global environmental solutions

Proposed Serviced Apartment

330 Church Street Parramatta

BCA Section J Verification Method

JV3 Verification using a Reference Building

Report Number 610.13828-R1

7 May 2015

Meriton Apartment
Level 11 Meriton Tower
528 Kent Street
Sydney NSW 2000

Version: Revision 1

Proposed Serviced Apartment

330 Church Street Parramatta

BCA Section J Verification Method

JV3 Verification using a Reference Building

PREPARED BY:

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
2 Lincoln Street Lane Cove NSW 2066 Australia

(PO Box 176 Lane Cove NSW 1595 Australia)
T: 61 2 9428 8100 F: 61 2 9427 8200
E: sydney@slrconsulting.com www.slrconsulting.com

DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
610.13828-R1	Revision 1	07 May 2015	Sophie Wong Kai In	Neihad Al-Khalidy	Neihad Al-Khalidy
610.13828-R1	Revision 0	30 September 2014	Sophie Wong Kai In	Neihad Al-Khalidy	Neihad Al-Khalidy

Executive Summary

SLR Consulting Australia (SLR) has been engaged by Meriton Apartment to assess the proposed serviced apartment building at 330 Church Street, Parramatta for compliance with the National Construction Code Series – Building Code of Australia (BCA) 2013 provision for Energy Efficiency under Section J using the JV3 – Verification method using a reference building. The objective of BCA Section J is to reduce greenhouse gas emissions by efficiently using energy in buildings.

It is proposed to build a 50-storey residential apartment tower and a 26-storey serviced apartment tower over a 5-storey podium at 330 Church Street, Parramatta. The proposed development site is bounded by the Parramatta River to the north and Church Street to the west.

JV3 – Verification method using a reference building is utilised to verify compliance with JP1 by determining that the annual energy consumption of the proposed building with its services is not more than the annual energy consumption of a reference building when:

- The proposed building is modelling with the proposed services; and
- The proposed building is modelled with the same services as the reference building.

Each individual serviced apartment was modelled in IES <VE> using the drawings dated March 2014. The local shading devices have recently changed where the horizontal louvres to the north corners of the building were reduced to two horizontal blades above the windows. The north 600mm awning and the double 300mm horizontal louvres at the corners were modelled as per drawings A149 and A352 dated 31/3/15 by Meriton The existing surrounding buildings and proposed 55 storey residential building were also modelled as adjacent buildings overshadowing the proposed Church Street serviced apartment building.

The predicted Total Energy Consumed annually by the reference building and the proposed building with the reference services excluding the basement carpark energy use, hot water supply and lifts is summarised in the table below.

Electricity Usage	**Reference building (MWh)**	**Proposed building with same services as reference building (MWh)**	**Proposed building with proposed services (MWh)**
Heating	413.93	382.65	254.68
Cooling	483.19	514.25	349.14
Fans, pumps and Controls	83.5	83.5	77.6
Lights	356.72	356.72	356.72
Equipment	783.89	783.89	783.89
Total	**2121.2**	**2121.01**	**1821.91**

One can conclude that the annual energy consumption of the proposed Class 3 serviced apartment building is less than that of:

- the reference building; and
- the proposed building modelled with the same services as the reference building

Therefore the proposed Church Street serviced apartment achieves compliance with JP1 as per BCA – JV3 Verification method.

The proposed serviced apartment building achieves compliance with JP1 as per BCA – JV3 Verification method with the following:

Executive Summary

- All external precast concrete walls have a total R-value of R3.5
- Spandrel walls with a total R-value of R1.5
- Single fritted glass (40% frit) as per architectural elevations in **Appendix B**.
- Roof/ceiling system with total R-value of 4.5
- Concrete floors to the serviced apartments above carpark with a total R-value of 1.25
- The air-conditioning system consists of individual 2 star cooling/2.5 star heating, reverse cycle spit air-conditioning systems to each apartment. The air-conditioning systems have a COP of 3.2 cooling and 3.5 heating. The cooling and heating capacity are 8.5 and 9.0 KW respectively.
- Main glazing as high performance double glazing grey U-value=3.0, SHGC=0.30
- Shading horizontal devices as per drawings A149 and A352 dated 31/3/15 by Meriton.

Table of Contents

1 INTRODUCTION 6

1.1 Proposed Development Description 6

2 JV3 – VERIFICATION METHOD 7

2.1 Thermal Calculation of the Proposed and Reference Buildings 8

3 MODELLING DESCRIPTION 9

3.1 Input Data for Reference Building 9

3.2 Input Data for Proposed Building 10

5 SIMULATION RESULTS 12

6 CONCLUSION 13

TABLES

Table 1 Input Modelling Data for Reference Building 9
Table 2 Input Modelling Data for Proposed Building 10
Table 3 Comparison of Annual Energy Consumption between the reference and proposed building 12

FIGURES

Figure 1 Aerial View of Site Location 6
Figure 2 North View of the Proposed Development in IES<VE> 8

APPENDICES

Appendix A Occupancy and Operation Profiles of a Class 3 Building
Appendix B Spandrel walls and fritted glass locations

1 INTRODUCTION

SLR Consulting Australia (SLR) has been engaged by Meriton Apartment to assess the proposed serviced apartment building at 330 Church Street, Parramatta for compliance with the National Construction Code Series – Building Code of Australia (BCA) 2013 provision for Energy Efficiency under Section J using the JV3 – Verification method using a reference building. The objective of BCA Section J is to reduce greenhouse gas emissions by efficiently using energy in buildings.

It is proposed to build a 50-storey residential apartment tower and a 26-storey serviced apartment tower over a 5-storey podium at 330 Church Street, Parramatta. The proposed development site is bounded by the Parramatta River to the north and Church Street to the west. The development site location is shown in **Figure 1**.

Figure 1 Aerial View of Site Location

1.1 Proposed Development Description

The proposed development consists of a 31-storey serviced apartment building on the east part of the site and 55-storey residential apartment building on the west part of the site, including a 5-storey podium.

The proposed development comprises:

- Retail tenancies on ground floor;
- Serviced apartment reception lobby on the ground floor, entry from the east;

- Podium floors, level 1 to 3 with carparking, residential apartments on the west perimeter and serviced apartments on the west perimeter;
- Serviced apartments from level 4 to 30 and plant rooms on the top floor in the east tower;
- Residential apartments from level 4 to 53 on the west tower.

The main objective of this study is to assess the serviced apartment for compliance with the National Construction Code Series – Building Code of Australia (BCA) 2013 provision for Energy Efficiency under Section J using the JV3 – Verification method using a reference building.

2 JV3 – VERIFICATION METHOD

JV3 – Verification method using a reference building is utilised to verify compliance with JP1 by determining that the annual energy consumption of the proposed building with its services is not more than the annual energy consumption of a reference building when:

- The proposed building is modelling with the proposed services; and
- The proposed building is modelled with the same services as the reference building.

The annual energy consumption of the proposed building may be reduced by the amount of energy obtained from:

1 an on-site renewable energy source; or

2 another process as reclaimed energy.

The reference building uses:

a The Deemed-to-Satisfy (DtS) Provision such as J1 Building Fabrics, J2 External glazing;

b A solar absorptance of 0.6 for the external walls and 0.7 for roofs;

c The maximum lamp power density without any increase for control device illumination power density adjustment factor;

d Air-conditioning with the conditioned space temperature within the range 18°CDB to 26°CDB for 98% of the plant operation time;

e The profiles for occupancy air-conditioning, lighting and internal heat gains for people, hot meals, equipment and hot water supply systems of Specifications JV; and

f Infiltration values:

   a. for the perimeter zone depth equal to the floor-to-ceiling height when pressuring plant is operating, 1.0 air change per hour and

   b. for the whole building, when the pressuring plant is not operating, 1.5 air change per hour.

g Both the proposed and the reference building will use the same annual energy consumption calculation method and building features such as:

   a. location, adjacent structures, building form

   b. internal heat gains including people, lighting, appliances, meals and other electric power loads

   c. and other features as specified in BCA JV3

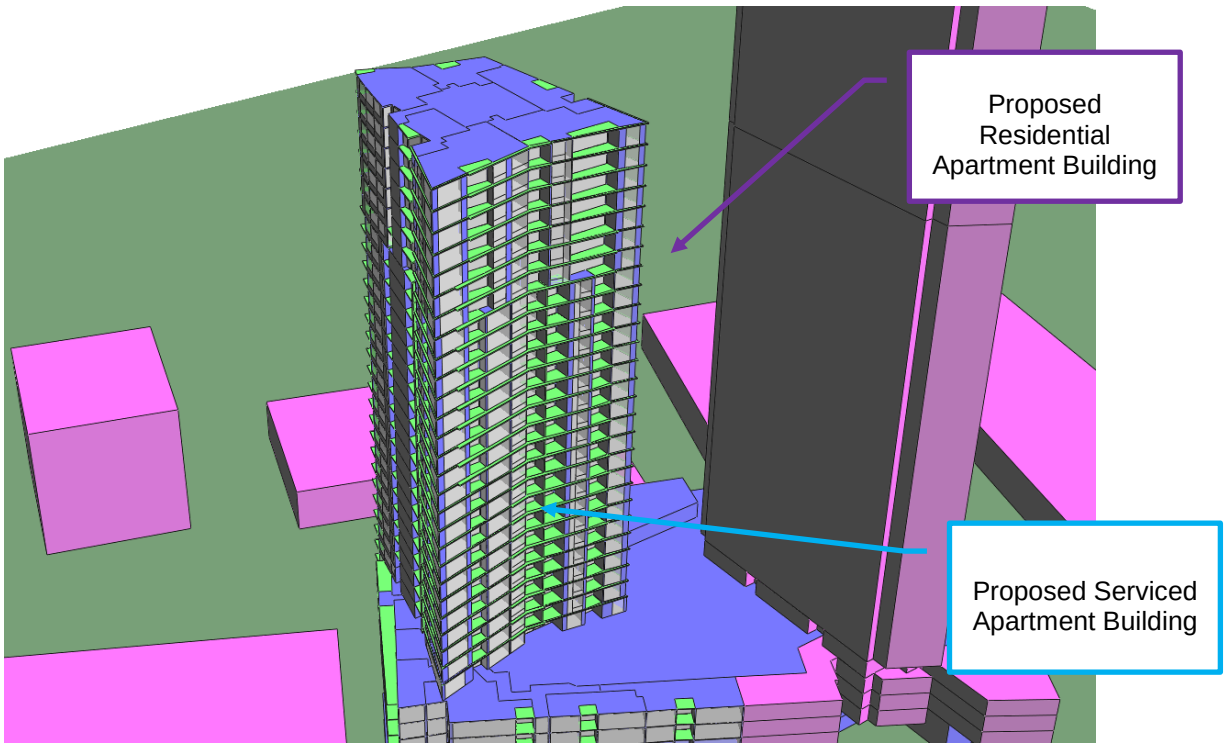
2.1 Thermal Calculation of the Proposed and Reference Buildings

The Energy Simulation Program used in this study is the IES computer program Virtual Environment 2013(VE) version 2013.2.0.3. The program is based on the ASHRAE response factor and the modifications included utilising Australian weather data and including building materials more appropriate to those used in Australia, and enabling the input of metric data.

- SLR Consulting Pty Ltd (SLR) supports a perpetual license of the Energy Simulation Software package IES <VE>.
- IES <VE> has passed the BESTEST (ASHRAE Standard 140) external validation process.
- The weather data from ACADS-BSG 94768 Sydney RO 1981 Test Reference Year (TRY) is used for the modelling.
- The building's proposed air-conditioning systems are individual reverse cycle split air-conditioners and as such can be readily modelled using the proposed energy software.
- IES<VE> assesses U-Value, SHGC, and shade coefficient when evaluating the effect of glazing. This will tend towards a more conservative outcome.
- Plant Performance curves, such as chillers, and curves for devices such as variable speed drives are readily modelled using IES <VE>.

Each individual serviced apartment was modelled as separate spaces in IES <VE> as per the drawings dated March 2014 with their awnings and balconies. The north 600mm awning and the double 300mm horizontal louvres at the corners were modelled as per drawings A149 and A352 dated 31/3/15 by Meriton. The existing surrounding buildings and proposed 55-storey residential building were also modelled as adjacent buildings overshadowing the proposed Church Street serviced apartment building.

Figure 2 North View of the Proposed Development in IES<VE>



3 MODELLING DESCRIPTION

The proposed Church Street serviced apartment building and surrounding buildings were modelled in IES<VE> so as to compare the Class 3 building in accordance to JV3 verification method.

3.1 Input Data for Reference Building

Table 1 Input Modelling Data for Reference Building

<table>
<tr><th>Item</th><th colspan="4">Description</th></tr>
<tr><td>Climate Data</td><td colspan="4">Weather data from ACADS-BSG, 94768 Sydney RO 1981 Test Reference Year (TRY)</td></tr>
<tr><td>Building Form</td><td colspan="4">• External walls: precast concrete, mainly to the eastern, western and south façade
• Curtain wall construction with insulated 1000mm high spandrels panels or full height spandrels as per architectural plans and advice from architect.
• Horizontal blades and large awning mainly to the north facade</td></tr>
<tr><td>External Shade</td><td colspan="4">• Balconies sliding door shaded by balconies above
• Double 300mm horizontal louvres above the windows at the north corners
• Large 600mm awning of varying length and location to the north facade
• Surrounding high rise buildings</td></tr>
<tr><td>External wall</td><td colspan="4">All external walls (including spandrels) have a total R-value of R2.3 for south facing walls and R2.8 for other external walls to comply with Section J1.5</td></tr>
<tr><td>Glazing</td><td colspan="4">Glazing system (glass and frame) with U value & Solar Heat Gain Coefficient as per BCA Section J 2013 Part J2.4 external glazing calculator.
<table>
<tr><th>Floor</th><th>Orientation</th><th>U-value</th><th>Solar Heat Gain Coefficient (SHGC)</th></tr>
<tr><td>Reception</td><td>East</td><td>2.0</td><td>0.1</td></tr>
<tr><td></td><td>South</td><td>3.0</td><td>0.68</td></tr>
<tr><td>Level 1 to 3</td><td>South</td><td>2.8</td><td>0.70</td></tr>
<tr><td></td><td>West</td><td>1.5</td><td>0.16</td></tr>
<tr><td></td><td>Northeast</td><td>6.0</td><td>0.14</td></tr>
<tr><td></td><td>Southeast</td><td>1.7</td><td>0.65</td></tr>
<tr><td>Level 4</td><td>North</td><td>6.5</td><td>0.46</td></tr>
<tr><td></td><td>East</td><td>2.0</td><td>0.14</td></tr>
<tr><td></td><td>South</td><td>3.7</td><td>0.6</td></tr>
<tr><td></td><td>West</td><td>2.5</td><td>0.26</td></tr>
<tr><td>Level 5 to 23</td><td>North</td><td>6.5</td><td>0.32</td></tr>
<tr><td></td><td>East</td><td>2.6</td><td>0.15</td></tr>
<tr><td></td><td>South</td><td>4.4</td><td>0.7</td></tr>
<tr><td></td><td>West</td><td>1.5</td><td>0.16</td></tr>
<tr><td>Level 24 to 30</td><td>North</td><td>6.5</td><td>0.3</td></tr>
<tr><td></td><td>East</td><td>2.5</td><td>0.13</td></tr>
<tr><td></td><td>South</td><td>3.0</td><td>0.65</td></tr>
<tr><td></td><td>West</td><td>1.8</td><td>0.10</td></tr>
</table></td></tr>
<tr><td>Roof</td><td colspan="4">Concrete slab roof with ceiling insulation and plasterboard ceiling
Total R-value= R3.2</td></tr>
<tr><td>Floor/Ceiling</td><td colspan="4">Concrete Floors with carpet overlay with plasterboard false ceiling
Floors over carpark are to be R2.0</td></tr>
</table>

Item	Description
Lighting Density	5 W / m² in serviced apartments 6 W/m² in carparks 8 W/m² in lobbies, corridors as per BCA 2013 Table J6.2a.
Lighting hours	Schedules used in study are as per Table 2a in 2013 BCA JV Specification. See **Appendix A**.
Equipment density	Equipment load in the model is 5W / m² for 24 hours per day, 7 days per week, continuous as per 2013 BCA Table 2h.
Occupant density	15m ² / person
Occupancy Schedule	Schedules used in study are as per Table 2a in 2013 BCA JV Specification. See **Appendix A**.
HVAC System type	The system modelled consists of individual reverse cycle spit air-conditioning systems to each apartment. The air-conditioning systems have a COP of 2.
HVAC Hours	Schedules used in study are as per Table 2a in 2013 BCA JV Specification. See **Appendix A**.
HVAC Control	Space temperature indoor conditions 22±2.0°CBD.
Document References	The proposed building is outlined in the drawings provided, namely A-0001 to A-0013, A-0021 to A-0028, A-2040, A-2050 to A-2054, A-2211, A-2230 by Meriton, dated March 2014. Awnings and horizontal louvres modelled as per drawings A149 and A352 dated 31/3/2015.

3.2 Input Data for Proposed Building

The proposed class 3 building has the same commitments as the reference building as described in **Table 1** except for the glazing, roof, floor above carpark and external walls of the assessed serviced apartment building. The mechanical services consist of individual 2 star cooling/2.5 star heating reverse cycle inverters to each apartment with individual controls.

The main glazing system for the proposed building is high performance double glazing grey U-value=3.0, SHGC=0.30 that complies with JV3 calculations

Table 2 Input Modelling Data for Proposed Building

Item	Description
Climate Data	Weather data from ACADS-BSG, 94768 Sydney RO 1981 Test Reference Year (TRY)
Building Form	• External walls: precast concrete, mainly to the eastern, western and south façade • Curtain wall construction with insulated 1000mm high spandrels panels or full height spandrels as per architectural plans and advice from architect. • Horizontal blades and large awning mainly to the north facade
External Shade	• Balconies sliding door shaded by balconies above • Double 300mm horizontal louvres above the windows at the north corners • Large 600mm awning of varying length and location to the north facade • Surrounding high rise buildings
External wall	***All external precast concrete walls have a total R-value of R3.5 and the spandrel walls will have a total R-value of R1.5.***
Glazing	***External glazings are modelled as double grey glazing with glass U-value of 3.0 and glass SHGC value of 0.30 and single fritted glass (40% frit) as per architectural elevations.***
Roof	Concrete slab roof with ceiling insulation and plasterboard ceiling ***Total R-value= R4.5***
Floor/Ceiling	Concrete Floors with carpet overlay with plasterboard false ceiling

Item	Description
	Floors over carpark are to be R1.25
Lighting Density	5 W / m² in serviced apartments 6 W/m² in carparks 8 W/m² in lobbies, corridors as per BCA 2013 Table J6.2a.
Lighting hours	Schedules used in study are as per Table 2a in 2013 BCA JV Specification. See **Appendix A**.
Equipment density	Equipment load in the model is 5W / m² for 24 hours per day, 7 days per week, continuous as per 2013 BCA Table 2h.
Occupant density	15m ² / person
Occupancy Schedule	Schedules used in study are as per Table 2a in 2013 BCA JV Specification. See **Appendix A**.
HVAC System type	The system modelled consists of individual 2 star cooling/2.5 star heating, reverse cycle spit air-conditioning systems to each apartment. The air-conditioning systems have a COP of 3.2 cooling and 3.5 heating. Daikin model FTXS85LVMA has been used as reference. The cooling and heating capacity are 8.5 and 9.0 KW respectively.
HVAC Hours	Schedules used in study are as per Table 2a in 2013 BCA JV Specification. See **Appendix A**.
HVAC Control	Space temperature indoor conditions 22±2.0°CBD.
Document References	The proposed building is outlined in the drawings provided, namely A-0001 to A-0013, A-0021 to A-0028, A-2040, A-2050 to A-2054, A-2211, A-2230 by Meriton, dated March 2014. Awnings and horizontal louvres modelled as per drawings A149 and A352 dated 31/3/2015.

5 SIMULATION RESULTS

The predicted Total Energy Consumed annually by the reference building and the proposed building with the reference services excluding the basement carpark energy use, hot water supply and lifts is summarised in **Table 3.**

The reference and proposed building with reference services temperature is within the range 18°CDB to 26°CDB for **100%** of the plant operation time.

The proposed building with the proposed services is within the range 18°CDB to 26°CDB for **100%** of the plant operation time for all apartments.

Table 3 Comparison of Annual Energy Consumption between the reference and proposed building

Electricity Usage	Reference building (MWh)	Proposed building with same services as reference building (MWh)	Proposed building with proposed services (MWh)
Heating	413.93	382.65	254.68
Cooling	483.19	514.25	349.14
Fans, pumps and Controls	83.5	83.5	77.6
Lights	356.72	356.72	356.72
Equipment	783.89	783.89	783.89
Total	**2121.2**	**2121.01**	**1821.91**

Note 1: Fans are assumed to operate on full load when there is a requirement for cooling and heating.

One can conclude that the annual energy consumption of the proposed Class 3 serviced apartment building is less than that of:

- the reference building; and
- the proposed building modelled with the same services as the reference building

Therefore the proposed 330 Church Street serviced apartment achieves compliance with JP1 as per BCA – JV3 Verification method.

6 CONCLUSION

SLR Consulting Australia (SLR) has been engaged by Meriton Apartment to assess the proposed serviced apartment building at 330 Church Street, Parramatta for compliance with the National Construction Code Series – Building Code of Australia (BCA) 2013 provision for Energy Efficiency under Section J using the JV3 – Verification method using a reference building. The objective of BCA Section J is to reduce greenhouse gas emissions by efficiently using energy in buildings.

It is proposed to build a 50-storey residential apartment tower and a 26-storey serviced apartment tower over a 5-storey podium at 330 Church Street, Parramatta. The proposed development site is bounded by the Parramatta River to the north and Church Street to the west.

JV3 – Verification method using a reference building is utilised to verify compliance with JP1 by determining that the annual energy consumption of the proposed building with its services is not more than the annual energy consumption of a reference building when:

- The proposed building is modelling with the proposed services; and
- The proposed building is modelled with the same services as the reference building.

The annual energy consumption of the proposed building may be reduced by the amount of energy obtained from:

1 an on-site renewable energy source; or

2 another process as reclaimed energy.

The reference serviced apartment building deemed-to-satisfy Section J requirements included:

- R2.8 external walls
- Glazing with performance values varying from U-value 1.0 to 6.0 and SHGC values from 0.1 to 0.7.

Glazing system with U-value under 2.7 and SHGC value under 0.3 are not available in Australia and therefore the JV3 modelling is used for find an alternative solution for the glazing.

The proposed serviced apartment building to achieve compliance with JP1 as per BCA – JV3 Verification method is required to have the following:

- All external precast concrete walls have a total R-value of R3.5
- Spandrel walls with a total R-value of R1.5
- Single fritted glass (40% frit) as per architectural elevations in **Appendix B**. Modelled as glazing with U-value=6.0 and SHGC=0.29
- Roof/ceiling system with total R-value of 4.5
- Concrete floors to the serviced apartments above carpark with a total R-value of 1.25
- The air-conditioning system consists of individual 2 star cooling/2.5 star heating, reverse cycle spit air-conditioning systems to each apartment. The air-conditioning systems have a COP of 3.2 cooling and 3.5 heating. The cooling and heating capacity are 8.5 and 9.0 KW respectively.
- Main glazing as high performance double glazing grey U-value=3.0, SHGC=0.30.

Occupancy and Operation Profiles of a Class 3 Building

Time period (local standard time)	Occupancy		Artificial lighting	Air-conditioning	
	Monday to Friday	Saturday, Sunday and holidays		Monday to Friday	Saturday, Sunday and holidays
12:00am to 1:00am	85%	85%	5%	On	On
1:00am to 2:00am	85%	85%	5%	On	On
2:00am to 3:00am	85%	85%	5%	On	On
3:00am to 4:00am	85%	85%	5%	On	On
4:00am to 5:00am	85%	85%	5%	On	On
5:00am to 6:00am	85%	85%	25%	On	On
6:00am to 7:00am	85%	85%	80%	On	On
7:00am to 8:00am	80%	85%	80%	On	On
8:00am to 9:00am	50%	50%	50%	On	On
9:00am to 10:00am	10%	50%	20%	Off	On
10:00am to 11:00am	10%	20%	20%	Off	Off
11:00am to 12:00pm	10%	20%	20%	Off	Off
12:00pm to 1:00pm	10%	20%	20%	Off	Off

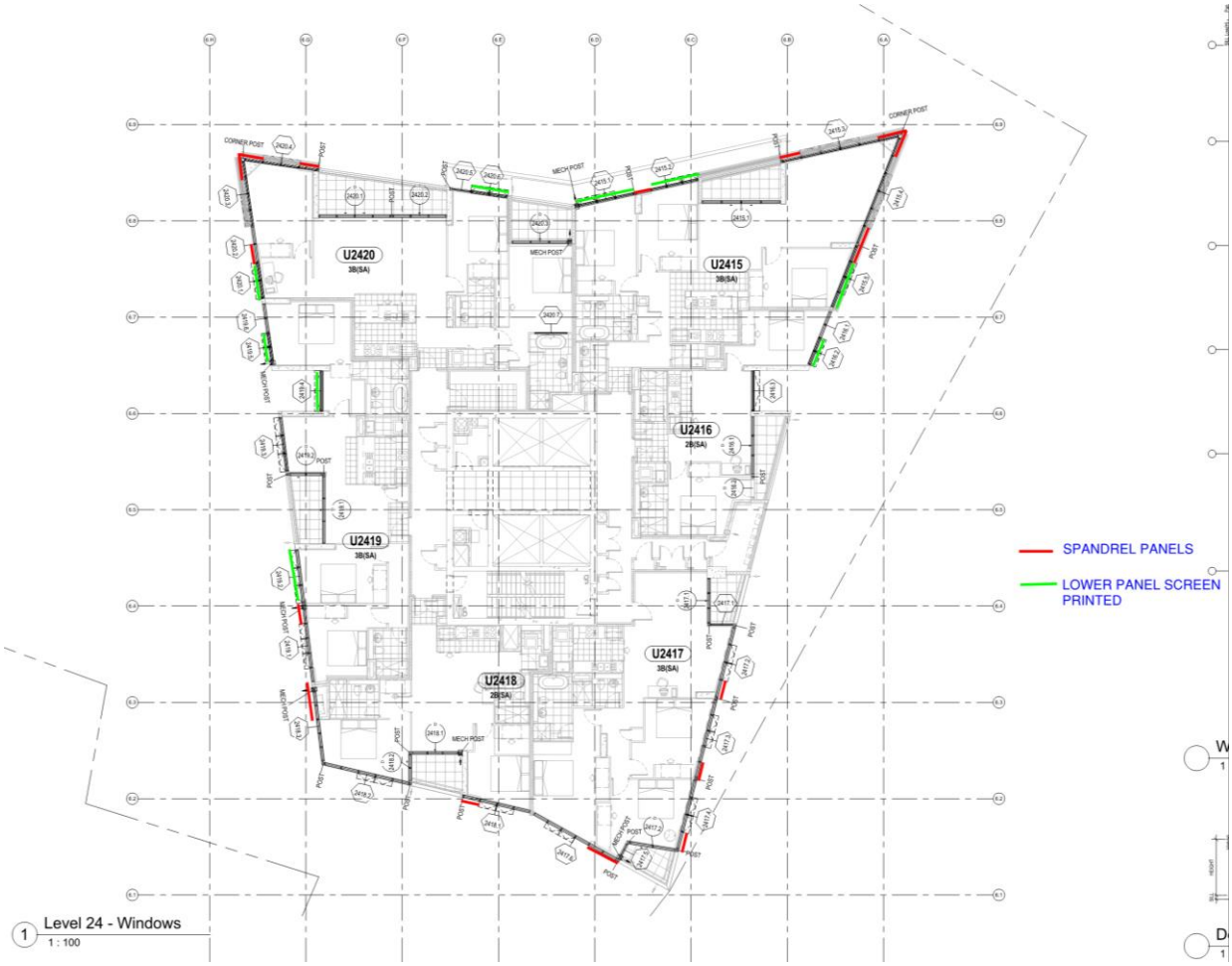
Occupancy and Operation Profiles of a Class 3 Building

Time period (local standard time)	Occupancy		Artificial lighting	Air-conditioning	
	Monday to Friday	Saturday, Sunday and holidays		Monday to Friday	Saturday, Sunday and holidays
1:00pm to 2:00pm	10%	20%	20%	Off	Off
2:00pm to 3:00pm	10%	20%	20%	Off	Off
3:00pm to 4:00pm	10%	30%	20%	Off	Off
4:00pm to 5:00pm	50%	50%	20%	On	On
5:00pm to 6:00pm	50%	50%	50%	On	On
6:00pm to 7:00pm	70%	50%	50%	On	On
7:00pm to 8:00pm	70%	70%	50%	On	On
8:00pm to 9:00pm	80%	80%	50%	On	On
9:00pm to 10:00pm	85%	80%	50%	On	On
10:00pm to 11:00pm	85%	85%	50%	On	On
11:00pm to 12:00am	85%	85%	5%	On	On

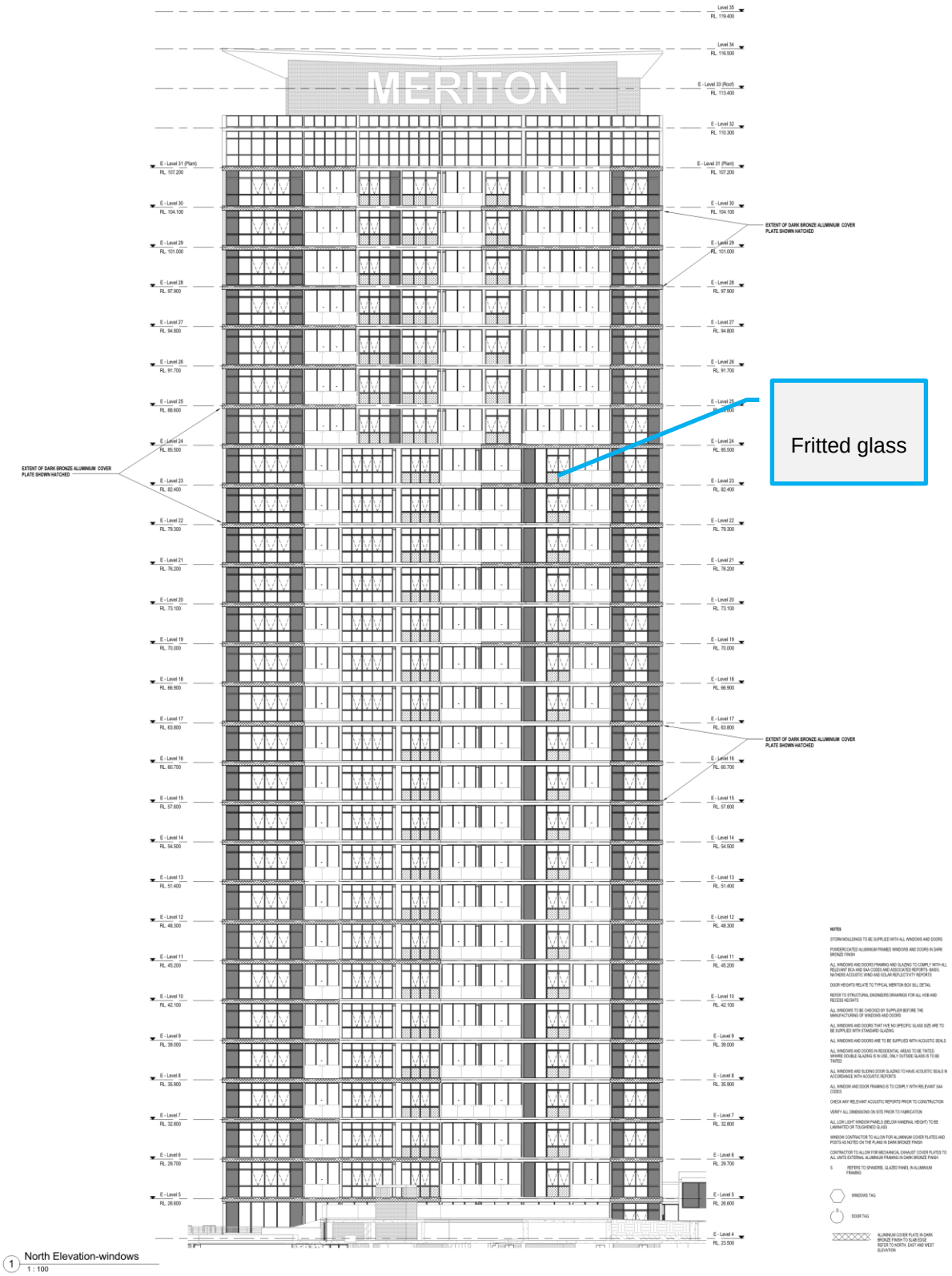
Note: The occupancy profile is expressed as a percentage of the maximum number of people that can be accommodated in the Class 3 building or Class 9c *aged care building*. The artificial lighting profile is expressed as a percentage of the maximum *illumination power density* permitted under Part J6.

Spandrel Walls and Fritted Glass Locations

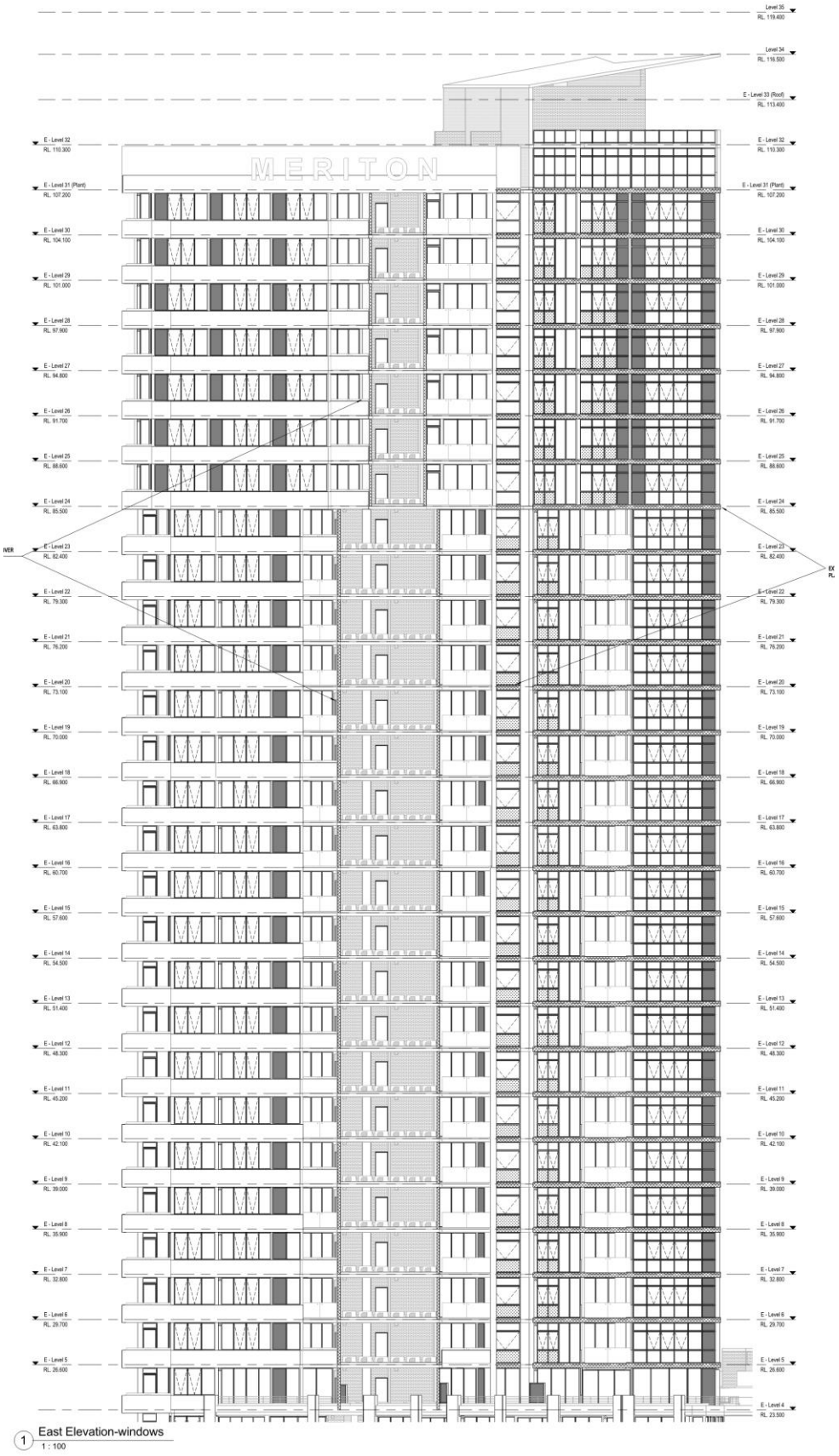
Spandrel Walls and Fritted Glass Locations



Spandrel Walls and Fritted Glass Locations

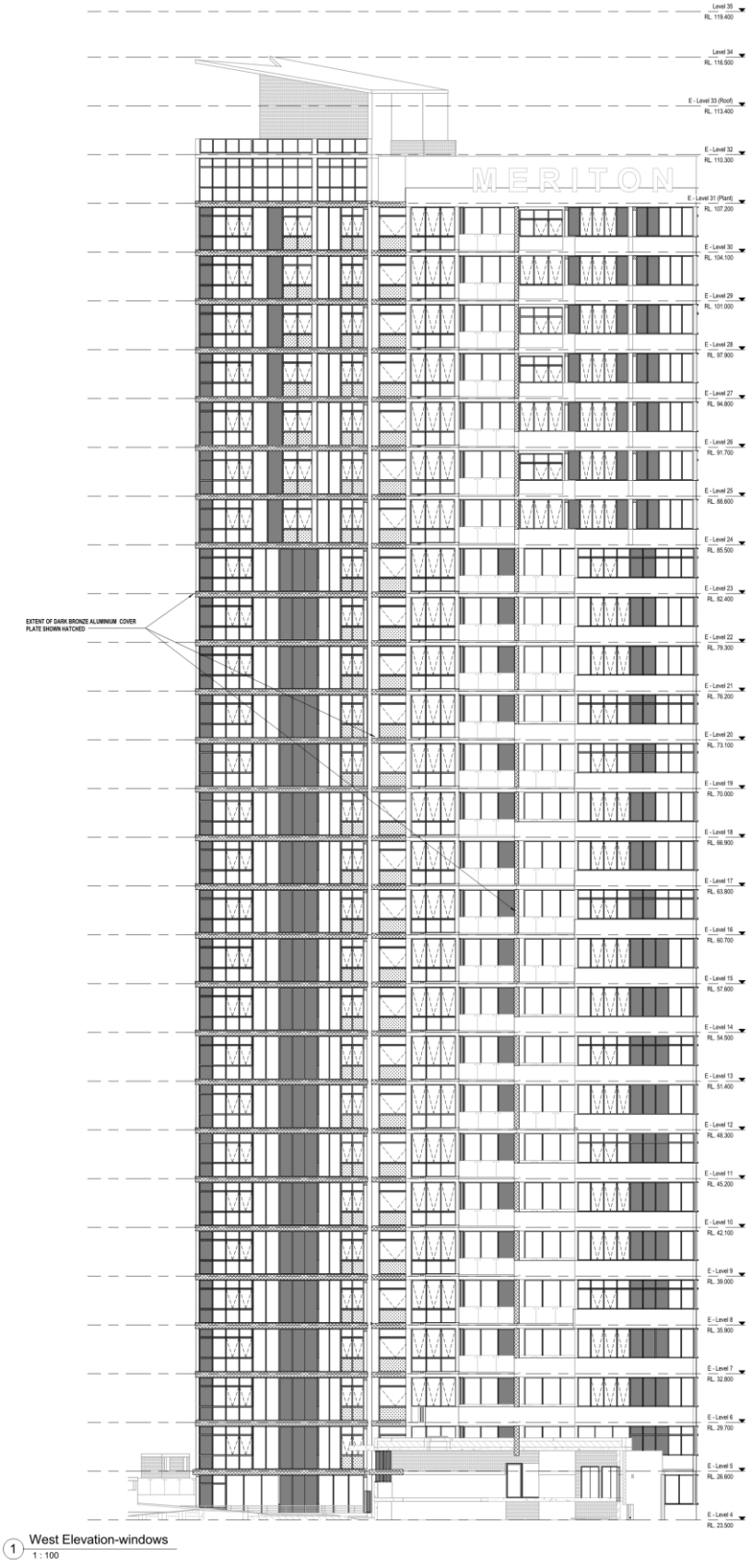


Spandrel Walls and Fritted Glass Locations



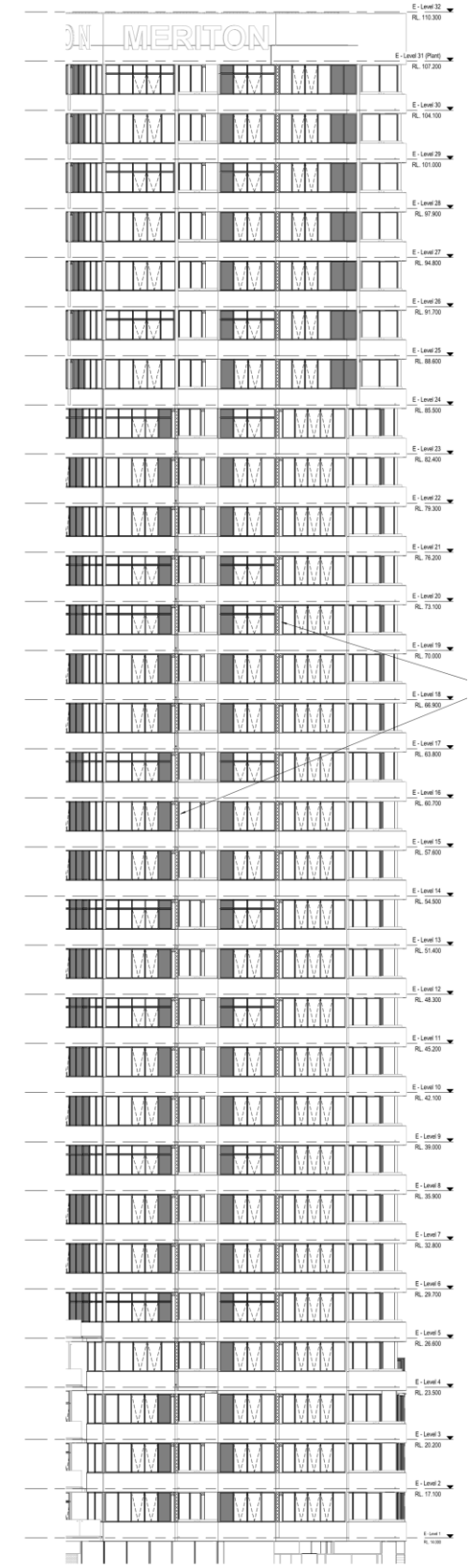
1 East Elevation-windows
1 : 100

Spandrel Walls and Fritted Glass Locations



1 West Elevation-windows
1 : 100

Spandrel Walls and Fritted Glass Locations



1 South Elevation-windows
1 : 100