Flooring and joinery—selection of materials for flooring and joinery will take into consideration the recycled content of the product, product stewardship by the manufacturer, expected lifespan of the product, and the disassembly of the product to enable ease of reuse. All of these initiatives aim to reduce materials consumption.

Recycling will be convenient for the residents as recycling bins will be provided for each residential floor. A bulk storage space for large household items will also be provided in the basement.

Figure 3: Careful material selection will be undertaken for Block 1

Comfort

Thermal Comfort

Thermal modelling of the building has assisted with selecting glazing materials and insulation of walls and roofs to maximise the thermal performance of the building envelope. This will enhance thermal comfort for the occupants.

Careful design of external shading, such as louvres, will provide additional shading to the facades. For further details, please refer to the façade section of the architectural summary report.

In addition, careful design of the mechanical systems will maximise thermal comfort in all occupied spaces.

Acoustic Comfort

The acoustic design will aim to achieve a high level of acoustic amenity between adjacent rooms and improve the acoustic comfort of the occupants by minimising noise from external sources and internal building services equipment.

Sound insulation will be appropriately applied between occupied areas based on the use of the spaces.

Health

Paints and floor covering will have low levels of volatile organic compounds. Low formaldehyde wood products will be used.

All composite wood products will have low formaldehyde content.

In order to provide adequate lighting levels, electric lighting will be provided to achieve a minimum of 300 lux on kitchen sinks, cooktops and vanity basins

Transport

Provision of bicycle parking spaces has been shown to encourage the use of bicycles as an alternative form of transport. At least one bicycle locker or cage will be provided per apartment.

In addition, bicycle use among the residential visitors can be significantly encouraged by providing bicycles for their use. Bicycle racks for visitors will be provided at an easily accessible location, as shown on Ground Plane architectural drawings.

The building is located just over 300m from Central Station, putting it in excellent proximity to trains servicing the entire Sydney region as well as Country Link trains interstate.

Its position on Broadway also places the building on a major bus route, serviced by several bus services to the city and Sydney's east and west. Further bus services to Sydney's east, north and south are available at Central Station.

Car-sharing results in reduction of cars on the road. Car-share spaces will be provided in the Central Park Precinct.

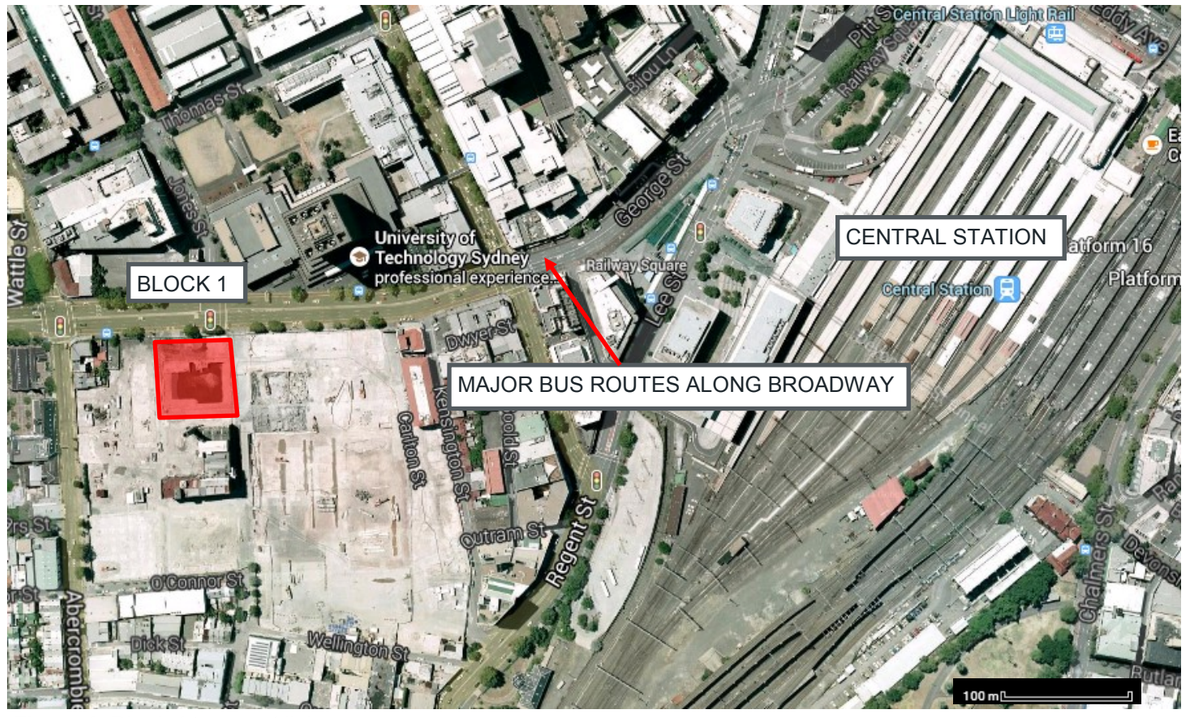


Figure 4: Block 1 transport links

2. ESD Initiatives—Green Star Strategy

In order to demonstrate the sustainability aspirations of the project, a 5 star Green Star pathway has been established to support the application of ESD initiatives across a full range of environmental categories. The Green Star tool applicable for Block 1 is the Multi Unit Residential v1 Tool. Table 1 demonstrates the 5 star Green Star pathway to be followed.

The minimum number of points required to achieve 5 star Green Star is 60 points. A minimum of 64 points will be targeted to allow a safety margin, in case points are dropped during the future project stages. The buffer with the current Green Star strategy is 5.5 points.

Table 1: Modelling parameters for the NatHERS modelling

Green Star Multi Unit Residential v1 Design Matrix

Title	Credit No.	Points Available	Points Targeted	Weighted Points
Management				
Green Star Accredited Professional	Man - 1	2	2	0.9
Commissioning Clauses	Man - 2	2	2	0.9
Building Tuning	Man - 3	1	1	0.4
Independent Commissioning Agent	Man - 4	1	1	0.4
Building Users' Guide	Man - 5	1	1	0.4
Environmental Management	Man - 6	3	3	1.3
Waste Management	Man - 7	2	2	0.9
Metering	Man - 16	6	6	2.7
Management	SUB-TOTAL	18	18	8.0
Indoor Environment Quality				
Daylight	IEQ - 4	2		0.0
Thermal Comfort	IEQ - 5	2	2	2.0
Hazardous Materials	IEQ - 6	1	1	1.0
Internal Noise Levels	IEQ - 7	2	1	1.0
Volatile Organic Compounds	IEQ - 8	4	4	4.0
Formaldehyde Minimisation	IEQ - 9	1	1	1.0
Electric Lighting Levels	IEQ - 13	1	1	1.0
Private External Space	IEQ - 20	1		0.0
Dwelling Ventilation	IEQ - 21	3	1	1.0
Natural Ventilation	IEQ - 22	3		0.0
Indoor Environment Quality	SUB-TOTAL	20	11	11.0
Energy				
Conditional Requirement	Ene - Con		Yes	
Greenhouse Gas Emissions	Ene - 1	20	5	4.8
Unoccupied Areas	Ene - 7	2	2	1.9
Energy Efficient Appliances	Ene - 11	2	2	1.9
Peak Electricity Demand Reduction	Ene - 12	2	2	1.9
Energy	SUB-TOTAL	26	11	10.6
Transport				
Provision of Car Parking	Tra - 1	2		0.0
Fuel-Efficient Transport	Tra - 2	2	2	1.4
Cyclist Facilities	Tra - 3	3	3	2.1
Commuting Mass Transport	Tra - 4	5	5	3.6
Trip Reduction-Mixed Use	Tra - 5	2	2	1.4
Transport	SUB-TOTAL	14	12	8.6
Water				
Occupant Amenity Water	Wat - 1	5	5	6.3
Landscape Irrigation	Wat - 3	1	1	1.3
Heat Rejection Water	Wat - 4	2	2	2.5
Fire System Water	Wat - 5	1	1	1.3
Water Efficient Appliances	Wat - 7	1	1	1.3
Swimming Pool/Spa Water Efficiency	Wat - 8	2		0.0
Water	SUB-TOTAL	12	10	12.5
Materials				
Recycling Waste Storage	Mat - 1	2	2	1.1
Building Re-use	Mat - 2	na		0.0
Recycled Content & Re-used Products and Materials	Mat - 3	1		0.0
Concrete	Mat - 4	3	2	1.1
Steel	Mat - 5	2	1	0.5
PVC	Mat - 6	2	2	1.1
Sustainable Timber	Mat - 7	1	1	0.5
Design for Disassembly	Mat - 8	1	1	0.5
Dematerialisation	Mat - 9	2		0.0
Flooring	Mat - 11	1	1	0.5
Joinery	Mat - 12	1	1	0.5
Internal Walls	Mat - 14	2	2	1.1
Universal Design	Mat - 15	1	1	0.5
Materials	SUB-TOTAL	19	14	7.4
Land Use & Ecology				
Conditional Requirement	Eco - Con		Yes	
Topsoil	Eco - 1	na		0.0
Re-use of Land	Eco - 2	1	1	0.7
Reclaimed Contaminated Land	Eco - 3	2	2	1.4
Change of Ecological Value	Eco - 4	4	1	0.7
Outdoor Communal Facilities	Eco - 5	3	1	0.7
Land Use & Ecology	SUB-TOTAL	10	5	3.5
Emissions				
Refrigerant ODP	Emi - 1	1	1	0.3
Refrigerant GWP	Emi - 2	2		0.0
Refrigerant Leaks	Emi - 3	1	1	0.3
Insulant ODP	Emi - 4	1	1	0.3
Stormwater	Emi - 5	3	3	1.0
Discharge to Sewer	Emi - 6	5	5	1.7
Light Pollution	Emi - 7	1	1	0.3
Legionella	Emi - 8	1		0.0
Emissions	SUB-TOTAL	15	12	4.0
	SUB-TOTAL CATEGORY WEIGHTING SCORE	134	93	65.5

3. BASIX Certification Strategy and Inputs | Overview and Water

BASIX Overview

Section J of Volume One of the NCC requires that Class 2 buildings are subject to BASIX.

BASIX is an online tool designed to assess the potential performance of certain residential buildings against a range of sustainability indices, including water, thermal comfort and energy. The BASIX tool also calculates the maximum heating and cooling load benchmarks for the building. Commitments made under BASIX become a condition of the relevant development consent or complying development certificate.

Block 1

A maximum of 100 apartments can be included in one BASIX Certificate, therefore three BASIX Certificates have been developed for Block 1 due to the number of apartments in the development (281). The certificates are aggregated as follows:

1. Certificate 1: Levels 2 –7, 100 apartments
2. Certificate 2: Levels 8-12, 90 apartments
3. Certificate 3: Levels 13-18, 91 apartments

The BASIX benchmarks that apply to this development are:

- Energy—20% reduction below current practice
- Water—40% reduction below current practice
- Thermal comfort—Pass demonstrated via NatHERS modelling for all buildings

Common Areas

Common areas for the development have been pro-rated according to the number of units on each BASIX Certificate, including the car parks, swimming pool and rainwater tanks.

Water Strategy for BASIX Certificate

Efficient Fixtures and Fittings

In order to maximise the water efficiency of the development, all fixtures in the proposed development are to meet the WELS (Water Efficiency Labelling Scheme) ratings detailed in Table 2.

Table 2: Proposed WELS ratings for fixtures for BASIX Certificate

Fixture	Proposed WELS Ratings
Toilets	4 Star
Bathroom and Kitchen Taps	6 Star
Showers	3 Star (>7.5 but <=9L/min)
Dishwashers	3.5 Star
Clothes washers	4.5 Star
Common area taps	6 Star
Common area toilets	4 Star

Landscaping

Further potable water use reductions will be achieved through a water sensitive landscape and irrigation design.

- Native, indigenous plant species will be selected for a portion of communal and private garden areas. This will reduce or eliminate irrigation demands after establishment, facilitate potable water reductions, and provide ongoing cost and maintenance savings.
- The ratio of exotic to indigenous plants will be 90:10.
- The portion of low water use plants (both exotic and indigenous) will be 50% of total plant species.
- All landscape demand will be met by recycled water from the central RWTP.

Further detail on the design can be found in the Landscape Design Report prepared by Turf Design Studio.

3. BASIX Certificates Strategy and Inputs | Thermal Comfort

Thermal Comfort

NatHERS Modelling

Compliance with the thermal comfort requirements of BASIX is demonstrated via NatHERS thermal comfort modelling.

NatHERS modelling is conducted using approved software, such as BERS Pro 4.2. Each representative type of apartment is modelled to obtain heating and cooling loads, which are then entered into BASIX. In order to meet the heating and cooling load limits set by BASIX, the initiatives in Table 3 will be employed.

BERS Pro, produced by Solar Logic, has been used by WSP Built Ecology to carry out the NatHERS modelling. It has been developed as a residential thermal comfort rating tool and is accredited under the NatHERS Software Accreditation Protocol. Dwellings can achieve up to ten stars in relation to their thermal comfort performance.

User inputs, such as area uses, orientation, climate zone, building materials and air conditioning requirements are used to calculate heating and cooling loads for each apartment.

The models have accounted for the following:

- The overhang of any balconies above each apartment, built in as eaves
- Any shading from overshadowing buildings
- Any balcony walls between dwellings, built in as shading screens and wing walls

Limitations

The results from the BERS Pro modelling shown within this report are limited in accuracy by the following factors:

- Actual energy consumption will also be dependent on the climate, occupants and their behaviour, which the software does not take into account
- Orientation and apartment layout being as shown on the drawings
- Construction parameters being as stated in Table 3 (next page)

3. BASIX Certification Strategy and Inputs | Thermal Comfort

Thermal Comfort

Table 3: Modelling parameters for the NatHERS modelling

Building element	Description
Floor to ceiling height	2.7m
External walls	Precast concrete panels - 160mm minimum thickness; provide R1.1 m^2.K/W insulation in all external walls to provide R_{total} 1.5 m^2.K/W (for further details refer to façade sections provided by the façade engineer in their SSDA report)
Party walls	Cavity panel; insulation in all party walls to meet acoustic requirements (R0.7 m^2.K/W
Walls to lifts, stair wells, toilets, plant areas, etc.	Tilt Concrete – lined - 200mm thickness; R0.7 m^2.K/W insulation in all walls to provide R_{total} 1.1 m^2.K/W
Internal wall between living/bedroom spaces	Cavity Panel; no insulation included in the model (insulation in internal spaces would not alter the thermal performance of the apartments); insulation to be specified based on acoustic requirements.
Internal wall between living/bedroom spaces to bathroom/ensuite space	Cavity Panel; no insulation included in the model (insulation in internal spaces would not alter the thermal performance of the apartments); insulation to be specified based on acoustic requirements.
Common area corridors	No minimum insulation levels on the external walls to common area corridors are required.
Walls to conditioned corridors	Cavity panel; insulation in all party walls to meet acoustic requirements (R0.7 m^2.K/W insulation used in NatHERS model to provide R_{total} 1.0 m^2.K/W)
Skylights	No skylights at the apartments.
Vented downlights	Vented downlights, wherever specified in apartments with ceiling to the exposed roof, will not compromise the levels of insulation on the roof (i.e. there will not be any penetrations to the insulation due to the downlights)
Doors	• External: Solid core • Internal: Hollow core
Window coverings	• Holland blinds*
Insect screens	• Yes*
Ceiling fans	• None

Building element	Description
Floors	• Exposed suspended floors and floors above car park and plant areas—no insulation required with the exception of L2-06, which requires R0.5 m^2.K/W insulation in the floor providing an Rtotal of 0.6 m^2.K/W • Floor coverings—tiles for kitchens, living room areas, bathrooms and corridors; carpet for bedrooms and living areas were included in the NatHERS model. Actual floor covering will be developed during Detailed Design.
Ceilings	• Internal ceilings between apartments: Concrete with plasterboard, no insulation. • For all apartments with a ceiling to the exposed roof: See “Roof” section below.
Roofs	Concrete slab, medium colour, no cavity, R1.4m^2.K/W insulation to achieve an R_{total} 1.5 m^2.K/W on all apartments with a ceiling to the exposed roof, apart from apartment L15-05 which requires R4.4 m^2.K/W insulation to achieve an R_{total} 4.5 m^2.K/W
Glazing type	Aluminium framed, double glazing. Provide the following whole of window parameters—U-value: 2.85 W/m^2K | Solar Heat Gain Coefficient (SHGC): 0.31 (NFRC Values) (mid – pane values: U-value 1.66 W/m^2 K and SHGC 0.35 with aluminium frames) for all glazing at the thermal envelope (i.e. external side at loggias and internal side at
Opening type and shading	As shown on Fosters elevations and façade detail. Please refer to the façade section of the architectural SSDA Summary Report.

**Insect screens and holland blinds are required as default parameters by the NatHERS modelling protocol*

*** If reflective insulation is selected this can act to reduce the R-value performance (thickness) of the insulation*

2. BASIX Certification Strategy and Inputs | Thermal Comfort

Thermal Comfort

The thermal envelope of the apartments for a typical floor is indicated in Figure 5.

The NCC 2014 defines this as “parts of the building’s fabric that separate a conditioned space or habitable room from: -

a) the exterior of the building; or

b) a non-conditioned space including; the floor of a rooftop plant room, lift-machine room or the like; and the floor above a carpark or warehouse; and the common wall with a carpark, warehouse or the like.”

The thermal envelope of the apartments is required to meet the minimum performance targets as set in NatHERS.

A mixed mode strategy will be implemented for the corridors (i.e. both natural and mechanical ventilation will be utilised). For the corridors there are no defined minimum performance requirements for the building elements to the exterior.

In BASIX certificates, the corridors will included as fully air-conditioned, as there is no option to include mixed mode ventilation.

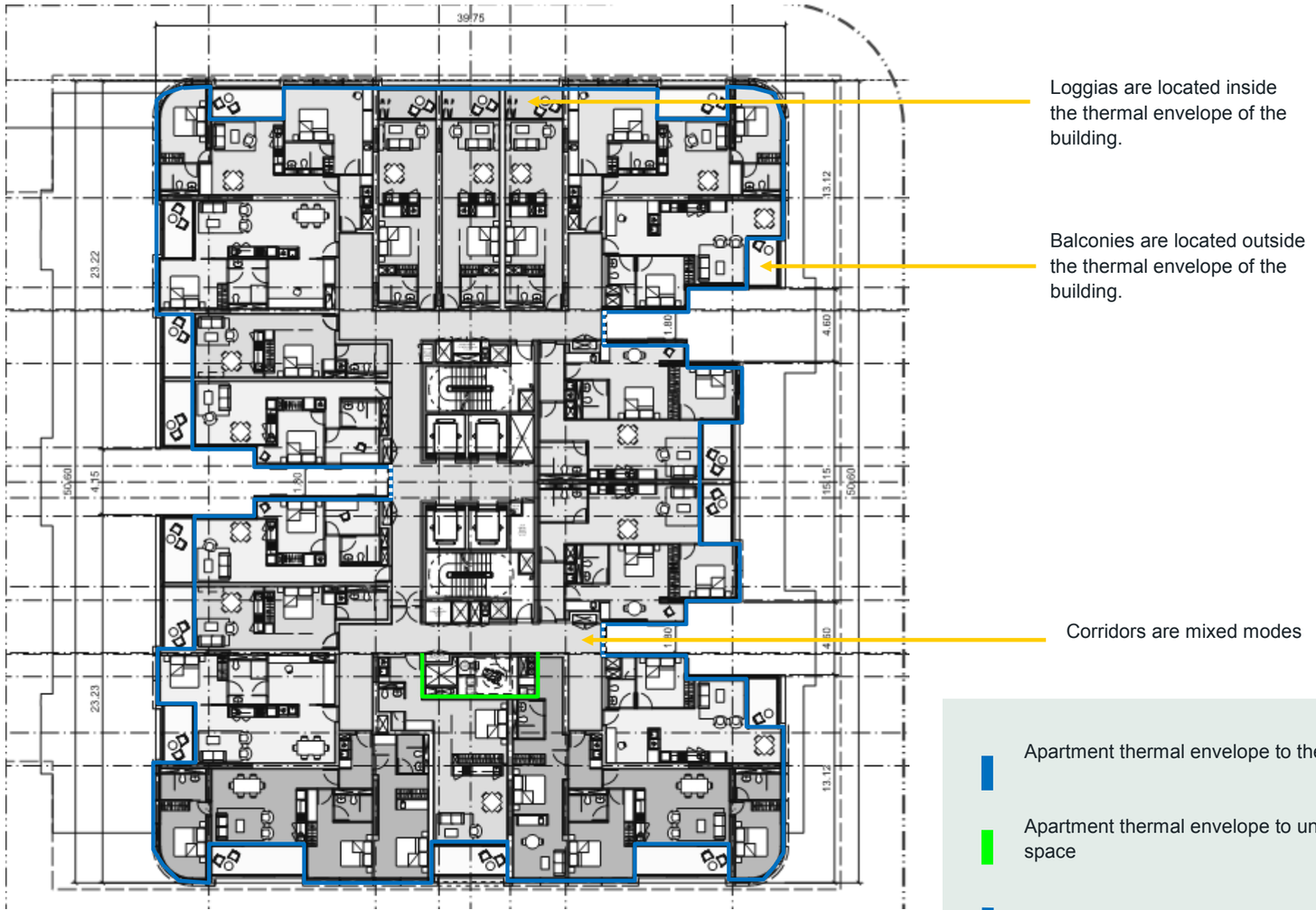


Figure 5: Building thermal envelope for a typical floor

2. BASIX Certification Strategy and Inputs | Thermal Comfort

NatHERS Modelling Results

Results

The current design of the dwellings have achieved the minimum requirements of the thermal comfort section of BASIX. Their area corrected heating and cooling loads have been identified in Table 4. The following SSDA architectural drawings for the tower prepared by Foster and Partners were used for the development on the NatHERS models: drawing numbers PA-A1-1600, PA-A1-1760 to 1766, PA-A1-1775 to 78, PA -A1-1780 to 1787, PA-A1-2050 to 2053, PA-A1-2252 to 2253, PA-A1-3500 to 3503, PA-A1-3770 to PA-A1-3779, dated 20/06/2014.

Table 4: NatHERS Thermal Comfort results

Dwelling Numbers	Conditioned Area (m^2)	Unconditioned Area (m^2)	Heating Load (MJ/m^2)	Cooling Load (MJ/m^2)	Star Rating
L02-01	43.7	0	0.9	23.3	7.5
L02-02	85.4	0	31.6	18.1	5
L02-03	82.1	0	14.2	24.8	6
L02-04	55.9	0	8.1	20.3	7
L02-05	62.9	0	6.2	16.2	7.5
L02-06	99	0	43.2	12.7	4.5
L02-07	59.2	7.9	6	35.7	5.5
L02-08	58.5	0	10.8	22.9	6.5
L02-09	66.2	0	18.6	24.5	5.5
L02-10	41.7	0	0.1	25.7	7.5
L02-11	42.2	0	0.1	25.7	7.5
L02-12	42.8	0	0	25	7.5
L02-13	52.6	0	1.5	22.7	7.5
L02-14	66.3	0	5.1	25.7	6.5
L02-15	84.1	0	32	17.6	5
L02-16	51.5	0	0.6	22.6	7.5
L03-01	64.7	0	15.2	13.3	7
L03-02	82.8	0	20	8.7	7
L03-03	89	0	7.3	13.9	8
L03-04	87.4	0	17.7	12.1	7
L03-05	83.6	0	4.7	14.3	8
L03-06	82.1	0	11.2	14	7.5
L03-07	110.2	0	11.8	18.1	7
L03-08	37.1	0	0.3	10.3	9
L03-09	37.1	0	0.3	11	9
L03-10	37.1	0	0.3	10.2	9
L03-11	95.1	7.3	15.3	24	5.5
L03-12	76.3	0	6.4	19.1	7.5
L04-01	90.5	0	17.7	13.6	6.5
L04-02	59	0	9.6	9.7	8
L04-03	121.8	0	8.2	27	6
L04-04	53	0	4.8	6.3	9
L04-05	111.5	0	17.7	11	7
L04-06	66	0	3.5	8	9
L04-07	41.3	0	1.8	10.5	9
L04-08	55.8	0	3.6	11.2	8.5
L04-09	54.7	0	12.6	11.2	7.5
L04-10	42.2	0	2	9.5	9
L04-11	66.6	0	3.7	7.4	9
L04-12	82.9	0	5.8	14.8	8
L04-13	47.6	8.8	0	5.1	10
L04-14	47.6	8.8	0	5.1	10
L04-15	47.6	8.8	0	5	10
L04-16	84.8	0	5.7	14.3	8
L04-17	52.7	6.3	12.5	7.2	8
L04-18	52.7	6.3	12.5	7.2	8
L05-01	90.5	0	17.7	13.6	6.5
L05-02	59	0	9.6	9.7	8
L05-03	121.8	0	8.2	27	6
L05-04	53	0	4.8	6.3	9
L05-05	111.5	0	17.7	11	7
L05-06	66	0	3.5	8	9
L05-07	41.3	0	1.8	10.5	9
L05-08	55.8	0	3.6	11.2	8.5
L05-09	54.7	0	12.6	11.2	7.5
L05-10	42.2	0	2	9.5	9
L05-11	66.6	0	3.7	7.4	9
L05-12	82.9	0	5.8	14.8	8
L05-13	47.6	8.8	0	5.1	10
L05-14	47.6	8.8	0	5.1	10
L05-15	47.6	8.8	0	5	10
L05-16	84.8	0	5.7	14.3	8
L05-17	52.7	6.3	12.5	7.2	8

2. BASIX Certification Strategy and Inputs | Thermal Comfort

NatHERS Modelling Results

Table 4 (cont'd): NatHERS Thermal Comfort results

Dwelling Numbers	Conditioned Area (m^2)	Unconditioned Area (m^2)	Heating Load (MJ/m^2)	Cooling Load (MJ/m^2)	Star Rating
L05-18	52.7	6.3	12.5	7.2	8
L06-01	90.5	0	17.7	13.6	6.5
L06-02	59	0	9.6	9.7	8
L06-03	121.8	0	8.2	27	6
L06-04	53	0	4.8	6.3	9
L06-05	111.5	0	17.7	11	7
L06-06	66	0	3.5	8	9
L06-07	41.3	0	1.8	10.5	9
L06-08	55.8	0	3.6	11.2	8.5
L06-09	54.7	0	12.6	11.2	7.5
L06-10	42.2	0	2	9.5	9
L06-11	66.6	0	3.7	7.4	9
L06-12	82.9	0	5.8	14.8	8
L06-13	47.6	8.8	0	5.1	10
L06-14	47.6	8.8	0	5.1	10
L06-15	47.6	8.8	0	5	10
L06-16	84.8	0	5.7	14.3	8
L06-17	52.7	6.3	12.5	7.2	8
L06-18	52.7	6.3	12.5	7.2	8
L07-01	90.5	0	18.4	13.7	6.5
L07-02	59	0	9.6	9.7	8
L07-03	121.8	0	8.6	27.3	6
L07-04	53	0	5.4	5.8	9
L07-05	111.5	0	18.5	10.5	7
L07-06	66	0	4	7.5	9
L07-07	41.3	0	2.2	10.2	9
L07-08	55.8	0	3.6	11.2	8.5
L07-09	54.7	0	12.6	11.2	7.5
L07-10	42.2	0	2.3	8.9	9
L07-11	66.6	0	3.7	7.4	9
L07-12	82.9	0	5.8	14.8	8
L07-13	47.6	8.8	0	5.1	10
L07-14	47.6	8.8	0	5.1	10
L07-15	47.6	8.8	0	5	10
L07-16	84.8	0	5.7	14.3	8
L07-17	52.7	6.3	12.5	7.2	8
L07-18	88.8	0	5.7	13.9	8
L08-01	90.5	0	18.4	13.7	6.5
L08-02	59	0	9.6	9.7	8
L08-03	121.8	0	8.6	27.3	6
L08-04	53	0	5.4	5.8	9
L08-05	111.5	0	18.5	10.5	7
L08-06	66	0	4	7.5	9
L08-07	41.3	0	2.2	10.2	9
L08-08	55.8	0	3.6	11.2	8.5
L08-09	54.7	0	12.6	11.2	7.5
L08-10	42.2	0	2.3	8.9	9
L08-11	66.6	0	3.7	7.4	9
L08-12	82.9	0	5.8	14.8	8
L08-13	47.6	8.8	0	5.1	10
L08-14	47.6	8.8	0	5.1	10
L08-15	47.6	8.8	0	5	10
L08-16	84.8	0	5.7	14.3	8
L08-17	52.7	6.3	12.5	7.2	8
L08-18	88.8	0	5.7	13.9	8
L09-01	90.5	0	18.4	13.7	6.5
L09-02	59	0	9.6	9.7	8
L09-03	121.8	0	8.6	27.3	6
L09-04	53	0	5.4	5.8	9
L09-05	111.5	0	18.5	10.5	7
L09-06	66	0	4	7.5	9
L09-07	41.3	0	2.2	10.2	9
L09-08	55.8	0	3.6	11.2	8.5
L09-09	54.7	0	12.6	11.2	7.5
L09-10	42.2	0	2.3	8.9	9
L09-11	66.6	0	3.7	7.4	9

2. BASIX Certification Strategy and Inputs | Thermal Comfort

NatHERS Modelling Results

Table 4 (cont'd): NatHERS Thermal Comfort results

Dwelling Numbers	Conditioned Area (m^2)	Unconditioned Area (m^2)	Heating Load (MJ/m^2)	Cooling Load (MJ/m^2)	Star Rating
L09-12	82.9	0	5.8	14.8	8
L09-13	47.6	8.8	0	5.1	10
L09-14	47.6	8.8	0	5.1	10
L09-15	47.6	8.8	0	5	10
L09-16	84.8	0	5.7	14.3	8
L09-17	52.7	6.3	12.5	7.2	8
L09-18	88.8	0	5.7	13.9	8
L10-01	91.1	0	19.2	11	6.5
L10-02	59	0	10.9	10.8	8
L10-03	121.8	0	12	25.2	6
L10-04	53	0	18.1	5.8	7.5
L10-05	111.5	0	19.7	8.9	7
L10-06	66	0	5	7.1	9
L10-07	41.3	0	2.8	9.6	8
L10-08	55.8	0	4.9	10.5	8.5
L10-09	54.7	0	14.5	10.5	7.5
L10-10	42.2	0	2.8	8.9	9
L10-11	66.6	0	4.3	7.1	9
L10-12	82.9	0	10	11.9	8
L10-13	47.6	8.8	0	4.2	10
L10-14	47.6	8.8	0	4.2	10
L10-15	47.6	8.8	0	4.2	10
L10-16	84.8	0	6.6	11.7	8
L10-17	59	0	15.5	6.6	7.5
L10-18	88	0	8.2	9.7	8
L11-01	91.1	0	19.2	11	6.5
L11-02	59	0	10.9	10.8	8
L11-03	121.8	0	12	25.2	6
L11-04	53	0	18.1	5.8	7.5
L11-05	111.5	0	19.7	8.9	7
L11-06	66	0	5	7.1	9
L11-07	41.3	0	2.8	9.6	8
L11-08	55.8	0	4.9	10.5	8.5
L11-09	54.7	0	14.5	10.5	7.5
L11-10	42.2	0	2.8	8.9	9
L11-11	66.6	0	4.3	7.1	9
L11-12	82.9	0	10	11.9	8
L11-13	47.6	8.8	0	4.2	10
L11-14	47.6	8.8	0	4.2	10
L11-15	47.6	8.8	0	4.2	10
L11-16	84.8	0	6.6	11.7	8
L11-17	59	0	15.5	6.6	7.5
L11-18	88	0	8.2	9.7	8
L12-01	91.1	0	19.2	11	6.5
L12-02	59	0	10.9	10.8	8
L12-03	121.8	0	12	25.2	6
L12-04	53	0	18.1	5.8	7.5
L12-05	111.5	0	19.7	8.9	7
L12-06	66	0	5	7.1	9
L12-07	41.3	0	2.8	9.6	8
L12-08	55.8	0	4.9	10.5	8.5
L12-09	54.7	0	14.5	10.5	7.5
L12-10	42.2	0	2.8	8.9	9
L12-11	66.6	0	4.3	7.1	9
L12-12	82.9	0	10	11.9	8
L12-13	47.6	8.8	0	4.2	10
L12-14	47.6	8.8	0	4.2	10
L12-15	47.6	8.8	0	4.2	10
L12-16	84.8	0	6.6	11.7	8
L12-17	59	0	15.5	6.6	7.5
L12-18	88	0	8.2	9.7	8
L13-01	91.1	0	19.2	11	6.5
L13-02	59	0	10.9	10.8	8
L13-03	121.8	0	12	25.2	6
L13-04	53	0	18.1	5.8	7.5
L13-05	111.5	0	19.7	8.9	7

2. BASIX Certification Strategy and Inputs | Thermal Comfort

NatHERS Modelling Results

Table 4 (cont'd): NatHERS Thermal Comfort results

Dwelling Numbers	Conditioned Area (m^2)	Unconditioned Area (m^2)	Heating Load (MJ/m^2)	Cooling Load (MJ/m^2)	Star Rating
L13-06	66	0	5	7.1	9
L13-07	41.3	0	2.8	9.6	8
L13-08	55.8	0	4.9	10.5	8.5
L13-09	54.7	0	14.5	10.5	7.5
L13-10	42.2	0	2.8	8.9	9
L13-11	66.6	0	4.3	7.1	9
L13-12	82.9	0	10	11.9	8
L13-13	47.6	8.8	0	4.2	10
L13-14	47.6	8.8	0	4.2	10
L13-15	47.6	8.8	0	4.2	10
L13-16	84.8	0	6.6	11.7	8
L13-17	59	0	15.5	6.6	7.5
L13-18	88	0	8.2	9.7	8
L14-01	91.1	0	19.2	11	6.5
L14-02	59	0	10.9	10.8	8
L14-03	121.8	0	12	25.2	6
L14-04	53	0	18.1	5.8	7.5
L14-05	111.5	0	19.7	8.9	7
L14-06	66	0	5	7.1	9
L14-07	41.3	0	2.8	9.6	8
L14-08	55.8	0	4.9	10.5	8.5
L14-09	54.7	0	14.5	10.5	7.5
L14-10	42.2	0	2.8	8.9	9
L14-11	66.6	0	4.3	7.1	9
L14-12	82.9	0	10	11.9	8
L14-13	47.6	8.8	0	4.2	10
L14-14	47.6	8.8	0	4.2	10
L14-15	47.6	8.8	0	4.2	10
L14-16	84.8	0	6.6	11.7	8
L14-17	59	0	15.5	6.6	7.5
L14-18	88	0	8.2	9.7	8
L15-01	91.1	0	19.2	11	6.5
L15-02	59	0	19.7	11.2	6.5
L15-03	121.8	0	21.5	26.8	3.5
L15-04	53	0	30	6.7	6
L15-05	111.5	0	50	8.5	4
L15-06	66	0	12.5	7.6	8
L15-07	41.3	0	6.9	9.7	8.5
L15-08	55.8	0	10	9.6	8
L15-09	54.7	0	14.5	10.5	7.5
L15-10	42.2	0	2.8	8.9	9
L15-11	66.6	0	4.3	7.1	9
L15-12	82.9	0	10	11.9	8
L15-13	47.6	8.8	0	4.2	10
L15-14	47.6	8.8	0	4.2	10
L15-15	47.6	8.8	0	4.2	10
L15-16	84.8	0	6.6	11.7	8
L15-17	59	0	15.5	6.6	7.5
L15-18	88	0	8.2	9.7	8
L16-01	91.1	0	19.2	11	6.5
L16-02	36.5	0	31.6	18.2	5
L16-03	63.1	0	7.1	10.1	8
L16-04	37.7	0	4.9	16.4	8
L16-05	54.7	0	14.5	10.5	7.5
L16-06	42.2	0	2.8	8.9	9
L16-07	66.6	0	4.3	7.1	9
L16-08	82.9	0	10	11.9	8
L16-09	47.6	8.8	0	4.2	10
L16-10	47.6	8.8	0	4.2	10
L16-11	47.6	8.8	0	4.2	10
L16-12	84.8	0	6.6	11.7	8
L16-13	59	0	15.5	6.6	7.5
L16-14	88	0	8.2	9.7	8
L17-01	64.8	0	9.5	10	8
L17-02	41.4	0	32.4	12.2	5
L17-03	64.8	0	16.4	9.5	7.5

2. BASIX Certification Strategy and Inputs | Thermal Comfort

NatHERS Modelling Results

Table 4 (cont'd): NatHERS Thermal Comfort results

Dwelling Numbers	Conditioned Area (m^2)	Unconditioned Area (m^2)	Heating Load (MJ/m^2)	Cooling Load (MJ/m^2)	Star Rating
L17-04	37.7	0	4.6	14.4	8
L17-05	54.7	0	21.6	9.5	6.5
L17-06	42.2	0	7	9.5	8.5
L17-07	66.6	0	12.2	7.3	6
L17-08	82.9	0	11.6	12.1	7.5
L17-09	47.6	8.8	0.5	4.7	10
L17-10	47.6	8.8	0.5	5.1	10
L17-11	47.6	8.8	0.4	5.1	10
L17-12	84.8	0	8.6	12.5	8
L17-13	59	0	25.3	7.2	6.5
L17-14	64.8	0	8.6	8.8	8
L18-01	58	0	33.8	10	5.5
L18-02	41.4	0	42.3	11.5	4.5
L18-03	64.8	0	26.7	8.9	6
L18-04	37.7	0	7.2	15.2	7.5
L18-05	65.5	0	23.1	8.1	6.5
L18-06	74.5	0	30.9	10.4	5.5
L18-07	77.9	0	15.2	7.6	7.5
L18-08	73.6	0	27.9	7.7	6
L18-09	58	0	20.8	12.5	6.5

Energy Strategy for BASIX Certificate

Common Areas and Dwellings

Energy consumption in multi-unit residential buildings is heavily influenced by the utilisation and servicing of the common areas. HVAC and artificial lighting systems in car parks, lobbies and common corridors need to be carefully designed to reduce energy demands. Also, the appliances, lighting and HVAC systems used in the dwellings needs to be carefully considered to reduce energy use.

For Block 1, the energy initiatives currently proposed are summarised in Tables 5—7.

Table 5: Energy Initiatives for Block 1

Energy Item	Strategy
Air-conditioning	No individual system; heating and cooling provided by the Central Thermal Plant (gas trigeneration engine)
Central DHW heating system	Provided by the Central Thermal Plant (gas trigeneration engine)
Lift motors	Gearless traction with VVVF motors
Appliances	All appliances to meet the following Energy Star ratings: • Cooktop—Electric for Studios and Dual Key apartments; Gas for all other apartments • Oven—Electric • Dishwashers—3 stars • Refrigerator—3.5stars • Clothes washers—3.5 star • Clothes dryer—2 stars *No ventilated fridge spaces, i.e. the refrigerator will be enclosed*
Heating and cooling	Heating and cooling provided by the Central Thermal Plant (gas trigeneration engine and absorption chillers)
Lighting (apartments)	Not dedicated fluorescent or LED lamps
Ventilation (apartments)	Bathroom and laundry ventilation— individual fan into central duct + VSD; Interlocked to light Kitchen ventilation— individual fan into central duct + VSD; manual

Table 6: Common area lighting strategy

Common area lighting			
	Type	Control	Linked to BMS?
Pool	Fluorescent	zoned switching	Yes
Gym and facilities	Compact fluorescent	Zoned switching + motion sensor	Yes
Basement car parks	Fluorescent	Time clock + motion sensor	Yes
Main electrical switch room, water meter, gas meter, grease arrestor, comms, fire pump rooms, private substation, ausgrid substation, energy transfer system room, fire control, pool rooms, plantroom, storage cages, exhaust and supply fan rooms, residential holding bin room, bin room 5	Fluorescent	Manual switch	No
Changing rooms	Compact fluorescent	Motion sensor	No
Residential lobby and mail room	Compact fluorescent	Time clock	Yes
Residential corridor, lift lobbies	Compact fluorescent	Motion sensor	Yes
Garbage chute rooms	Compact fluorescent	Manual / timer switch	No

Table 7: Common area ventilation strategy

Common Area Ventilation		
	Strategy	Control
Pool, gym and facilities, residential lobby and corridors	Ventilation (supply and exhaust)	Time clock or BMS controlled
Basement car parks	Ventilation (supply and exhaust)	Carbon monoxide monitor + VSD fan
Grease arrestor room, storage cages	Ventilation (supply and exhaust)	Interlocked to light
Comms, fire pump rooms, private substation, ausgrid substation, energy trasfer system room, main electrical switch room, water meter room, fire control room	No mechanical ventilation	N/A
Mail room	Ventilation (exhaust only)	Interlocked to light
Pool plantroom, plantroom, changing rooms, residential holding bin room, bin room 5, garbage chute rooms	Ventilation (supply and exhaust)	Continuous
Exhaust and supply fan rooms, gas meter room	Ventilation (exhaust only)	Continuous

4. SEPP65—Natural Cross Ventilation Assessment

The SEPP65 Natural Cross Ventilation Assessment has been undertaken by Foster and Partners (refer to their SSDA report). The results showed that 56% of the apartments are cross ventilated. In order to reach the required 60%, WSP Built Ecology undertook a dynamic simulation modelling to demonstrate that apartments with single sided ventilation achieve the same levels of thermal comfort and indoor air quality as an equivalent cross ventilated apartment.

Method

To demonstrate that the apartments have access to good natural ventilation equivalent to a cross ventilation scenario, a typical apartment which is found on all floors between Level 4 and 17 was modelled using EDSL Tas 9.2.1 thermal analysis software.

The SEPP65 target is for 60% of the apartments to be cross ventilated. For Block 1, 157 apartments or 56% of the total number of apartments is cross ventilated, therefore, in order to reach 60%, it is required to demonstrate that at least another 12 apartments perform as well as a cross ventilated scenario.

The typical apartment modelled is found on 14 levels, therefore, in total 14+157=171 apartments OR 61% of the total apartments are deemed to comply with the SEPP 65 natural ventilation prescriptive requirements.
The apartment selected is shown in Figure 6.

Two parameters were evaluated in the thermal model:

- Adaptive Thermal Comfort in each space, using ASHRAE Thermal Comfort Standard 55-2010. This standard stipulates a measure for thermal comfort in naturally ventilated spaces based on the resultant temperatures in the space. Resultant temperatures take into consideration the dry bulb temperature of the air and the radiant temperatures experienced from surrounding surfaces.
- Carbon dioxide levels in each space. CO_2 levels are an indicator of air flow through the space. Cross ventilation facilitates good air flow, ensuring pollutant levels in the space are kept to an acceptable level.

The cross ventilated scenario for the apartment modelled includes the introduction of a grille above the door to the common corridor, with an openable area 2.5% of the apartment area that it serves (BCA requires 5% of the area in total, therefore a minimum of 2.5% in located at the balcony door and 2.5% at the grille). The opening area at the external face of the balcony and the sliding door opening area was included in both options.

It should be noted that the apartment selected is located on Level 4. The apartments on higher levels will be more exposed and experience higher wind loads, therefore

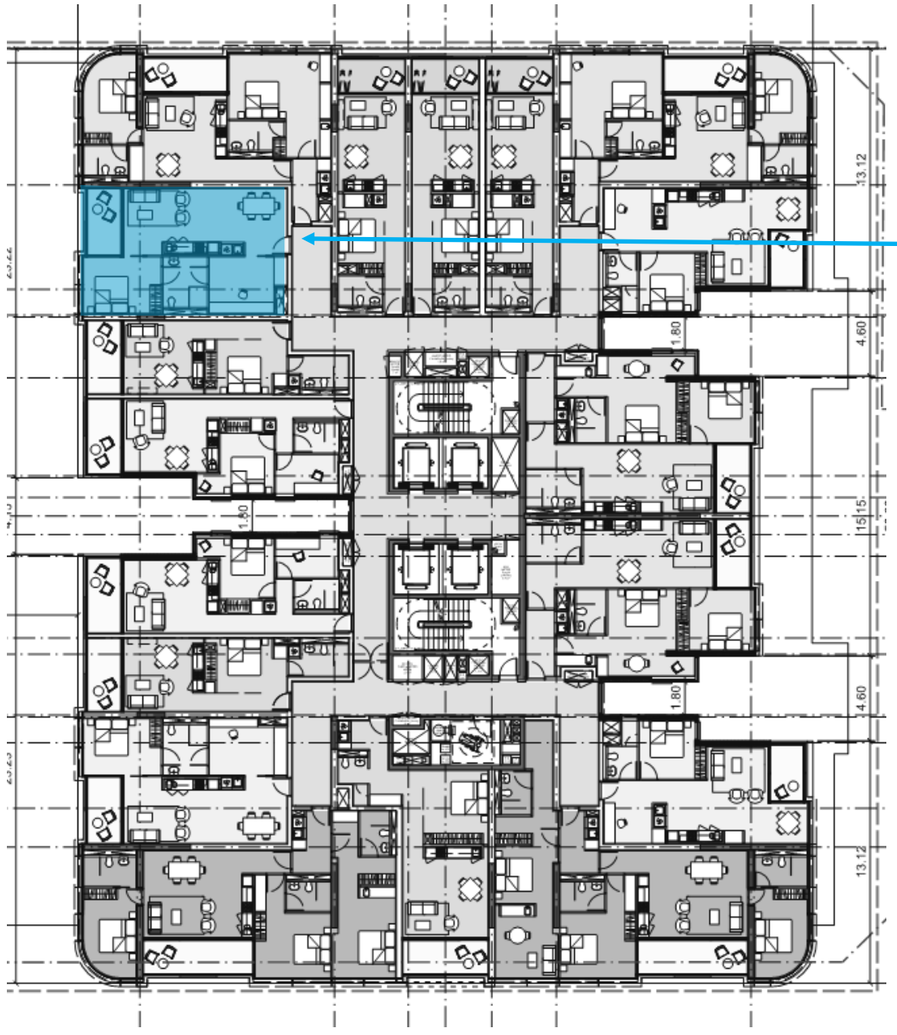


Figure 6: Typical apartment modelled for natural ventilation

SEPP65 proposes that 60% of residential units should be naturally cross ventilated. Compliance with this has been met as follows:

- 56% of the apartments are cross ventilated (refer to Fosters report for further details)
- Another 5% of the apartments which have single sided ventilation achieve the same levels of thermal comfort and indoor air quality as an equivalent cross ventilated apartment (refer to the analysis presented in this report).
- TOTAL COMPLIANT APARTMENTS: 61%

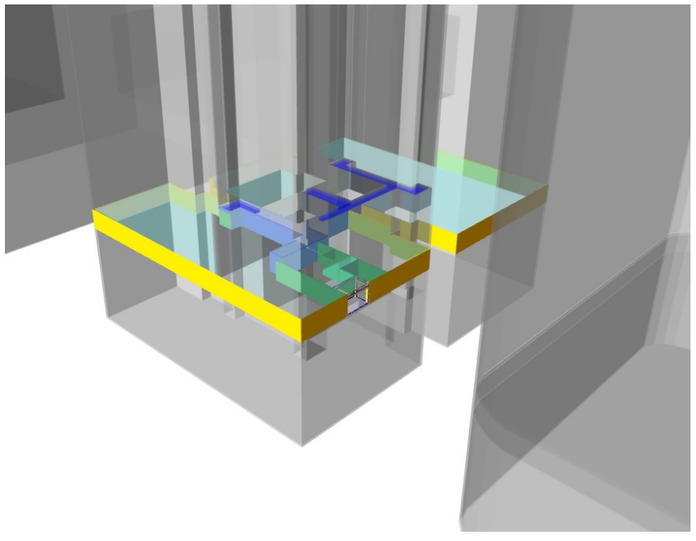


Figure 7: 3D representation of the apartment modelled

4. SEPP65—Natural Cross Ventilation Assessment

No significant improvement in thermal comfort or air quality was experienced in the apartment with cross ventilation. The proposed natural ventilation solution for the single sided apartment provides good natural ventilation.

Thermal Comfort

Figure 8 depicts the external temperatures (the orange line) and the range of temperatures experienced in the apartments throughout the year (the green dots). The comfort range as determined by the ASHRAE thermal comfort standard is shown in grey. The 90% acceptability limit (shown in dark grey) represents when 90% of occupants would be considered comfortable. Similarly, the 80% limit shows when 80% of occupants are considered comfortable.

In a climate like Sydney's, a fair portion of the year falls below the comfort range, representing the winter months and cool summer evenings. A residential dwelling would be expected to mitigate the number of hours that fall outside the comfort range by providing shelter from external conditions.

The figure demonstrates that just over 65% of the hours of the year fall within the comfort zone in both scenarios. Therefore, the natural ventilation solution provided by the apartment modelled provides thermal comfort equivalent to a cross ventilation scenario.

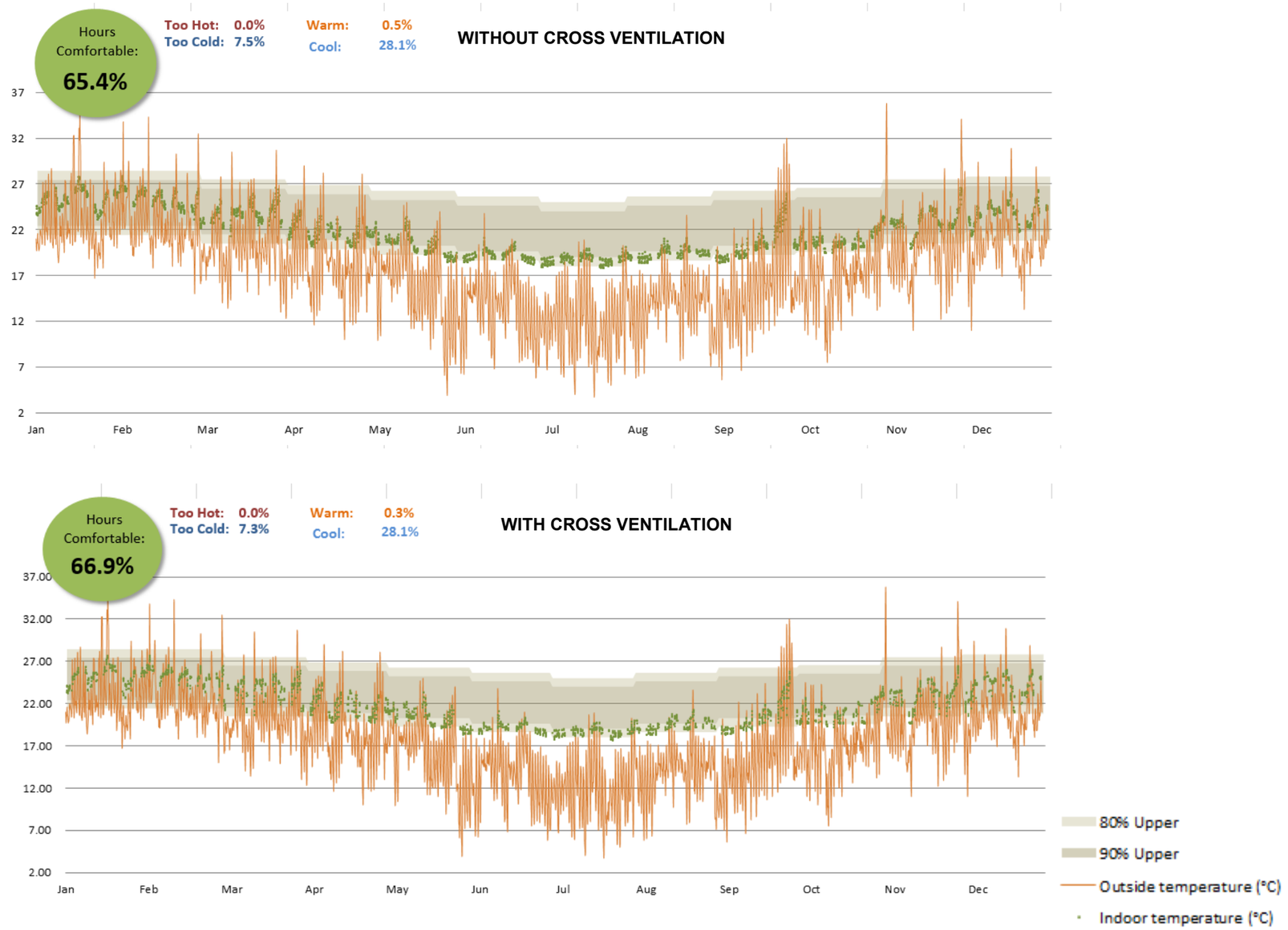


Figure 8: Adaptive thermal comfort in the selected apartments with cross ventilation

4. SEPP65—Natural Cross Ventilation Assessment

CO_2 Levels

ASHRAE Standard 62.1-2010 recommends that CO_2 levels should not exceed 700 parts per million (ppm) in an occupied space. In a residential dwelling, CO_2 levels would typically be controlled by the occupant opening or closing the windows.

The natural ventilation modelling was conducted based on occupants opening and closing the windows according to temperature—if it is hot they will open the windows and if it is cold they will close the windows.

The results showed that CO_2 levels did occasionally go above 700ppm, however through further interrogation of the model, it could be seen that this only occurred for the bedroom only and for a small number of hours in a year.

The comparison of the two models—with cross ventilation and without–showed that there was no significant difference between the two scenarios, suggesting that natural ventilation in these two apartments is equivalent of a cross ventilation scenario.

Prevailing winds

Single sided ventilation effectiveness can be enhanced with appropriate wind orientation. The annual wind roses for Sydney region have been downloaded from the Australian Bureau Of Meteorology (BOM) website (see Figure 10). The wind roses show that:

- At 9am the prevailing winds are North West. These winds will enhance cross ventilation for the NW corner apartments, but also the single sided studios located to the North .
- At 3pm the prevailing winds are equally South and North East. These will not only help with ventilating the north studios as well, but also all the single aspect apartments on the south side of the building.

The apartments on the west side of the buiding will be sheltered by future Block 4N, however sufficient ventilation was demonstrated through the dynamic simulation modelling.

Based on this wind analysis it is deemed that a further 64 apartments (51 on the north and 13 on the south) could have good levels of ventilation.

Table 8: Carbon dioxide levels in the apartments

	Space	Dining	Kitchen	Bedroom	Lounge
Peak CO_2 levels	Without cross ventilation	612	605	850	603
	With Cross ventilation	612	606	894	603
	% difference	0.0%	-0.2%	5%	0.0%
Number of hours CO_2>700	Without cross ventilation	0	0	6	0
	With cross ventilation	0	0	20	0
	% difference	0.0%	0.0%	-70%	0.0%

Conclusion

The layout of the apartment modelled in combination with the location of the windows and doors which act as ventilation openings, provides good natural ventilation to the spaces within the apartment.

The air quality and thermal comfort provided by the natural ventilation solution is equivalent to a cross ventilated scenario.

Due to the prevailing winds north and south single aspect apartments are also deemed to have good levels of ventilation.

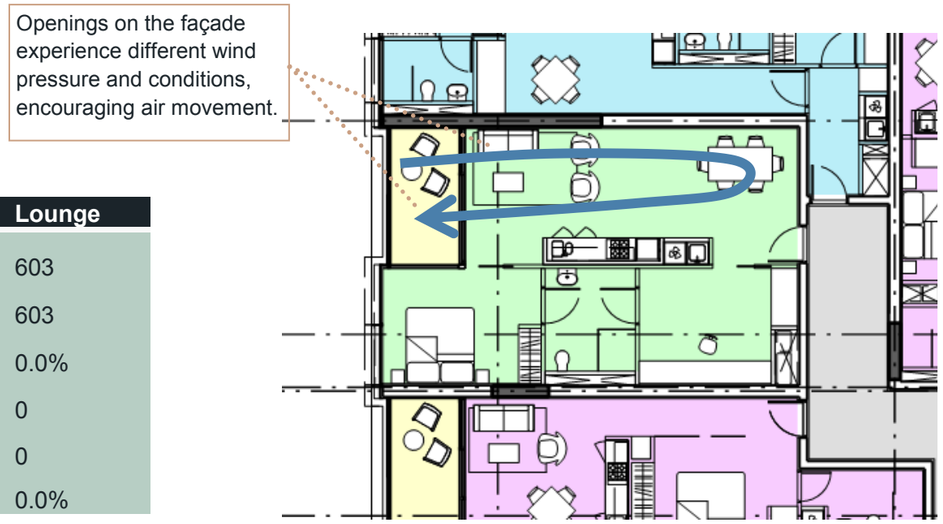


Figure 9: Natural cross ventilation paths through the selected apartment

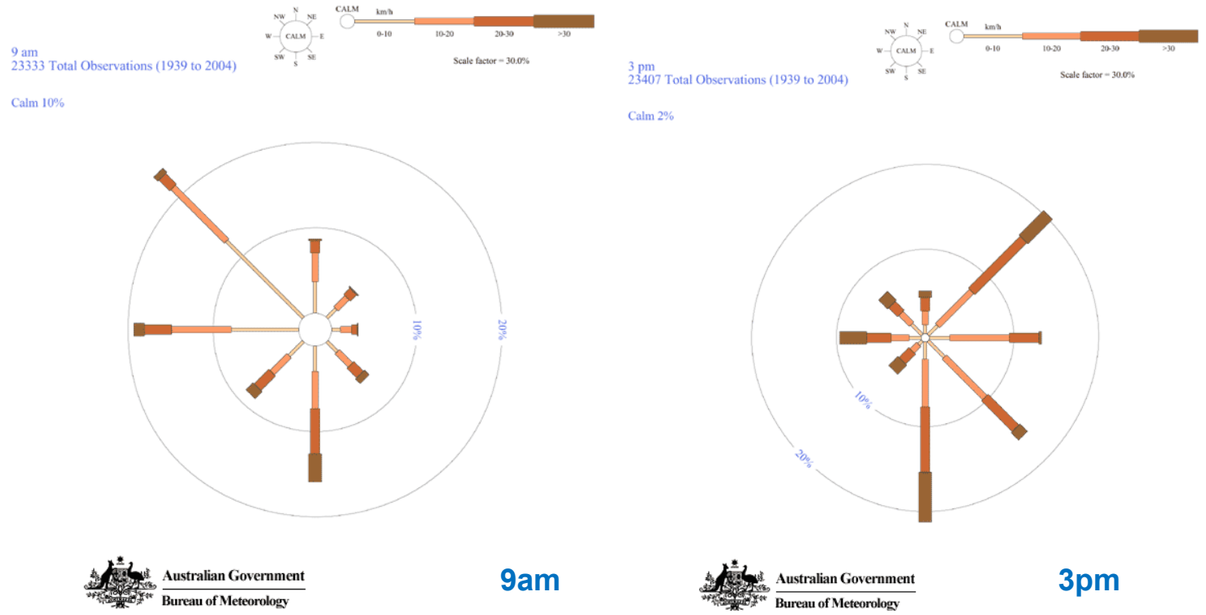


Figure 10: Annual wind roses for Sydney for 9am and 3pm.

5. Section J Analysis—Part J1 and J2 for Retail Areas

Section J Analysis

Under Part A3.2 of Volume One of the NCC Series 2014, the commercial retail areas of Central Park Block 1 are classified as *Class 6: a shop or other building for the sale of goods by retail or the supply of services direct to the public*. The commercial retail areas are required to meet the requirements of Part J1 Building Fabric and Part J2 Glazing of Section J. The site falls within Climate Zone 5.

- Part J1 requires the building fabric elements to meet the Deemed-To-Satisfy (DTS) provisions of Section J
- Part J2 requires compliance with the ABCB glazing calculator, which assesses façade areas, glazing areas and properties, shading, and orientation in each storey, including any mezzanine

The applicable elements (building fabric and glazing) are all those which form part of the building envelope (all building elements that separate conditioned spaces from non-conditioned spaces).

Part J1

Part J1 performance requirements for the retail areas are summarised in Table 9.

Part J2

Part J2 performance requirements for the retail areas are summarised in Table 10, and the preliminary glazing calculator results are shown in Figure 11 on page 19.

Table 9: Summary of building fabric performance requirements for the retail

Building Element	Part J1 DTS Performance Requirements
All insulation	≥ **R 0.2** m^2.K/W All insulation must form a continuous barrier with ceilings, walls, bulkheads, floors or the like that inherently contribute to the thermal barrier.
Suspended floors	≥ **R 1.0** m^2.K/W Between conditioned and non-conditioned internal space (e.g. suspended floor retail and basement car park)
External walls	≥ **R 2.8** m^2.K/W (on north, east and west facing façade) ≥ **R 2.3** m^2.K/W (walls shaded with a projection shade angle of 30°—60°) ≥ **R 1.8** m^2.K/W (walls shaded with a projection shade angle of > 60°) *No walls are assumed to have a surface density of > 220kg/m². No walls are assumed to only have space for insulation provided by a furring channel, top hat section or the like.*
Envelope walls other than external walls (e.g. between conditioned and non-conditioned internal spaces)	≥ **R 1.0** m^2.K/W for walls other than an external wall where air change rates are < 1.5 ≥ **R 1.8** m^2.K/W for all other cases
Roof	≥ **R 3.2** m^2.K/W for upper surface solar absorptance of ≤0.4 ≥ **R 3.7** m^2.K/W for upper surface solar absorptance of >0.4 and ≤0.6 ≥ **R 4.2** m^2.K/W for upper surface solar absorptance of >0.6

R-values stated in Table 9 relate to total R-values across a construction build-up

Table 10: Summary of the glazing performance requirements

Building Element	Building Element Construction Performance Requirements
Fixed glazing, all orientations (north, east, south west)	**U 3.5 W/m^2K | SHGC 0.3** (whole of window) E.g. 12.76mm Viridian XIR Sunergy 54 *Aluminium frame*
Sliding entrance doors, all orientations (north, east, south west)	**U 6.3 W/m^2K | SHGC 0.71** (whole of window) E.g. 10mm Viridian VFloat Clear *Aluminium frame*

*Note: the benchmark glazing products nominated in Table 10 are presented **for information only**. It is the responsibility of the architect or contractor to select glazing products which meet the stated U-value and Solar Heat Gain Coefficient (SHGC) performance requirements, as well as other requirements such as safety and strength.*

5. Section J Analysis—Part J1 and J2 for Retail Areas

Envelope

Parts J1 and J2 of Section J apply to the building envelope. The NCC 2014 defines this as “parts of the building’s fabric that separate a conditioned space or habitable room from: -

a) the exterior of the building; or

b) a non-conditioned space including; the floor of a rooftop plant room, lift-machine room or the like; and the floor above a carpark or warehouse; and the common wall with a carpark, warehouse or the like.”

Figure 11 shows where conditioned space is currently provided for the commercial retail areas.

Legend:

Conditioned space (the envelope of conditioned space must comply with Parts J1 and J2)

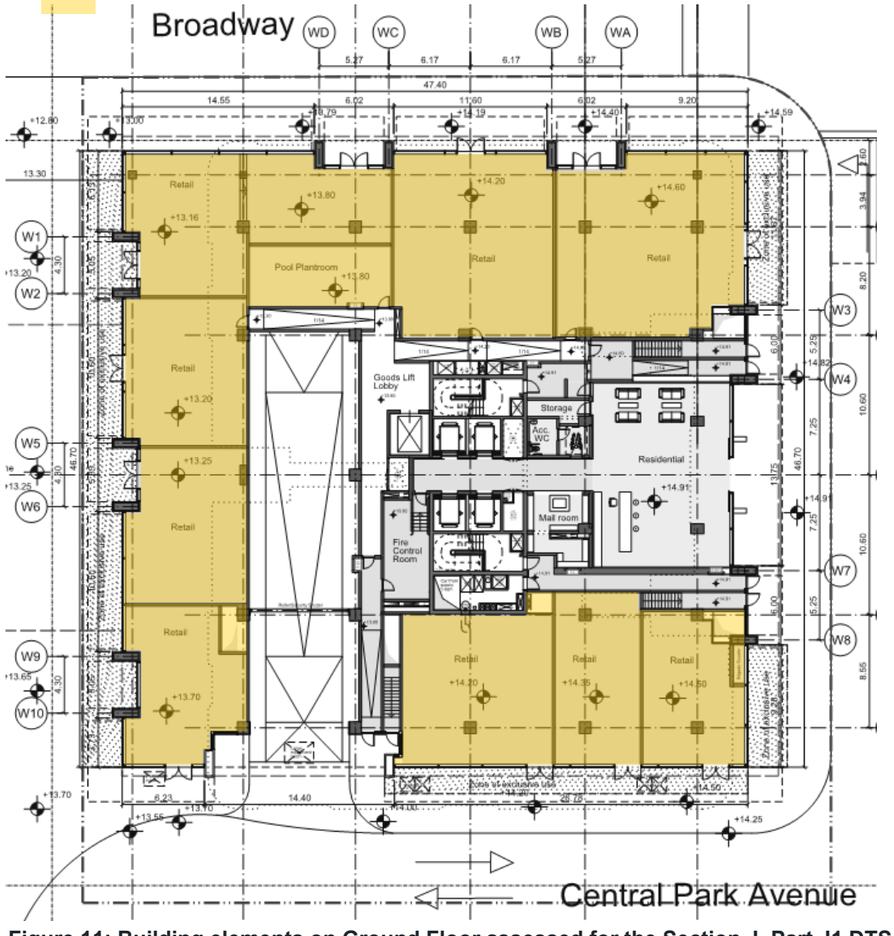


Figure 11: Building elements on Ground Floor assessed for the Section J, Part J1 DTS provisions review

5. Section J Analysis—Part J1 and J2 for Retail Areas

NCC VOLUME ONE GLAZING CALCULATOR (first issued with NCC 2014) HELP

Building name/description: Central Park Block 1 | Application: other | Climate zone: 5

Storey: Ground

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	314m²		311m²		237m²		343m²		
Option B									n/a
Glazing area (A)	*209m²*		*83.8m²*		*109m²*		*227m²*		

Number of rows preferred in table below: 40 *Click arrow beside 'ID' and select only '40' on the drop-down list*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
rows ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	N00-01	N		4.22		38.81	3.5	0.30	2.600	4.220	0.62	0.00	0.63	0.45	38.81	11% of 73%
2	N00-02	N		4.50		46.12	3.5	0.30	2.600	4.500	0.58	0.00	0.68	0.48	46.12	15% of 73%
3	N00-03	N		5.30		76.52	3.5	0.30	2.600	*5.30*	0.49	0.00	0.77	0.54	76.52	29% of 73%
4	N00-04	N		4.41		13.61	3.5	0.30	2.600	4.410	0.59	0.00	0.67	0.47	13.61	4% of 73%
5	N00-04a	N		3.00		6.12	6.3	0.71	2.600	4.410	0.59	1.41	0.99	0.88	6.12	11% of 73%
6	N00-02a	N		3.00		6.20	6.3	0.71	2.600	4.500	0.58	1.50	0.99	0.89	6.20	12% of 73%
7	N00-07	N		4.68		14.92	3.5	0.30	2.600	4.680	0.56	0.00	0.70	0.49	14.92	5% of 73%
8	N00-07a	N		3.40		6.70	6.3	0.71	2.600	4.700	0.55	1.30	0.99	0.89	6.70	13% of 73%
9	E00-01	E		4.13		37.85	3.5	0.30	2.600	4.130	0.63	0.00	0.60	0.58	37.85	38% of 36%
10	E00-02	E		4.03		39.97	3.5	0.30	2.600	4.030	0.65	0.00	0.58	0.57	39.97	40% of 36%
11	E00-02a	E		3.00		6.02	6.3	0.71	2.600	4.030	0.65	1.03	0.93	0.86	6.02	22% of 36%
12	S00-01	S		4.94		25.10	3.5	0.30	1.850	4.940	0.37	0.00	0.88	0.82	25.10	20% of 68%
13	S00-02	S		3.25		62.12	3.5	0.30	1.850	4.200	0.44	0.95	0.97	0.94	62.12	50% of 68%
14	S00-01a	S		3.00		6.12	6.3	0.71	*1.850*	4.970	*0.00*	*1.97*	*1.00*	*1.00*	6.12	9% of 68%
15	S00-02a	S		2.40		4.80	6.3	0.71	*1.850*	4.970	*0.00*	*2.57*	*1.00*	*1.00*	4.80	7% of 68%
16	S00-02b	S		2.30		5.20	6.3	0.71	*1.850*	4.970	*0.00*	*2.67*	*1.00*	*1.00*	5.20	7% of 68%
17	S00-02c	S		2.60		5.31	6.3	0.71	*1.850*	4.970	*0.00*	*2.37*	*1.00*	*1.00*	5.31	8% of 68%
18	W00-01	W		5.50		33.95	3.5	0.28	2.600	5.500	0.47	0.00	0.75	0.68	33.95	13% of 100%
19	W00-02	W		5.52		13.10	3.5	0.28	2.600	5.520	0.47	0.00	0.75	0.68	13.10	5% of 100%
20	W00-03	W		5.45		51.12	3.5	0.28	2.600	5.450	0.48	0.00	0.75	0.67	51.12	19% of 100%
21	W00-04	W		5.45		15.76	3.5	0.28	2.600	5.450	0.48	0.00	0.75	0.67	15.76	6% of 100%
22	W00-05	W		5.20		57.08	3.5	0.28	2.600	5.200	0.50	0.00	0.73	0.66	57.08	21% of 100%
23	W00-06	W		5.00		18.42	3.5	0.28	2.600	5.000	0.52	0.00	0.72	0.65	18.42	7% of 100%
24	W00-07	W		5.00		18.78	3.5	0.28	2.600	5.000	0.52	0.00	0.72	0.65	18.78	7% of 100%
25	W00-02a	W		3.10		6.40	6.3	0.71	*2.600*	5.520	*0.00*	*2.42*	*1.00*	*1.00*	6.40	8% of 100%
26	W00-03a	W		3.00		6.13	6.3	0.71	*2.600*	5.450	*0.00*	*2.45*	*1.00*	*1.00*	6.13	7% of 100%
27	W00-04a	W		3.00		6.10	6.3	0.71	*2.600*	5.450	*0.00*	*2.45*	*1.00*	*1.00*	6.10	7% of 100%

Figure 12: Glazing calculator undertaken for the Ground floor for the Part J2 DTS provisions review

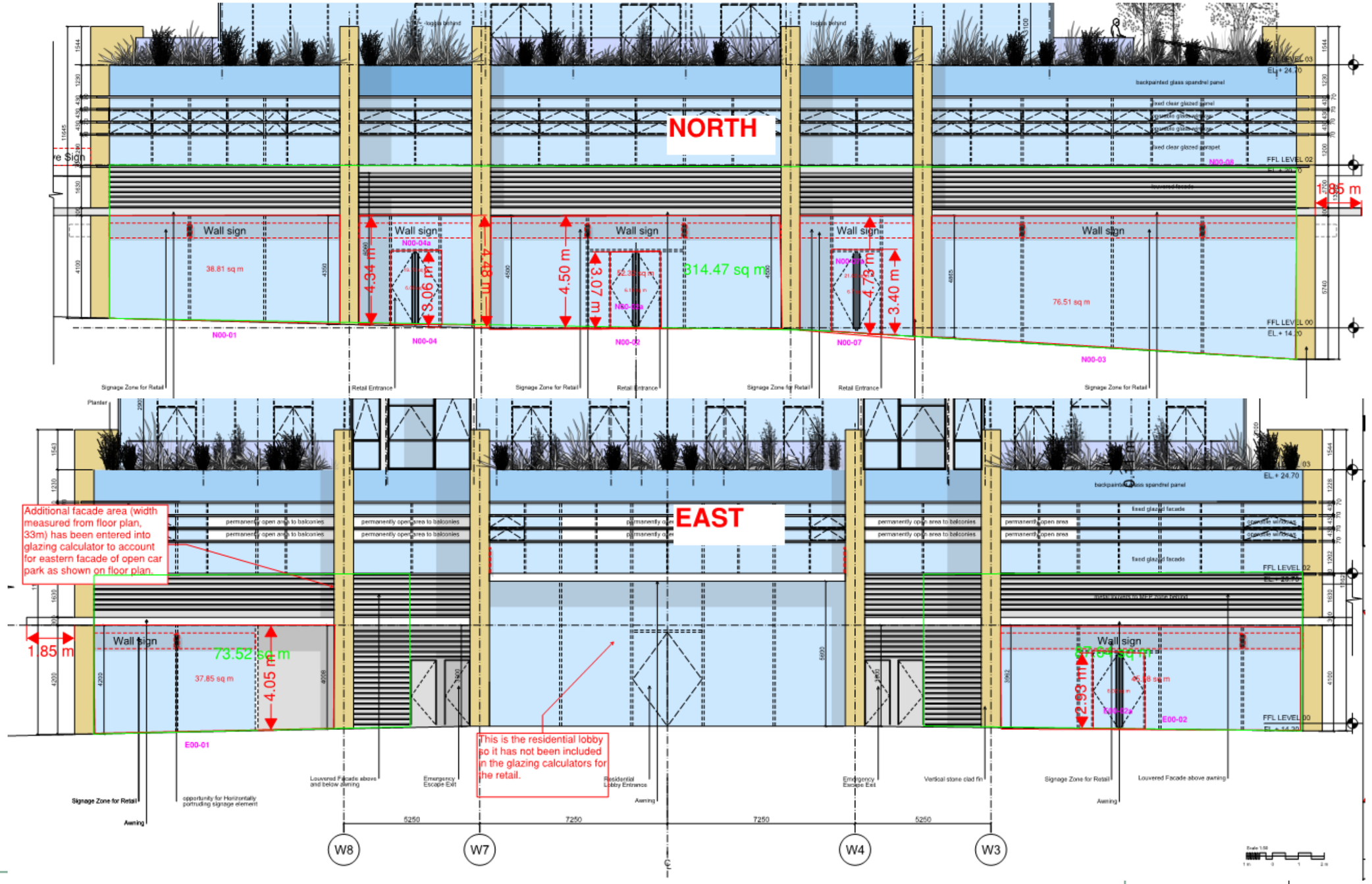
Appendix A | BASIX Certificates

Appendix B | ABSA Certificates

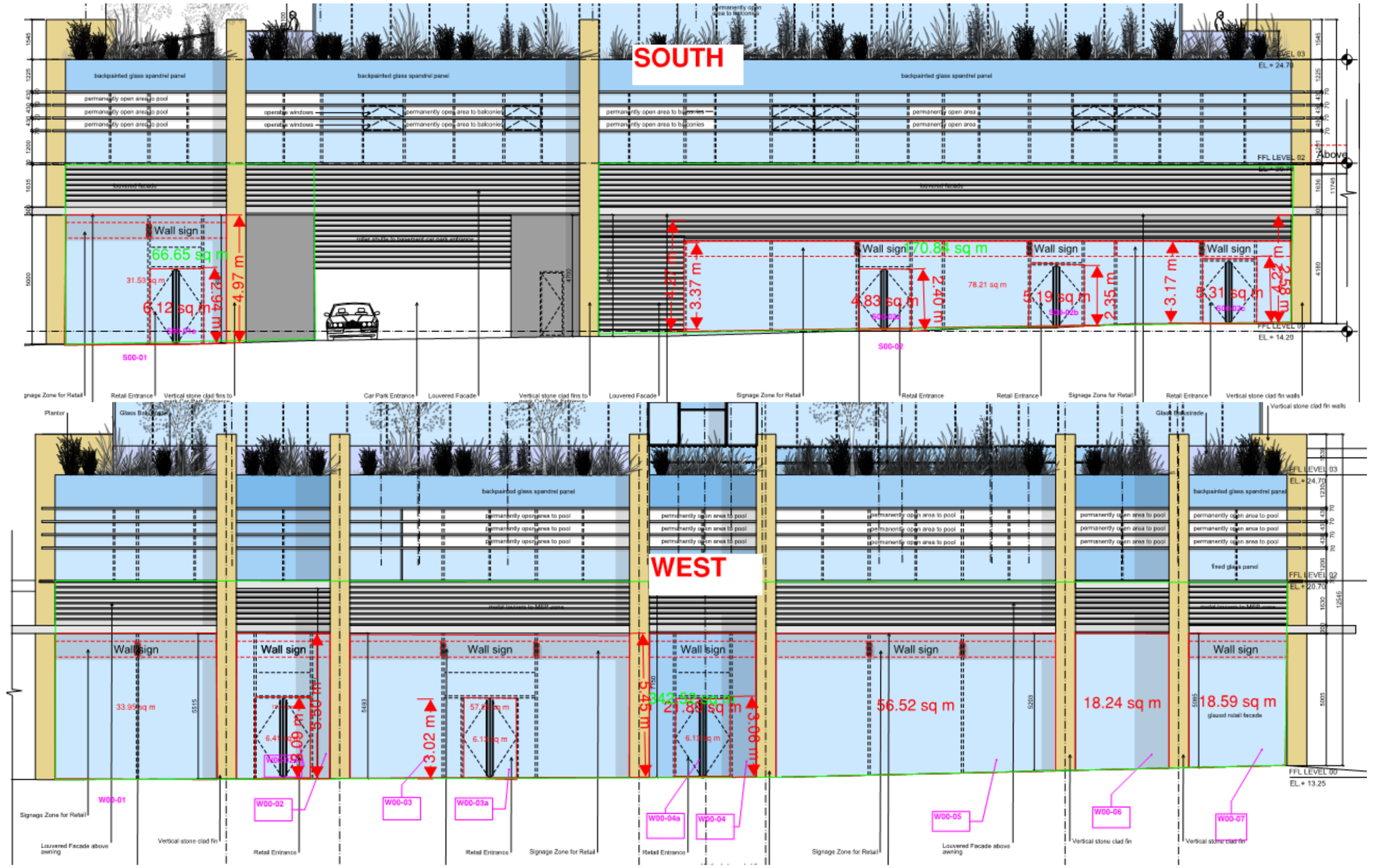
Appendix C | Sample Star Rating Report and Building Elements report

Appendix D | Stamped Plans

Appendix E | Glazing Calculator Inputs



Appendix E | Glazing Calculator Inputs



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