

Part O Thermal Comfort Analysis

Ref: Z61922 RevB

Russell Road Development

Russell Road,

Manchester

for

Rowlinson Constructions Ltd.



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Disclaimer

This report has been prepared by Energy Counsel with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our Standard Terms and Conditions of Business and taking into account the resources devoted to it by agreement with the Client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own discretion and risk.

The results within this report are based on a theoretical model. Whilst reasonable skill, care and diligence has been used to recreate the parameters of the building within the theoretical 3D model, the internal temperatures experienced within the actual building may differ to the modelling results.

Contents

1. Executive Summary	4
2. Introduction	5
2.1. Site Location	5
3. Simulation Data	6
3.1. Software	6
3.2. Weather Data	6
3.3. Analysis Criteria	6
3.3.1. CIBSE TM59 - Design methodology for the assessment of overheating risk in homes	6
4. Modelling Data	7
4.1. Dynamic Simulation Model	7
4.2. Thermal Modelling Parameters	7
4.3. System Design	7
4.4. Building Envelope Thermal Performance	8
4.5. Room Activities	8
4.6. Weather Data	8
4.7. Fenestration	8
4.8. Mechanical Ventilation & Cooling	9
4.9. Internal Gains	10
4.10. Profiles of Use	11
5. Results	12
5.1. CIBSE TM59 Results	12
6. Conclusion	13
7. Appendices	14
7.1. Worst-case Apartments Assessed	14
7.2. Approved Document O Compliance report	19

1. Executive Summary

Energy Counsel have been appointed to carry out thermal comfort analysis in accordance with CIBSE TM59 and assessment of Building Regulations Part O compliance for the Russell Road development in Manchester. We have been asked to provide analysis of the worst-case apartments within the Extra Care and Shared Ownership portions of the building. We have used our experience on similar projects of this nature, building type and orientation to define what apartments are at most risk of overheating (these are shown in the marked-up drawings in Appendix 7.1). The occupied residential spaces have been assessed against the following standards for the current weather criteria:

- CIBSE Technical Manual 59 – Design methodology for the assessment of overheating risk in homes (2017)
- Building Regulations Approved Document O: Overheating (2021)

A full Dynamic Thermal Simulation (DSM) has been undertaken in IES-VE 2023 using geometry developed from the architectural drawings. The model has been carried out at the planning stage and specific gains and profiles have been applied to the internal spaces and the openings defined, as described within this report. The Apartments will be assessed in accordance with the adaptive comfort methodology outlined in CIBSE TM59 (2017). Whilst the relevant internal gains and heating profiles have been applied to the limited number of communal areas, TM59 does not assess these areas so the results have not been included within this report. The development is mainly naturally ventilated through opening windows and doors, but also served by localised mechanical ventilation units with and without heat recovery.

Thermal comfort is defined in BS EN ISO 7730¹ as “that condition of mind which expresses satisfaction with the thermal environment”. Thermal comfort describes a person’s psychological state of mind and is generally meant to describe whether someone feels neither too hot nor too cold. Thermal comfort is inherently subjective, as comfort preference varies between individuals.

This report provides a summary of thermal modelling work undertaken to analyse predicted thermal comfort conditions within defined occupied rooms or zones for a specific set of weather data. For Building Regulations Part O (2021) compliance, the High Emissions 50th Percentile 2020 Design Summer Year (DSY1_2020High50) for Manchester scenario has been used.

This report assumes that mechanical ventilation is provided to these areas as detailed within Section 4 of this report. Ventilation rates in accordance with the Approved Document Part F minimums have been included in the occupied areas to meet the CIBSE TM59 (2017) criteria. See Section 4.8 for more details.

CIBSE TM59 (2017) and Part O (2021) compliance is provided for the proposed summer weather scenario for the worst-case residential spaces providing the specification within this report is adhered to.

¹ BS EN ISO 7730:2005: *Ergonomics of the thermal environment*. Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria

2. Introduction

Energy Counsel have been appointed to assess the predicted thermal comfort conditions for the proposed Russell Road development. This report summarises the thermal comfort analysis for the satisfaction of CIBSE requirements, with regard to adaptive comfort methodology CIBSE TM59.

The development consists of two large Apartment Blocks, and Extra Care building and a Shared Ownership Block. The Extra Care building contains a number of 1 and 2 Bed Self-contained apartments and several communal facilities, e.g. Café, Staff Rooms, Laundry, Communal Lounges, dining areas, etc...; whilst the Shared Ownership block is mainly just accommodation (one, two and three Bed Apartments). The development is mainly naturally ventilated through opening windows and doors, but also served by localised mechanical ventilation units with and without heat recovery. The apartments are provided with local electric panel heaters, whilst the communal areas in the Extra Care building are provided with a VRF Heating and Cooling system.

A full Dynamic Thermal Simulation has been performed using IES-VE 2023, which is compliant with the software requirements of CIBSE AM11 – Building Energy and Environmental Modelling. Results will be used to inform the thermal comfort design, heating, cooling and mechanical services strategy. The purpose of this analysis is to identify any spaces that would result in occupant dissatisfaction due to temperatures falling out of standard comfortable ranges.

The input data used in the analysis includes lighting, equipment and occupancy gains to suit the intended occupation pattern and in accordance with the CIBSE TM59 methodology.

The building is located on Russell Road in Whalley Range, Manchester. The building is bound by Russell Road to the Southwest, Carlton Road to the Southeast and Whalley Road to the Northwest.

2.1. Site Location



3. Simulation Data

3.1. Software

Integrated Environmental Solutions (IES) version 2023.4.1.0 has been used to conduct the dynamic thermal modelling analysis described within this report. The ModellIT, Apache and MacroFlo packages have been used to generate the models and run the simulations to produce the results herein.

3.2. Weather Data

The Manchester weather file has been used for the simulation; this is the closest available weather file for the specific location. The weather data used for simulations was sourced from CIBSE (Chartered Institute for Building Services Engineers), an industry recognised organisation. Manchester is one of the locations across the UK that data is available for and therefore has been used for this model. Section 4 provides further description of the weather files used.

3.3. Analysis Criteria

The proposed development will be assessed for thermal comfort against the criteria of CIBSE TM59. The DSY1 for 2020s, high emissions, 50% percentile for Manchester will be used, ensuring that a stringent level of analysis is provided to meet the requirements set out within CIBSE TM59 (2017).

3.3.1. CIBSE TM59 - Design methodology for the assessment of overheating risk in homes

CIBSE TM59 – Design methodology for the assessment of overheating risk in homes (2017) provides a standardised approach to predicting overheating risk for residential building designs (new-build or major refurbishment) using dynamic thermal analysis. The methodology suggests the following requirement is met for spaces that are predominantly naturally ventilated:

Compliance is based on passing both of the following two criteria:

(a) For living rooms, kitchens and bedrooms: the number of hours during which ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours. (CIBSE TM52 Criterion 1: Hours of exceedance).

(b) For bedrooms only: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26 °C will be recorded as a fail).

*Criteria 2 and 3 of CIBSE TM52 may fail to be met, but both (a) and (b) above **must** be passed for all relevant rooms.*

The methodology suggests the following requirement is met for spaces that are predominantly mechanically ventilated (this applies to dwellings where opening restrictions are applied):

For homes with restricted window openings, the CIBSE fixed temperature test must be followed, i.e. all occupied rooms should not exceed an operative temperature of 26 °C for more than 3% of the annual occupied annual hours (CIBSE Guide A (2015a)).

The majority of the apartments are assessed as naturally ventilated space, as although the windows are restricted for safety reasons, they can be opened day and night when required. However, due to the security restrictions that have to be applied to the Ground Floor, in accordance with Part O, the ground floor apartments are being assessed as predominantly mechanically ventilated as the windows are not allowed to be opened during the nighttime to alleviate overheating risk.

Occupied hours are calculated for a summer period between May and September only. This is taken to be 24 hours a day for bedrooms (totalling 3672 hours) and for 13 hours a day in living rooms (totalling 1989 hours).

Unlike the traditional non-domestic approach in CIBSE TM52, both occupancy and equipment gains are prescribed within the guidance document for this methodology.

4. Modelling Data

4.1. Dynamic Simulation Model

We have constructed a 1:1 3D virtual model of the development based on the drawings provided by Triangle Architects:

DRAFT 2100_A GA Ground Floor Plan (27.02.24)
DRAFT 2101_A GA First Floor Plan (27.02.24)
DRAFT 2102_A GA Second Floor Plan (27.02.24)
DRAFT 2103_A GA Third Floor Plan (27.02.24)
DRAFT 2104_A GA Fourth Floor Plan (27.02.24)
DRAFT 2105 GA Roof Plan (29.02.24)
DRAFT 2201_A GA External Elevations (27.02.24)
DRAFT 2202_A GA Internal Courtyard Elevations (27.02.24)
DRAFT 2301_GA Sections - Sheet 1 (29.02.24)

4.2. Thermal Modelling Parameters

The following criteria have been considered for every space in the building in order to calculate heating losses and cooling gains:

- Orientation and location including weather and irradiance data
- Summer design temperatures in °C
- Infiltration in air changes per hour (ach)
- Thermal weight and fabric u-values of all elements, both internal and external
- Lighting gains in W/m²
- Occupancy sensible and latent gains in W/person
- Equipment sensible and latent gains in W/m²
- Ventilation rates in litres per second (l/s)
- Lighting, occupancy, equipment, temperature and ventilation profiles

4.3. System Design

For the development, a mix of natural and mechanical ventilation is provided to meet the fresh air requirements, to provide comfort into the space and to remove odours.

The Apartments are mainly served by localised continuous mechanical ventilation extract to the Bathrooms and Kitchen areas. However, the Ground Floor apartments are provided with localised Mechanical Ventilation with Heat Recovery (MVHR) to provide additional ventilation to all areas due to the restrictions on opening windows at nighttime.

The thermal model takes into account the exchange of heat between rooms and the external environment. All internal temperatures listed below are the result of the interactions between several systems operating concurrently to maintain the environmental conditions within the building.

As noted in Section 2, thermal comfort is subjective. User expectations of what constitutes a comfortable environment may vary throughout the year; for example, warmer internal temperatures are generally more accepted during summer. Where possible, local temperature control is to be included to account for differences in individual comfort. The limits for room temperature set-points are generally as outlined in CIBSE Guide A, Table 1.5.

4.4. Building Envelope Thermal Performance

The building envelope fabric performance values are tabulated below:

Building Envelope Thermal Performance		
Component	U-value (W/m ² .K)	G-value
Roof – Concrete deck with Insulation and waterproof membrane	0.11	N/A
Ground Floor – Reinforced Concrete with rigid insulation and screed	0.12	N/A
Windows and Glazed Doors	1.30	0.40
External Wall (Extra Care) – Brick External Wall with medium weight concrete block and rigid insulation	0.18	N/A
External Wall (Shared Ownership) – Brick External Wall with LGSF and Rockwool insulation	0.18	N/A
Apartment Internal Walls – Plasterboard, metal stud and mineral wool insulation	N/A	N/A
Apartment Party Walls – 2 layers of dense Plasterboard, metal stud and 50mm mineral wool insulation	N/A	N/A
Internal Walls to unheated spaces – LGSF with Plasterboard and mineral wool insulation	0.22	N/A
Internal Floors / Ceilings – 150mm hollow rib concrete suspended floor with 50mm screed	N/A	N/A
Infiltration Rate	0.15 ac/hr based on air permeability of 4m ³ /hr.m ² @ 50pa	N/A

4.5. Room Activities

In order to assess thermal comfort levels, the worst-case occupied room has been analysed to ascertain their performance. Only spaces which are likely to be used for over 30 minutes at a time are considered occupied according to CIBSE technical standards. Intermittently occupied spaces such as circulation are therefore excluded from summertime temperature analysis; however their internal gains still contribute to the building environment. A full overview of gains and profiles applied for these spaces is provided below.

4.6. Weather Data

To demonstrate compliance with the requirements of CIBSE TM59, the model has been simulated against summer conditions taken from the CIBSE Design Summer Year (DSY1) weather file for Manchester. The Manchester weather file best represents local climatic conditions for this area from the data sets available; it is the nearest locality with an hourly account of wind, solar irradiation, cloud, precipitation and temperature information.

The Design Summer Year is used to assess compliance against CIBSE TM59. The DSY is a single continuous year rather than a composite one made up from average months. For the purposes of this analysis, the DSY1 for 2020s, high emissions, 50% percentile for Manchester will be used for a current weather scenario.

4.7. Fenestration

The building is predominantly naturally ventilated, with a mix of natural and mechanical ventilation being provided to meet the fresh air requirements, to provide comfort into the space and to remove odours.

The Apartments are mainly served by localised continuous mechanical ventilation extract to the Bathrooms and Kitchen areas. However, the Ground Floor apartments are provided with localised Mechanical Ventilation with Heat Recovery (MVHR) to provide additional ventilation to all areas due to the restrictions on opening windows at nighttime.

Openable windows are available to all occupied apartment areas. All windows are hung as per the elevations confirmed in Section 4.1, with free areas assigned as per the table below. All upper and ground floor windows incorporate child restrictors, which will limit each opening to 100mm opening distance. Glazed balcony doors are also included for the purposes of this analysis with a 100mm opening distance. Opening free areas are confirmed in the table below based on opening panel dimensions. Natural ventilation is introduced when internal temperatures are >22°C, as per CIBSE guidance.

1) GF Side Hung 2.6a (day)	Value	2) GF Top Hung 2.6a (day)	Value	3) GF Top Hung (Slim) 2.6a (day)	Value	4) GF Balcony Door 2.6a (day)	Value	5) UF Top Hung 2.6a + b (day & night)	Value
Equivalent orifice area (%)	16.45	Equivalent orifice area (%)	23.23	Equivalent orifice area (%)	23.23	Equivalent orifice area (%)	9.70	Equivalent orifice area (%)	23.23
Opening Distance (mm)	100	Opening Distance (mm)	100	Opening Distance (mm)	100	Opening Distance (mm)	100	Opening Distance (mm)	100
Crack length (%)	79.17	Crack length (%)	77.00	Crack length (%)	80.00	Crack length (%)	65.38	Crack length (%)	77.00
Opening threshold (°C)	22	Opening threshold (°C)	22	Opening threshold (°C)	22	Opening threshold (°C)	22	Opening threshold (°C)	22
6) UF Top Hung (Slim) 2.6a + b (day & night)	Value	7) UF Door (Jul Balc) 2.6a + b (day & night)	Value	8) UF Side Hung (Slim) 2.6a + b (day & night)	Value	9) UF Side Hung (Sq) 2.6a + b (day & night)	Value		
Equivalent orifice area (%)	23.23	Equivalent orifice area (%)	9.68	Equivalent orifice area (%)	9.68	Equivalent orifice area (%)	23.23		
Opening Distance (mm)	100	Opening Distance (mm)	100	Opening Distance (mm)	100	Opening Distance (mm)	100		
Crack length (%)	80.00	Crack length (%)	65.63	Crack length (%)	83.75	Crack length (%)	75.00		
Opening threshold (°C)	22	Opening threshold (°C)	22	Opening threshold (°C)	22	Opening threshold (°C)	22		

4.8. Mechanical Ventilation & Cooling

The mechanical ventilation strategy for the model has been based on localised continuously running extract only to the Upper Floors, and Heat Recovery Units providing supply and extract to the Ground Floor apartments. The following ventilation rate must be provided to the relevant areas to ensure compliance with Part O:

- Apartment Bathroom - 8 litres/second
- Apartment Living / Kitchen - 13 litres/second
- Apartment Bedroom (Ground Floor Only) - 6 litres/second

Comfort Cooling is to be provided to the following areas: residents lounge, staff room, treatment rooms, offices, interview and reception, multipurpose eating space, multipurpose rooms, comms or IT rooms, café, cinema room, incidental space, library and all circulation space on the extra care facility.

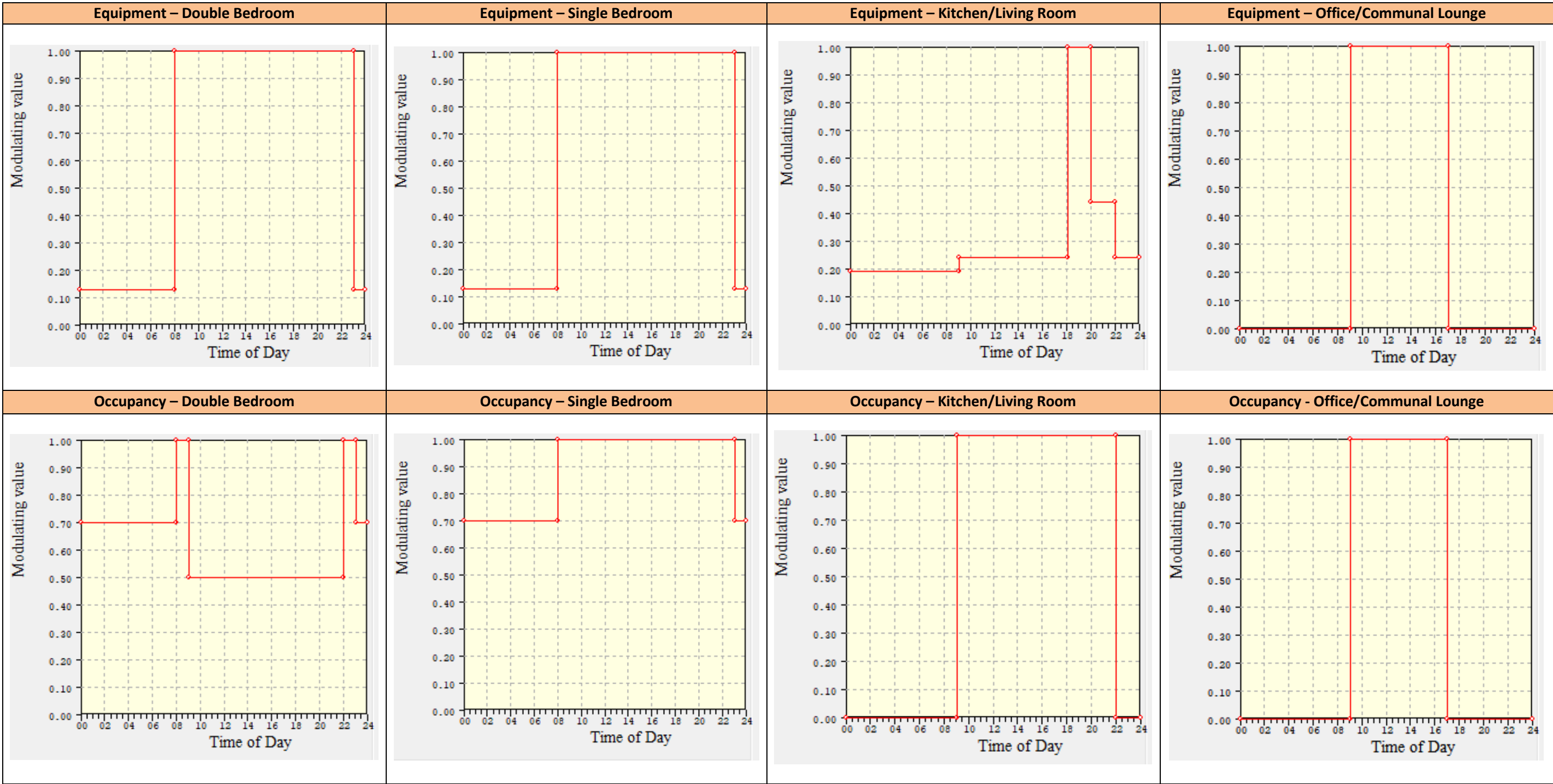
4.9. Internal Gains

Operation profiles have been set up to account for variations in building use over time. Operating hours are based on CIBSE guidance or as prescribed within CIBSE TM59 for a building of this type. A general overview of lighting, occupant and equipment gains in each space is provided in the table below.

Room Type	Lighting Gain	Equipment Gain	Occupancy Gain			Notes
	Max. Sensible Gain (W/m ²)	Max. Sensible Gain (W)	Occupancy (people)	Max. Sensible Gain (W/person)	Max. Latent Gain (W/person)	
Bathroom / WC	2	1.75W/m ²	-	-	-	Prescribed gains from TM59 methodology.
Double Bedroom	2	80	2	75	55	
Single Bedroom	2	80	1	75	55	
1 Bed Kitchen/Living Room	2	450	1	75	55	
2 Bed Kitchen/Living Room	2	450	2	75	55	
3 Bed Kitchen/Living Room	2	450	2	75	55	CIBSE Guide A assumed occupancy and equipment gains.
Resident's Lounge / Treatment / Cinema	5	5 W/m ²	Furniture Layout	75	55	
Office / Interview / Staff Room	6	15 W/m ²	Furniture Layout	75	55	
Multi-purpose Space / Café / Library	6	10 W/m ²	Furniture Layout	75	55	
Entrance Lobby / Reception	8	5 W/m ²	30m ² /person	75	55	
Circulation	2	4W/m ²	30m ² /person	-	-	Heat gain from distribution pipework

4.10. Profiles of Use

The images below show how operation profiles have been set up for the simulation. A value of 1 = 100% fully occupied room, a value of 0.5 = 50% occupied, etc...



5. Results

A review of compliance with CIBSE TM59 for the worst-case Apartments is provided below. A full summary of the results has been included in the Appendices of this report.

5.1. CIBSE TM59 Results

The CIBSE TM59 methodology suggests the following requirement is met for spaces that are predominantly naturally ventilated:

Compliance is based on passing both of the following two criteria:

(a) For living rooms, kitchens and bedrooms: the number of hours during which ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours. (CIBSE TM52 Criterion 1: Hours of exceedance).

(b) For bedrooms only: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26 °C will be recorded as a fail).

*Criteria 2 and 3 of CIBSE TM52 may fail to be met, but both (a) and (b) above **must** be passed for all relevant rooms.*

The methodology suggests the following requirement is met for spaces that are predominantly mechanically ventilated (this applies to dwellings where opening restrictions are applied):

For homes with restricted window openings, the CIBSE fixed temperature test must be followed, i.e. all occupied rooms should not exceed an operative temperature of 26 °C for more than 3% of the annual occupied annual hours (CIBSE Guide A (2015a)).

The Ground Floor Apartments have been assessed against the predominantly mechanically ventilated criteria; all other apartments have been assessed against the predominantly naturally ventilated criteria.

Criteria	Spaces
Compliant Apartment rooms (a. CIBSE TM52 Criterion 1: Hours of exceedance)	64
Compliant Bedrooms (b. operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of annual hours)	32
Compliant Apartment rooms (not exceed an operative temperature of 26 °C for more than 3% of the annual occupied annual hours)	9
Non-Compliant Apartment rooms (a. CIBSE TM52 Criterion 1: Hours of exceedance)	0
Non-Compliant Bedrooms (b. operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of annual hours)	0
Non-Compliant Apartment rooms (not exceed an operative temperature of 26 °C for more than 3% of the annual occupied annual hours)	0

All residential areas assessed within the development are therefore compliant with CIBSE TM59 (2017) and Building Regulation Part O. A full summary of the results has been included in the Appendices of this report.

6. Conclusion

The results of this report confirm the performance of the worst-case Apartments within the Extra Care and Shared Ownership portions of the development, when assessed against the CIBSE TM59 thermal comfort methodology. We have assessed a selection of the worst-case Apartments at each floor level, a total of 32 Apartments, to provide a sufficient cross-section of Apartments to provide confidence that all other Apartments will achieve improved results.

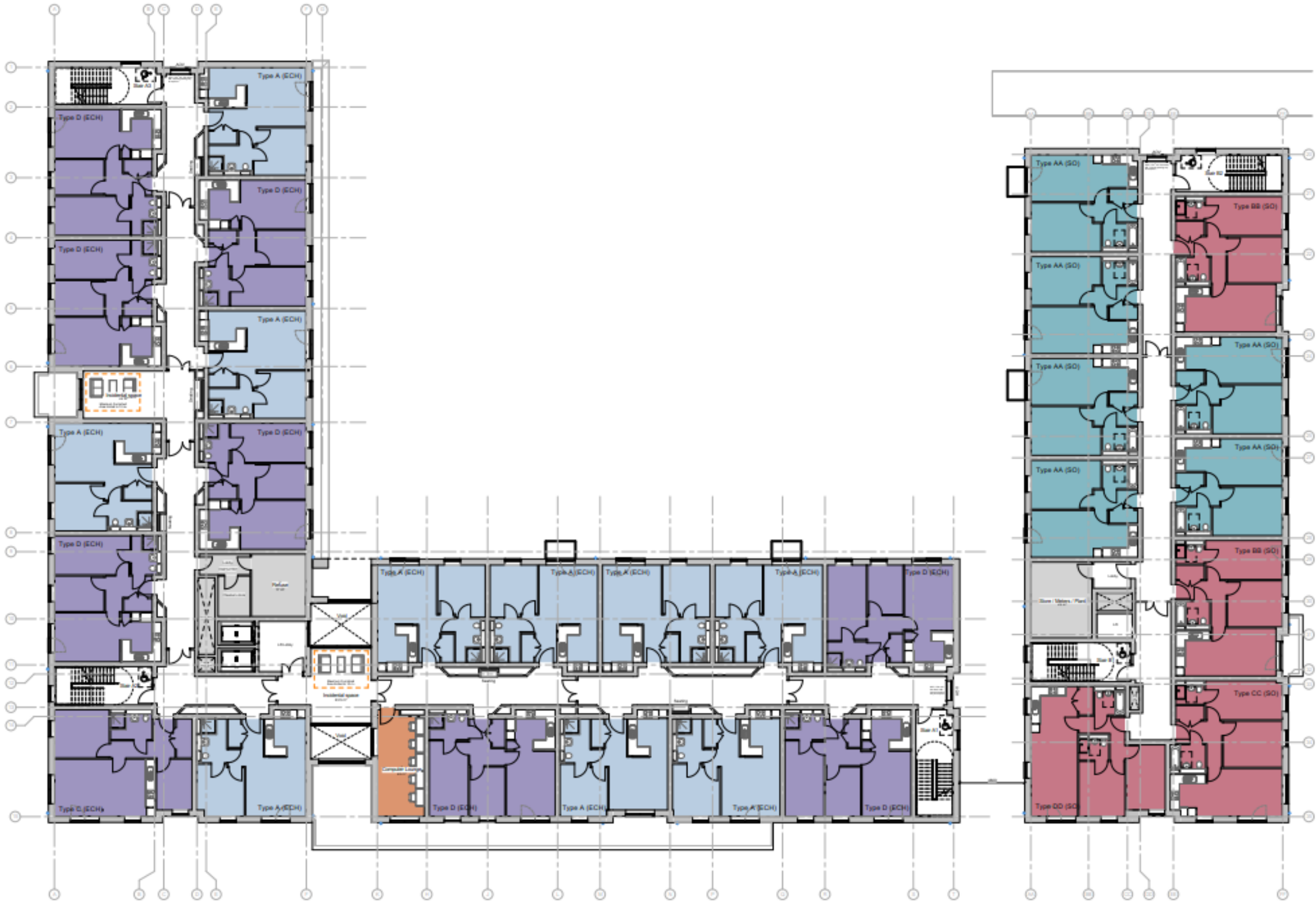
This report assumes that mechanical ventilation is provided as detailed within Section 4 of this report. Ventilation rates in accordance with the Approved Document Part F minimums have been included in the occupied areas to meet the CIBSE TM59 (2017) and Part O criteria.

The results of the analysis indicate that all of the occupied residential spaces (Bedrooms and Living/Kitchen spaces) assessed meet the requirements of Part O of the Building Regulations.

7. Appendices

7.1. Worst-case Apartments Assessed

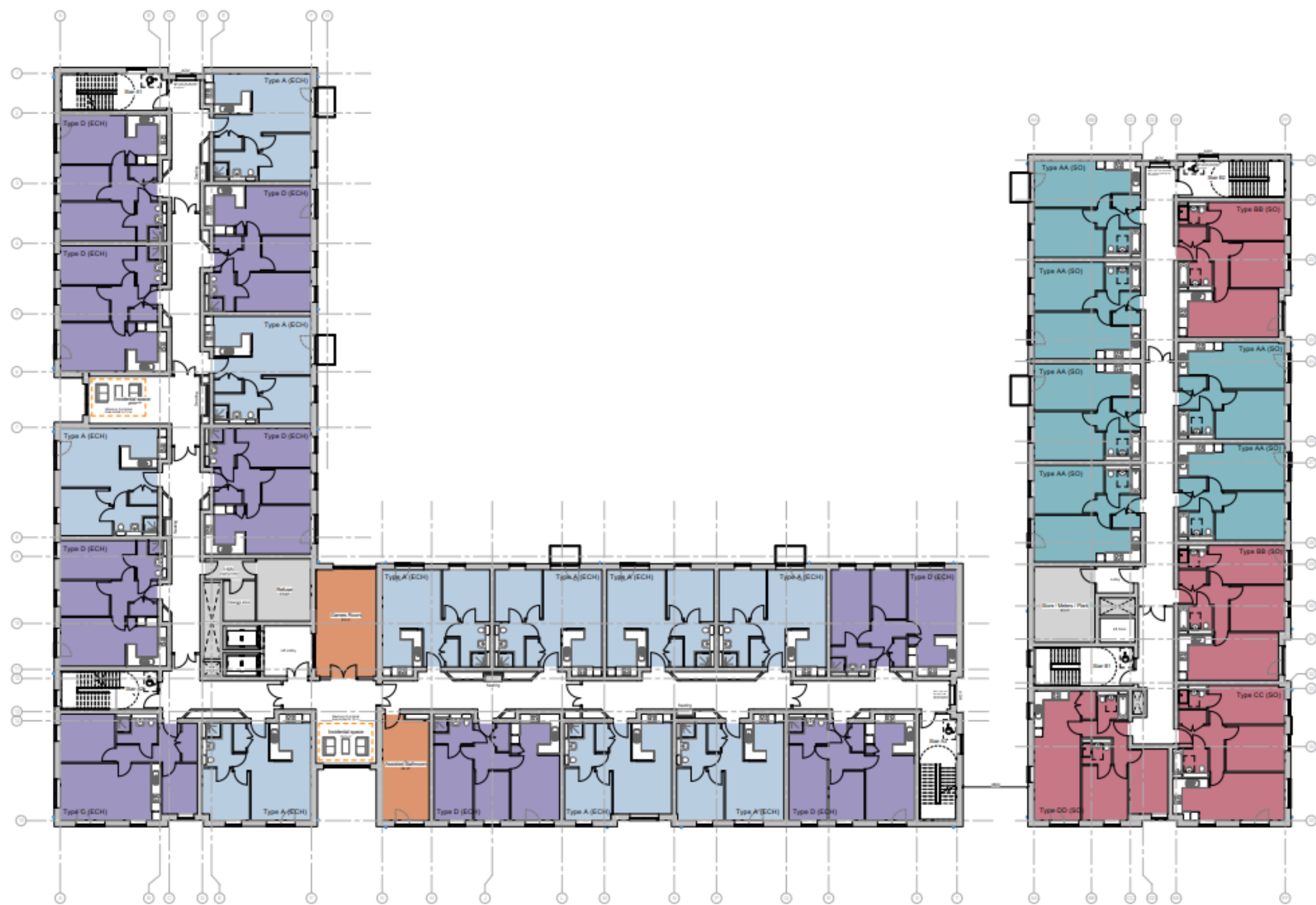




1 GA First Floor Plan
1:100



1 GA Second Floor Plan
1:100



1 GA Third Floor Plan
1:100



2 GA Fourth Floor Plan
1:100

7.2. Approved Document O Compliance report

Approved Document O report
Overheating risk in residential buildings
for
Russell Road Extra Care

Russell Road Extra Care

Page 1 of 20

Building details

Project name: Russell Road Extra Care	Date: 20-03-2024 18:15:50
Location: Manchester Ap, United Kingdom	
Address: Russell Road, Whaley Range, Manchester	
Building use: Extra Care and Shared Ownership Facility	
Are there any security, noise, or pollution issues: Security Issues at Ground Floor	

Designer's details

Designer's name: Matthew Adams
Designer's organisation: Energy Counsel
Designer's address: Viridor House, 3 Bolholt Terrace, Bury, BL8 1PP

Dynamic thermal model

Software: IESVE version 2023.4.1.0	
Weather file: Manchester_DSY1_2020High50_.epw	
Results file: Russell-PartO-1.aps	
Number of rooms analysed: 64	
TM59: summer elevated air speed: 0.1	
TM59: occupant category: Category II (normal)	
Overheating mitigation strategy: Openable windows and continuous Mechanical Ventilation	
Has the building construction proposal been modelled accurately?	YES
Have the analysed rooms passed the assessment for Approved Doc O Dynamic Thermal Modelling Method (CIBSE TM 59)?	YES
Designer's signature:	

Russell Road Extra Care

Page 2 of 20

Summary

CIBSE TM59 overheating methodology for predominantly naturally ventilated rooms assesses against two criteria, (a) and (b) (for Category I occupancy, T_{max} is reduced by 1K):

- Criterion (a) states that for living rooms, kitchens and bedrooms, the number of hours during which ΔT is greater than or equal to 1K from May to September (or November to March for southern hemisphere locations) shall not exceed 3% of occupied hours
- Criterion (b) states that the operative temperature of the bedrooms from 22:00-07:00 shall not exceed 26°C for more than 1% of annual hours (33 hours is therefore recorded as a fail). Approved document O applies limits to CIBSE TM59 section 3.3 (openings); these requirements are applied by appropriate assignment of MacroFlo types / scripted profiles in the model (see Modelled Openings Section).

CIBSE TM59 overheating methodology for predominantly mechanically ventilated rooms states the operative temperature of all rooms shall not exceed 26°C for more than 3% of annual occupied hours.

CIBSE TM59 also states that the inclusion of corridors in the overheating analysis is mandatory where community heating pipework runs through them. While there is no mandatory target for communal corridors, if an operative temperature of 28°C is exceeded for more than 3% of the total annual hours this should be identified as a significant risk.

Room name	Naturally ventilated Criterion a check	Naturally ventilated Criterion b check	Mechanically ventilated check	Corridor overheating risk check
EC GF - Apt 3 Living/Kitchen	-	-	Pass	-
EC GF - Apt 3 Bed 2	-	-	Pass	-
EC GF - Apt 3 Bed 1	-	-	Pass	-
EC GF - Apt 4 Bed 1	-	-	Pass	-
EC GF - Apt 4 Living/Kitchen	-	-	Pass	-
SO GF - Apt 5 Bedroom	-	-	Pass	-
SO GF - Apt 5 Living / Kitchen	-	-	Pass	-
SO GF - Apt 11 Bedroom	-	-	Pass	-
SO GF - Apt 11 Living / Kitchen	-	-	Pass	-
EC 1F - Apt 3 Living/Kitchen	Pass	N/A	-	-
SO 1F - Apt 5 Bedroom	Pass	Pass	-	-
SO 1F - Apt 5 Living / Kitchen	Pass	N/A	-	-
SO 1F - Apt 11 Bedroom	Pass	Pass	-	-
SO 1F - Apt 11 Living / Kitchen	Pass	N/A	-	-
EC 1F - Apt 3 Bed 1	Pass	Pass	-	-
EC 1F - Apt 3 Bed 2	Pass	Pass	-	-
EC 1F - Apt 4 Living/Kitchen	Pass	N/A	-	-
EC 1F - Apt 4 Bed 1	Pass	Pass	-	-
EC 2F - Apt 4 Living/Kitchen	Pass	N/A	-	-
EC 2F - Apt 4 Bed 1	Pass	Pass	-	-
EC 2F - Apt 8 Bed 1	Pass	Pass	-	-
EC 2F - Apt 8 Bed 2	Pass	Pass	-	-

Russell Road Extra Care

Page 3 of 20

Room name	Naturally ventilated Criterion a check	Naturally ventilated Criterion b check	Mechanically ventilated check	Corridor overheating risk check
EC 2F - Apt 8 Living/Kitchen	Pass	N/A	-	-
EC 2F - Apt 10 Living/Kitchen	Pass	N/A	-	-
EC 2F - Apt 10 Bed 1	Pass	Pass	-	-
EC 2F - Apt 10 Bed 2	Pass	Pass	-	-
EC 2F - Apt 16 Bed 1	Pass	Pass	-	-
EC 2F - Apt 16 Living/Kitchen	Pass	N/A	-	-
EC 2F - Apt 19 Bed 2	Pass	Pass	-	-
EC 2F - Apt 19 Living/Kitchen	Pass	N/A	-	-
EC 2F - Apt 19 Bed 1	Pass	Pass	-	-
SO 2F - Apt 12 (Duplex) Living / Kitchen	Pass	N/A	-	-
SO 2F - Apt 11 (Duplex) Living/Kitchen	Pass	N/A	-	-
SO 2F - Apt 5 (Duplex) Living/Kitchen	Pass	N/A	-	-
EC 3F - Apt 4 Living/Kitchen	Pass	N/A	-	-
EC 3F - Apt 4 Bed 1	Pass	Pass	-	-
EC 3F - Apt 8 Bed 1	Pass	Pass	-	-
EC 3F - Apt 8 Bed 2	Pass	Pass	-	-
EC 3F - Apt 8 Living/Kitchen	Pass	N/A	-	-
EC 3F - Apt 10 Living/Kitchen	Pass	N/A	-	-
EC 3F - Apt 10 Bed 1	Pass	Pass	-	-
EC 3F - Apt 10 Bed 2	Pass	Pass	-	-
EC 3F - Apt 16 Bed 1	Pass	Pass	-	-
EC 3F - Apt 16 Living/Kitchen	Pass	N/A	-	-
EC 3F - Apt 19 Bed 2	Pass	Pass	-	-
EC 3F - Apt 19 Living/Kitchen	Pass	N/A	-	-
EC 3F - Apt 19 Bed 1	Pass	Pass	-	-
SO 3F - Apt 5 (Duplex) Bed 1	Pass	Pass	-	-
SO 3F - Apt 5 (Duplex) Bed 2	Pass	Pass	-	-
SO 3F - Apt 11 (Duplex) Bed 1	Pass	Pass	-	-
SO 3F - Apt 11 (Duplex) Bed 2	Pass	Pass	-	-

Russell Road Extra Care

Page 4 of 20

Room name	Naturally ventilated Criterion a check	Naturally ventilated Criterion b check	Mechanically ventilated check	Corridor overheating risk check
SO 3F - Apt 12 (Duplex) Bed 1	Pass	Pass	-	-
SO 3F - Apt 12 (Duplex) Bed 2	Pass	Pass	-	-
SO 3F - Apt 12 (Duplex) Bed 3	Pass	Pass	-	-
EC 4F - Apt 4 Living/Kitchen	Pass	N/A	-	-
EC 4F - Apt 4 Bed 1	Pass	Pass	-	-
EC 4F - Apt 8 Bed 1	Pass	Pass	-	-
EC 4F - Apt 8 Bed 2	Pass	Pass	-	-
EC 4F - Apt 8 Living/Kitchen	Pass	N/A	-	-
EC 4F - Apt 16 Bed 1	Pass	Pass	-	-
EC 4F - Apt 16 Living/Kitchen	Pass	N/A	-	-
EC 4F - Apt 19 Bed 2	Pass	Pass	-	-
EC 4F - Apt 19 Living/Kitchen	Pass	N/A	-	-
EC 4F - Apt 19 Bed 1	Pass	Pass	-	-

Russell Road Extra Care

Page 5 of 20

Naturally ventilated rooms – criterion (a)

Criterion (a) states that for living rooms, kitchens and bedrooms, the number of hours during which ΔT is greater than or equal to 1K from May to September (or November to March for southern hemisphere locations) shall not exceed 3% of occupied hours.

Room name	Occupied hours	No. hours $\Delta T \geq 1^\circ\text{K}$	% Occupied hours $\Delta T \geq 1^\circ\text{K}$	Criterion a check
EC 1F - Apt 3 Living/Kitchen	1989	0	0.0	Pass
SO 1F - Apt 5 Bedroom	3672	0	0.0	Pass
SO 1F - Apt 5 Living / Kitchen	1989	0	0.0	Pass
SO 1F - Apt 11 Bedroom	3672	0	0.0	Pass
SO 1F - Apt 11 Living / Kitchen	1989	0	0.0	Pass
EC 1F - Apt 3 Bed 1	3672	0	0.0	Pass
EC 1F - Apt 3 Bed 2	3672	0	0.0	Pass
EC 1F - Apt 4 Living/Kitchen	1989	0	0.0	Pass
EC 1F - Apt 4 Bed 1	3672	0	0.0	Pass
EC 2F - Apt 4 Living/Kitchen	1989	0	0.0	Pass
EC 2F - Apt 4 Bed 1	3672	0	0.0	Pass
EC 2F - Apt 8 Bed 1	3672	0	0.0	Pass
EC 2F - Apt 8 Bed 2	3672	0	0.0	Pass
EC 2F - Apt 8 Living/Kitchen	1989	0	0.0	Pass
EC 2F - Apt 10 Living/Kitchen	1989	0	0.0	Pass
EC 2F - Apt 10 Bed 1	3672	0	0.0	Pass
EC 2F - Apt 10 Bed 2	3672	0	0.0	Pass
EC 2F - Apt 16 Bed 1	3672	0	0.0	Pass
EC 2F - Apt 16 Living/Kitchen	1989	0	0.0	Pass
EC 2F - Apt 19 Bed 2	3672	0	0.0	Pass
EC 2F - Apt 19 Living/Kitchen	1989	0	0.0	Pass
EC 2F - Apt 19 Bed 1	3672	0	0.0	Pass
SO 2F - Apt 12 (Duplex) Living / Kitchen	1989	0	0.0	Pass
SO 2F - Apt 11 (Duplex) Living/Kitchen	1989	0	0.0	Pass
SO 2F - Apt 5 (Duplex) Living/Kitchen	1989	0	0.0	Pass
EC 3F - Apt 4 Living/Kitchen	1989	0	0.0	Pass
EC 3F - Apt 4 Bed 1	3672	0	0.0	Pass

Russell Road Extra Care

Page 6 of 20

Room name	Occupied hours	No. hours $\Delta T \geq 1^\circ\text{K}$	% Occupied hours $\Delta T \geq 1^\circ\text{K}$	Criterion a check
EC 3F - Apt 8 Bed 1	3672	0	0.0	Pass
EC 3F - Apt 8 Bed 2	3672	0	0.0	Pass
EC 3F - Apt 8 Living/Kitchen	1989	0	0.0	Pass
EC 3F - Apt 10 Living/Kitchen	1989	0	0.0	Pass
EC 3F - Apt 10 Bed 1	3672	0	0.0	Pass
EC 3F - Apt 10 Bed 2	3672	0	0.0	Pass
EC 3F - Apt 16 Bed 1	3672	0	0.0	Pass
EC 3F - Apt 16 Living/Kitchen	1989	0	0.0	Pass
EC 3F - Apt 19 Bed 2	3672	0	0.0	Pass
EC 3F - Apt 19 Living/Kitchen	1989	0	0.0	Pass
EC 3F - Apt 19 Bed 1	3672	0	0.0	Pass
SO 3F - Apt 5 (Duplex) Bed 1	3672	0	0.0	Pass
SO 3F - Apt 5 (Duplex) Bed 2	3672	0	0.0	Pass
SO 3F - Apt 11 (Duplex) Bed 1	3672	0	0.0	Pass
SO 3F - Apt 11 (Duplex) Bed 2	3672	0	0.0	Pass
SO 3F - Apt 12 (Duplex) Bed 1	3672	0	0.0	Pass
SO 3F - Apt 12 (Duplex) Bed 2	3672	0	0.0	Pass
SO 3F - Apt 12 (Duplex) Bed 3	3672	0	0.0	Pass
EC 4F - Apt 4 Living/Kitchen	1989	0	0.0	Pass
EC 4F - Apt 4 Bed 1	3672	0	0.0	Pass
EC 4F - Apt 8 Bed 1	3672	0	0.0	Pass
EC 4F - Apt 8 Bed 2	3672	0	0.0	Pass
EC 4F - Apt 8 Living/Kitchen	1989	0	0.0	Pass
EC 4F - Apt 16 Bed 1	3672	0	0.0	Pass
EC 4F - Apt 16 Living/Kitchen	1989	0	0.0	Pass
EC 4F - Apt 19 Bed 2	3672	0	0.0	Pass
EC 4F - Apt 19 Living/Kitchen	1989	0	0.0	Pass
EC 4F - Apt 19 Bed 1	3672	0	0.0	Pass

Russell Road Extra Care

Page 7 of 20

Naturally ventilated rooms – criterion (b)

Criterion (b) states that the operative temperature of the bedrooms from 22:00-07:00 shall not exceed 26°C for more than 1% of annual hours (33 hours is therefore recorded as a fail). Any rooms that are not bedrooms are therefore not assessed, hence the corresponding N/A values.

Room name	No. hours > 26°C 22:00-24:00	No. hours > 26°C 00:00-07:00	Total hours > 26°C	Criterion b check
EC 1F - Apt 3 Living/Kitchen	N/A	N/A	N/A	N/A
SO 1F - Apt 5 Bedroom	15	6	21	Pass
SO 1F - Apt 5 Living / Kitchen	N/A	N/A	N/A	N/A
SO 1F - Apt 11 Bedroom	15	5	20	Pass
SO 1F - Apt 11 Living / Kitchen	N/A	N/A	N/A	N/A
EC 1F - Apt 3 Bed 1	12	4	16	Pass
EC 1F - Apt 3 Bed 2	15	6	21	Pass
EC 1F - Apt 4 Living/Kitchen	N/A	N/A	N/A	N/A
EC 1F - Apt 4 Bed 1	6	1	7	Pass
EC 2F - Apt 4 Living/Kitchen	N/A	N/A	N/A	N/A
EC 2F - Apt 4 Bed 1	7	0	7	Pass
EC 2F - Apt 8 Bed 1	11	1	12	Pass
EC 2F - Apt 8 Bed 2	12	1	13	Pass
EC 2F - Apt 8 Living/Kitchen	N/A	N/A	N/A	N/A
EC 2F - Apt 10 Living/Kitchen	N/A	N/A	N/A	N/A
EC 2F - Apt 10 Bed 1	11	1	12	Pass
EC 2F - Apt 10 Bed 2	10	0	10	Pass
EC 2F - Apt 16 Bed 1	7	0	7	Pass
EC 2F - Apt 16 Living/Kitchen	N/A	N/A	N/A	N/A
EC 2F - Apt 19 Bed 2	12	0	12	Pass
EC 2F - Apt 19 Living/Kitchen	N/A	N/A	N/A	N/A
EC 2F - Apt 19 Bed 1	5	0	5	Pass
SO 2F - Apt 12 (Duplex) Living / Kitchen	N/A	N/A	N/A	N/A
SO 2F - Apt 11 (Duplex) Living/Kitchen	N/A	N/A	N/A	N/A
SO 2F - Apt 5 (Duplex) Living/Kitchen	N/A	N/A	N/A	N/A
EC 3F - Apt 4 Living/Kitchen	N/A	N/A	N/A	N/A
EC 3F - Apt 4 Bed 1	4	0	4	Pass

Russell Road Extra Care

Page 8 of 20

Room name	No. hours > 26°C 22:00-24:00	No. hours > 26°C 00:00-07:00	Total hours > 26°C	Criterion b check
EC 3F - Apt 8 Bed 1	11	4	15	Pass
EC 3F - Apt 8 Bed 2	12	1	13	Pass
EC 3F - Apt 8 Living/Kitchen	N/A	N/A	N/A	N/A
EC 3F - Apt 10 Living/Kitchen	N/A	N/A	N/A	N/A
EC 3F - Apt 10 Bed 1	10	1	11	Pass
EC 3F - Apt 10 Bed 2	8	0	8	Pass
EC 3F - Apt 16 Bed 1	7	0	7	Pass
EC 3F - Apt 16 Living/Kitchen	N/A	N/A	N/A	N/A
EC 3F - Apt 19 Bed 2	12	1	13	Pass
EC 3F - Apt 19 Living/Kitchen	N/A	N/A	N/A	N/A
EC 3F - Apt 19 Bed 1	7	0	7	Pass
SO 3F - Apt 5 (Duplex) Bed 1	12	1	13	Pass
SO 3F - Apt 5 (Duplex) Bed 2	6	0	6	Pass
SO 3F - Apt 11 (Duplex) Bed 1	10	1	11	Pass
SO 3F - Apt 11 (Duplex) Bed 2	11	1	12	Pass
SO 3F - Apt 12 (Duplex) Bed 1	11	2	13	Pass
SO 3F - Apt 12 (Duplex) Bed 2	8	0	8	Pass
SO 3F - Apt 12 (Duplex) Bed 3	6	0	6	Pass
EC 4F - Apt 4 Living/Kitchen	N/A	N/A	N/A	N/A
EC 4F - Apt 4 Bed 1	4	0	4	Pass
EC 4F - Apt 8 Bed 1	10	1	11	Pass
EC 4F - Apt 8 Bed 2	11	0	11	Pass
EC 4F - Apt 8 Living/Kitchen	N/A	N/A	N/A	N/A
EC 4F - Apt 16 Bed 1	5	0	5	Pass
EC 4F - Apt 16 Living/Kitchen	N/A	N/A	N/A	N/A
EC 4F - Apt 19 Bed 2	10	0	10	Pass
EC 4F - Apt 19 Living/Kitchen	N/A	N/A	N/A	N/A
EC 4F - Apt 19 Bed 1	5	0	5	Pass

Russell Road Extra Care

Page 9 of 20

Mechanically ventilated rooms

CIBSE TM59 overheating methodology for predominantly mech. vent. rooms states the operative temperature of all rooms shall not exceed 26°C for more than 3% of annual occupied hours.

Room name	No. hours > 26°C	% Annual hours > 26°C	Mechanically ventilated check
EC GF - Apt 3 Living/Kitchen	96	2.0	Pass
EC GF - Apt 3 Bed 2	164	1.9	Pass
EC GF - Apt 3 Bed 1	144	1.6	Pass
EC GF - Apt 4 Bed 1	169	1.9	Pass
EC GF - Apt 4 Living/Kitchen	41	0.9	Pass
SO GF - Apt 5 Bedroom	189	2.2	Pass
SO GF - Apt 5 Living / Kitchen	55	1.2	Pass
SO GF - Apt 11 Bedroom	188	2.1	Pass
SO GF - Apt 11 Living / Kitchen	54	1.1	Pass

Communal corridors

CIBSE TM59 states that whilst there is no mandatory target for communal corridors, if an operative temperature of 28°C is exceeded for more than 3% of annual hours, then this should be identified as a significant risk within the TM59 overheating report.

Room name	No. hours > 28°C	% Annual hours > 28°C	Corridor overheating risk check
No corridors	N/A	N/A	N/A

Russell Road Extra Care

Page 10 of 20

Modelled details & overheating mitigation strategy

Approved document O: Providing Information & Appendix B requires information about the model and the overheating mitigation strategy. The following tables detail the modelling method and mitigation strategies applied to each analysed room. Where multiple active openings per space (windows & louvres) exist they are all listed. Occupancy, equipment and lighting profiles for occupied rooms comply with TM59 section 5.

Modelled occupancy

Room name	Floor area m ²	Thermal template	Occupancy profile	Equipment profile	Lighting profile
EC GF - Apt 3 Living/Kitchen	29.93	TM59 - 2 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC GF - Apt 3 Bed 2	9.16	TM59 - Single Bedroom	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
EC GF - Apt 3 Bed 1	17.7	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
EC GF - Apt 4 Bed 1	18.15	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
EC GF - Apt 4 Living/Kitchen	40.17	TM59 - 1 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
SO GF - Apt 5 Bedroom	12.75	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
SO GF - Apt 5 Living / Kitchen	32.57	TM59 - 1 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
SO GF - Apt 11 Bedroom	12.39	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
SO GF - Apt 11 Living / Kitchen	33.05	TM59 - 1 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC 1F - Apt 3 Living/Kitchen	29.92	TM59 - 2 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
SO 1F - Apt 5 Bedroom	12.75	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
SO 1F - Apt 5 Living / Kitchen	32.57	TM59 - 1 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
SO 1F - Apt 11 Bedroom	12.39	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
SO 1F - Apt 11 Living / Kitchen	33.06	TM59 - 1 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC 1F - Apt 3 Bed 1	13.78	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
EC 1F - Apt 3 Bed 2	8.88	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h

Russell Road Extra Care

Page 11 of 20

Room name	Floor area m ²	Thermal template	Occupancy profile	Equipment profile	Lighting profile
EC 1F - Apt 4 Living/Kitchen	32.67	TM59 - 1 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC 1F - Apt 4 Bed 1	17.52	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
EC 2F - Apt 4 Living/Kitchen	32.67	TM59 - 1 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC 2F - Apt 4 Bed 1	17.52	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
EC 2F - Apt 8 Bed 1	14.33	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
EC 2F - Apt 8 Bed 2	8.45	TM59 - Single Bedroom	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
EC 2F - Apt 8 Living/Kitchen	30.96	TM59 - 2 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC 2F - Apt 10 Living/Kitchen	30.91	TM59 - 2 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC 2F - Apt 10 Bed 1	14.01	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
EC 2F - Apt 10 Bed 2	8.75	TM59 - Single Bedroom	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
EC 2F - Apt 16 Bed 1	13.36	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
EC 2F - Apt 16 Living/Kitchen	31.84	TM59 - 1 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC 2F - Apt 19 Bed 2	8.58	TM59 - Single Bedroom	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
EC 2F - Apt 19 Living/Kitchen	31.49	TM59 - 2 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC 2F - Apt 19 Bed 1	13.77	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
SO 2F - Apt 12 (Duplex) Living / Kitchen	34.58	TM59 - 3 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
SO 2F - Apt 11 (Duplex) Living/Kitchen	36.74	TM59 - 2 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
SO 2F - Apt 5 (Duplex) Living/Kitchen	36.67	TM59 - 2 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC 3F - Apt 4 Living/Kitchen	32.67	TM59 - 1 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h

Russell Road Extra Care

Page 12 of 20

Room name	Floor area m ²	Thermal template	Occupancy profile	Equipment profile	Lighting profile
EC 3F - Apt 4 Bed 1	17.52	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
EC 3F - Apt 8 Bed 1	14.33	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
EC 3F - Apt 8 Bed 2	8.45	TM59 - Single Bedroom	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
EC 3F - Apt 8 Living/Kitchen	30.96	TM59 - 2 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC 3F - Apt 10 Living/Kitchen	30.91	TM59 - 2 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC 3F - Apt 10 Bed 1	14.01	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
EC 3F - Apt 10 Bed 2	8.75	TM59 - Single Bedroom	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
EC 3F - Apt 16 Bed 1	13.36	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
EC 3F - Apt 16 Living/Kitchen	31.84	TM59 - 1 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC 3F - Apt 19 Bed 2	8.58	TM59 - Single Bedroom	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
EC 3F - Apt 19 Living/Kitchen	31.49	TM59 - 2 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC 3F - Apt 19 Bed 1	13.77	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
SO 3F - Apt 5 (Duplex) Bed 1	12.84	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
SO 3F - Apt 5 (Duplex) Bed 2	13.94	TM59 - Single Bedroom	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
SO 3F - Apt 11 (Duplex) Bed 1	12.67	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
SO 3F - Apt 11 (Duplex) Bed 2	11.95	TM59 - Single Bedroom	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
SO 3F - Apt 12 (Duplex) Bed 1	15.12	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
SO 3F - Apt 12 (Duplex) Bed 2	14.0	TM59 - Single Bedroom	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
SO 3F - Apt 12 (Duplex) Bed 3	10.5	TM59 - Single Bedroom	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
EC 4F - Apt 4 Living/Kitchen	32.67	TM59 - 1 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC 4F - Apt 4 Bed 1	17.52	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h

Russell Road Extra Care

Page 13 of 20

Room name	Floor area m ²	Thermal template	Occupancy profile	Equipment profile	Lighting profile
EC 4F - Apt 8 Bed 1	14.33	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
EC 4F - Apt 8 Bed 2	8.45	TM59 - Single Bedroom	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
EC 4F - Apt 8 Living/Kitchen	30.96	TM59 - 2 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC 4F - Apt 16 Bed 1	13.36	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
EC 4F - Apt 16 Living/Kitchen	31.84	TM59 - 2 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC 4F - Apt 19 Bed 2	8.58	TM59 - Single Bedroom	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
EC 4F - Apt 19 Living/Kitchen	31.49	TM59 - 2 Bedroom - Living / Kitchen	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
EC 4F - Apt 19 Bed 1	13.77	TM59 - Double Bedroom	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h

Russell Road Extra Care

Page 14 of 20

Modelled openings

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m ²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
EC GF - Apt 3 Living/Kitchen	8.55	0.4007	2.25, 2.25	60.0, 0.0	4.51	ADO.Section_26a, off continuously
EC GF - Apt 3 Bed 2	11.43	0.4007	1.55, 0.8	60.0, 0.0	10.15	ADO.Section_26a, off continuously
EC GF - Apt 3 Bed 1	22.32	0.4007	1.55, 0.8	60.0, 0.0	5.25	ADO.Section_26a, off continuously
EC GF - Apt 4 Bed 1	32.27	0.4007	2.05, 1.3, 0.75	0.0, 60.0, 0.0	4.3	ADO.Section_26a, off continuously
EC GF - Apt 4 Living/Kitchen	30.99	0.4007	2.25, 2.25	60.0, 0.0	3.36	ADO.Section_26a, off continuously
SO GF - Apt 5 Bedroom	23.81	0.4007	1.55, 0.8	60.0, 0.0	7.29	ADO.Section_26a, off continuously
SO GF - Apt 5 Living / Kitchen	22.63	0.4007	1.4, 1.4	60.0, 0.0	2.58	ADO.Section_26a, off continuously
SO GF - Apt 11 Bedroom	24.22	0.4007	1.55, 0.8	60.0, 0.0	7.51	ADO.Section_26a, off continuously
SO GF - Apt 11 Living / Kitchen	12.71	0.4007, 0.4007	1.55, 0.8, 1.4, 1.4	60.0, 0.0, 60.0, 0.0	5.36	ADO.Section_26a, off continuously
EC 1F - Apt 3 Living/Kitchen	14.59	0.4007, 0.4007	2.2, 1.3, 0.9, 2.1	0.0, 60.0, 0.0, 60.0	6.82	ADO.Section_26ab, off continuously
SO 1F - Apt 5 Bedroom	26.14	0.4007	1.03, 1.55	0.0, 60.0	7.29	ADO.Section_26ab, off continuously
SO 1F - Apt 5 Living / Kitchen	35.56	0.4007	2.2, 2.2	0.0, 60.0	4.05	ADO.Section_26ab, off continuously
SO 1F - Apt 11 Bedroom	26.58	0.4007	1.04, 1.55	0.0, 60.0	7.51	ADO.Section_26ab, off continuously
SO 1F - Apt 11 Living / Kitchen	16.65	0.4007, 0.4007	1.55, 0.8, 2.2, 2.2	60.0, 0.0, 0.0, 60.0	6.81	ADO.Section_26ab, off continuously
EC 1F - Apt 3 Bed 1	27.04	0.4007	1.03, 1.55	0.0, 60.0	6.75	ADO.Section_26ab, off continuously

Russell Road Extra Care

Page 15 of 20

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m ²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
EC 1F - Apt 3 Bed 2	29.59	0.4007	1.04, 1.55	0.0, 60.0	10.47	ADO.Section_26ab, off continuously
EC 1F - Apt 4 Living/Kitchen	29.63	0.4007	2.2, 2.2	0.0, 60.0	4.04	ADO.Section_26ab, off continuously
EC 1F - Apt 4 Bed 1	15.08	0.4007	1.03, 1.55	0.0, 60.0	5.31	ADO.Section_26ab, off continuously
EC 2F - Apt 4 Living/Kitchen	29.63	0.4007	2.2, 2.2	0.0, 60.0	4.04	ADO.Section_26ab, off continuously
EC 2F - Apt 4 Bed 1	15.08	0.4007	1.04, 1.55	0.0, 60.0	5.31	ADO.Section_26ab, off continuously
EC 2F - Apt 8 Bed 1	25.71	0.4007	1.03, 1.55	0.0, 60.0	6.49	ADO.Section_26ab, off continuously
EC 2F - Apt 8 Bed 2	30.16	0.4007	1.04, 1.55	0.0, 60.0	11.01	ADO.Section_26ab, off continuously
EC 2F - Apt 8 Living/Kitchen	25.64	0.4007	2.2, 2.2	0.0, 60.0	4.26	ADO.Section_26ab, off continuously
EC 2F - Apt 10 Living/Kitchen	26.14	0.4007	2.2, 2.2	0.0, 60.0	4.27	ADO.Section_26ab, off continuously
EC 2F - Apt 10 Bed 1	26.58	0.4007	1.03, 1.55	0.0, 60.0	6.64	ADO.Section_26ab, off continuously
EC 2F - Apt 10 Bed 2	29.59	0.4007	1.03, 1.55	0.0, 60.0	10.63	ADO.Section_26ab, off continuously
EC 2F - Apt 16 Bed 1	18.67	0.4007	1.03, 1.55	0.0, 60.0	6.96	ADO.Section_26ab, off continuously
EC 2F - Apt 16 Living/Kitchen	29.96	0.4007	2.2, 2.2	0.0, 60.0	4.15	ADO.Section_26ab, off continuously
EC 2F - Apt 19 Bed 2	30.16	0.4007	1.03, 1.55	0.0, 60.0	10.84	ADO.Section_26ab, off continuously
EC 2F - Apt 19 Living/Kitchen	24.92	0.4007	2.2, 2.2	0.0, 60.0	4.19	ADO.Section_26ab, off continuously

Russell Road Extra Care

Page 16 of 20

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m ²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
EC 2F - Apt 19 Bed 1	27.04	0.4007	1.04, 1.55	0.0, 60.0	6.75	ADO.Section_26ab, off continuously
SO 2F - Apt 12 (Duplex) Living / Kitchen	18.06	0.4007, 0.4007, 0.4007	1.03, 1.55, 2.1, 2.2, 1.3, 0.9	0.0, 60.0, 60.0, 0.0, 60.0, 0.0	8.59	ADO.Section_26ab, off continuously
SO 2F - Apt 11 (Duplex) Living/Kitchen	26.8	0.4007, 0.4007, 0.4007, 0.4007	1.03, 1.55, 2.1, 2.2, 1.3, 0.9, 1.04, 1.55	0.0, 60.0, 60.0, 0.0, 60.0, 0.0, 0.0, 60.0	10.62	ADO.Section_26ab, off continuously
SO 2F - Apt 5 (Duplex) Living/Kitchen	32.4	0.4007, 0.4007, 0.4007	1.03, 1.55, 2.1, 2.2, 1.3, 0.9	0.0, 60.0, 60.0, 0.0, 60.0, 0.0	8.1	ADO.Section_26ab, off continuously
EC 3F - Apt 4 Living/Kitchen	29.63	0.4007	2.2, 2.2	0.0, 60.0	4.04	ADO.Section_26ab, off continuously
EC 3F - Apt 4 Bed 1	15.08	0.4007	1.03, 1.55	0.0, 60.0	5.31	ADO.Section_26ab, off continuously
EC 3F - Apt 8 Bed 1	25.71	0.4007	1.03, 1.55	0.0, 60.0	6.49	ADO.Section_26ab, off continuously
EC 3F - Apt 8 Bed 2	30.16	0.4007	1.03, 1.55	0.0, 60.0	11.01	ADO.Section_26ab, off continuously
EC 3F - Apt 8 Living/Kitchen	25.64	0.4007	2.2, 2.2	0.0, 60.0	4.26	ADO.Section_26ab, off continuously
EC 3F - Apt 10 Living/Kitchen	26.14	0.4007	2.2, 2.2	0.0, 60.0	4.27	ADO.Section_26ab, off continuously
EC 3F - Apt 10 Bed 1	26.58	0.4007	1.03, 1.55	0.0, 60.0	6.64	ADO.Section_26ab, off continuously
EC 3F - Apt 10 Bed 2	29.59	0.4007	1.04, 1.55	0.0, 60.0	10.63	ADO.Section_26ab, off continuously
EC 3F - Apt 16 Bed 1	18.67	0.4007	1.04, 1.55	0.0, 60.0	6.96	ADO.Section_26ab, off continuously
EC 3F - Apt 16 Living/Kitchen	29.96	0.4007	2.2, 1.3, 0.9	0.0, 60.0, 0.0	2.45	ADO.Section_26ab, off continuously
EC 3F - Apt 19 Bed 2	30.16	0.4007	1.04, 1.55	0.0, 60.0	10.84	ADO.Section_26ab, off continuously

Russell Road Extra Care

Page 17 of 20

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m ²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
EC 3F - Apt 19 Living/Kitchen	24.92	0.4007	2.2, 2.2	0.0, 60.0	4.19	ADO.Section_26ab, off continuously
EC 3F - Apt 19 Bed 1	27.04	0.4007	1.04, 1.55	0.0, 60.0	6.75	ADO.Section_26ab, off continuously
SO 3F - Apt 5 (Duplex) Bed 1	23.41	0.4007	1.04, 1.55	0.0, 60.0	7.24	ADO.Section_26ab, off continuously
SO 3F - Apt 5 (Duplex) Bed 2	39.22	0.4007	2.2, 1.3, 0.9	0.0, 60.0, 0.0	5.6	ADO.Section_26ab, off continuously
SO 3F - Apt 11 (Duplex) Bed 1	23.41	0.4007	1.03, 1.55	0.0, 60.0	7.34	ADO.Section_26ab, off continuously
SO 3F - Apt 11 (Duplex) Bed 2	19.05	0.4007	2.2, 1.3, 0.9	0.0, 60.0, 0.0	6.53	ADO.Section_26ab, off continuously
SO 3F - Apt 12 (Duplex) Bed 1	24.24	0.4007	2.2, 1.3, 0.9	0.0, 60.0, 0.0	5.16	ADO.Section_26ab, off continuously
SO 3F - Apt 12 (Duplex) Bed 2	10.45	0.4007	1.04, 1.55	0.0, 60.0	6.64	ADO.Section_26ab, off continuously
SO 3F - Apt 12 (Duplex) Bed 3	20.45	0.4007	1.22, 0.81	60.0, 0.0	6.97	ADO.Section_26ab, off continuously
EC 4F - Apt 4 Living/Kitchen	26.43	0.4007	2.2, 1.3, 0.9	0.0, 60.0, 0.0	2.39	ADO.Section_26ab, off continuously
EC 4F - Apt 4 Bed 1	7.73	0.4007	1.04, 1.55	0.0, 60.0	5.31	ADO.Section_26ab, off continuously
EC 4F - Apt 8 Bed 1	22.93	0.4007	1.03, 1.55	0.0, 60.0	6.49	ADO.Section_26ab, off continuously
EC 4F - Apt 8 Bed 2	26.9	0.4007	1.03, 1.55	0.0, 60.0	11.01	ADO.Section_26ab, off continuously
EC 4F - Apt 8 Living/Kitchen	22.87	0.4007	2.2, 1.3, 0.9	0.0, 60.0, 0.0	2.52	ADO.Section_26ab, off continuously
EC 4F - Apt 16 Bed 1	16.65	0.4007	1.04, 1.55	0.0, 60.0	6.96	ADO.Section_26ab, off continuously

Russell Road Extra Care

Page 18 of 20

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m ²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
EC 4F - Apt 16 Living/Kitchen	10.39	0.4007	2.2, 1.3, 0.9	0.0, 60.0, 0.0	2.45	ADO.Section_26ab, off continuously
EC 4F - Apt 19 Bed 2	26.9	0.4007	1.03, 1.55	0.0, 60.0	10.84	ADO.Section_26ab, off continuously
EC 4F - Apt 19 Living/Kitchen	22.23	0.4007	2.2, 1.3, 0.9	0.0, 60.0, 0.0	2.48	ADO.Section_26ab, off continuously
EC 4F - Apt 19 Bed 1	24.11	0.4007	1.03, 1.55	0.0, 60.0	6.75	ADO.Section_26ab, off continuously

Russell Road Extra Care

Page 19 of 20

Modelled ventilation

Room name	Infiltration rate ACH	Mech vent flow rate ACH
EC GF - Apt 3 Living/Kitchen	0.15	0.47
EC GF - Apt 3 Bed 2	0.15	0.71
EC GF - Apt 3 Bed 1	0.15	0.37
EC GF - Apt 4 Bed 1	0.15	0.36
EC GF - Apt 4 Living/Kitchen	0.15	0.35
SO GF - Apt 5 Bedroom	0.15	0.51
SO GF - Apt 5 Living / Kitchen	0.15	0.44
SO GF - Apt 11 Bedroom	0.15	0.53
SO GF - Apt 11 Living / Kitchen	0.15	0.43
EC 1F - Apt 3 Living/Kitchen	0.15	0.47
SO 1F - Apt 5 Bedroom	0.15	0.0
SO 1F - Apt 5 Living / Kitchen	0.15	0.44
SO 1F - Apt 11 Bedroom	0.15	0.0
SO 1F - Apt 11 Living / Kitchen	0.15	0.43
EC 1F - Apt 3 Bed 1	0.15	0.0
EC 1F - Apt 3 Bed 2	0.15	0.0
EC 1F - Apt 4 Living/Kitchen	0.15	0.43
EC 1F - Apt 4 Bed 1	0.15	0.0
EC 2F - Apt 4 Living/Kitchen	0.15	0.43
EC 2F - Apt 4 Bed 1	0.15	0.0
EC 2F - Apt 8 Bed 1	0.15	0.0
EC 2F - Apt 8 Bed 2	0.15	0.0
EC 2F - Apt 8 Living/Kitchen	0.15	0.46
EC 2F - Apt 10 Living/Kitchen	0.15	0.46
EC 2F - Apt 10 Bed 1	0.15	0.0
EC 2F - Apt 10 Bed 2	0.15	0.0
EC 2F - Apt 16 Bed 1	0.15	0.0
EC 2F - Apt 16 Living/Kitchen	0.15	0.45
EC 2F - Apt 19 Bed 2	0.15	0.0
EC 2F - Apt 19 Living/Kitchen	0.15	0.45
EC 2F - Apt 19 Bed 1	0.15	0.0
SO 2F - Apt 12 (Duplex) Living / Kitchen	0.15	0.41
SO 2F - Apt 11 (Duplex) Living/Kitchen	0.15	0.39
SO 2F - Apt 5 (Duplex) Living/Kitchen	0.15	0.39
EC 3F - Apt 4 Living/Kitchen	0.15	0.43
EC 3F - Apt 4 Bed 1	0.15	0.0
EC 3F - Apt 8 Bed 1	0.15	0.0
EC 3F - Apt 8 Bed 2	0.15	0.0
EC 3F - Apt 8 Living/Kitchen	0.15	0.46
EC 3F - Apt 10 Living/Kitchen	0.15	0.46

Russell Road Extra Care

Page 20 of 20

Room name	Infiltration rate ACH	Mech vent flow rate ACH
EC 3F - Apt 10 Bed 1	0.15	0.0
EC 3F - Apt 10 Bed 2	0.15	0.0
EC 3F - Apt 16 Bed 1	0.15	0.0
EC 3F - Apt 16 Living/Kitchen	0.15	0.45
EC 3F - Apt 19 Bed 2	0.15	0.0
EC 3F - Apt 19 Living/Kitchen	0.15	0.45
EC 3F - Apt 19 Bed 1	0.15	0.0
SO 3F - Apt 5 (Duplex) Bed 1	0.15	0.0
SO 3F - Apt 5 (Duplex) Bed 2	0.15	0.0
SO 3F - Apt 11 (Duplex) Bed 1	0.15	0.0
SO 3F - Apt 11 (Duplex) Bed 2	0.15	0.0
SO 3F - Apt 12 (Duplex) Bed 1	0.15	0.0
SO 3F - Apt 12 (Duplex) Bed 2	0.15	0.0
SO 3F - Apt 12 (Duplex) Bed 3	0.15	0.0
EC 4F - Apt 4 Living/Kitchen	0.15	0.39
EC 4F - Apt 4 Bed 1	0.15	0.0
EC 4F - Apt 8 Bed 1	0.15	0.0
EC 4F - Apt 8 Bed 2	0.15	0.0
EC 4F - Apt 8 Living/Kitchen	0.15	0.41
EC 4F - Apt 16 Bed 1	0.15	0.0
EC 4F - Apt 16 Living/Kitchen	0.15	0.4
EC 4F - Apt 19 Bed 2	0.15	0.0
EC 4F - Apt 19 Living/Kitchen	0.15	0.4
EC 4F - Apt 19 Bed 1	0.15	0.0