

One Park Place, Manchester TM59 Summertime Overheating & Ventilation Statement



QA

Document ref: OPL-FUT-L6150-RP-05

Document History

Issue	01	02	03	
Date	08/09/2023	29/09/2023	09/01/2024	
Purpose	For Comment	Planning	Planning	
Created by	Gemma Scott	Gemma Scott	Gemma Scott	

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Title	Director	Director	Director	
Date of Issue	08/09/2023	29/09/2023	09/01/2024	
Version	For Comment	Planning	Planning	

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Executive Summary

This report has been produced to assess the overheating risk for the new proposed residential-led mixed use scheme at One Park Place, Manchester M4 4FY.

CIBSE TM59 methodology has been utilised to assess the overheating risk with key residential floors of the building assessed against the TM59 criteria and approved building regulation document guide O 2021.

Compliance with TM59 minimum criteria has been analysed using the Manchester weather Centre data.

Futureserv understands that some facades of the development are exposed to high noise levels which may limit the use of natural ventilation for reducing the risk of overheating within the affected dwellings.

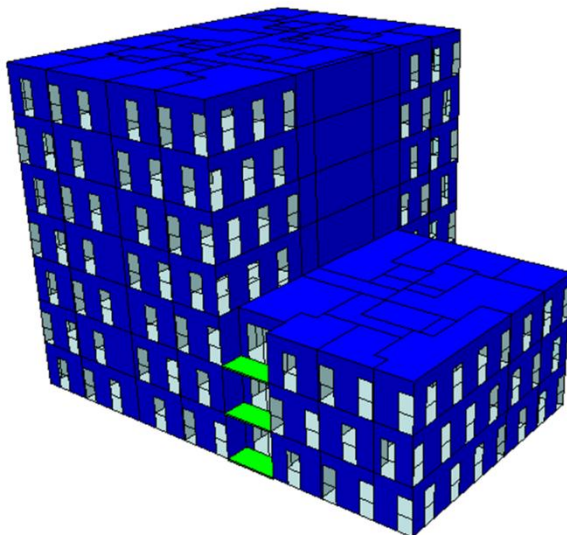
The One Park Place development passes the CIBSE TM59 overheating assessment.

To demonstrate consideration with acoustic measures the following has been proposed:

- Day to day general background ventilation inline with approved document Part F shall be provided by a Mechanical Ventilation Heat Recovery System (MVHR), therefore no requirement for trickle ventilation or opening windows to provide day to day background ventilation.
- Lower G values have been applied to the glass specification to reduce solar gain.
- All Apartments have been simulated with windows closed throughout the night (11pm to 8am) for the overheating assessment with the MVHR system incorporating increased ventilation overheating flowrates available via a boost switch within each apartment during the night time hours.
- Windows have been simulated as opening on all facades during the day time hours (8am to 11pm) set to begin to open when the internal temperature exceeds 22°C with a gradually opening profile and fully open when the internal temperature reaches 26°C. A less reactive window opening scenario was also tested with windows triggered when the internal temperature exceeds 23°C and all rooms were still compliant with TM59 reducing to the average opening hours during the summer months May-Sept of 10 hours a day.

1.0 Introduction

Levels 13-15 and levels 22-24 of the new proposed residential-led mixed use scheme at One Park Place, Manchester were simulated against TM59 Overheating criteria inline with Guide O of the building regulations 2021.



The criteria states that:

1. Living Rooms, Kitchens and Bedrooms – Hours of exceedance

The number of hours during which ΔT is greater than or equal to one degree ($^{\circ}\text{K}$) during the period May to September inclusive shall not be more than 3% of occupied hours. ΔT is defined as operative temperature less the maximum acceptable temperature. ΔT is rounded to the nearest whole degree (CIBSE TM52, criteria 1). In this the 3% of occupied hours, amounts to 59.7 Hours for Living/Kitchen/Dining areas and 110.2 hours for bedrooms. Therefore for criterion A to be complied with, the hours found must be less than this figure.

2. Bedrooms Only – Sleeping Conditions

During the sleeping hours the operative temperature in the bedroom from 10pm to 7am shall not exceed 26°C for more than 1% of annual hours. This has been determined as being 32 hours a year.

The TM59 criteria set out above provides a basis for assessing the risk of perceived overheating. The criteria above and results contained within this technical note are estimates of the temperatures that may be experienced in a typical year based on the CIBSE Cardiff DSY1 (Design Summer Year) weather file for the 2020's, high emissions, 50% percentile scenarios.

The building has 23 floors of residential accommodation in the form of 1 bed and 2 bed apartments. The bottom 2 floors consist of entrance/communal areas, staff and commercial zones. Only the Residential zones have been considered in this assessment.

At this stage the Key floors for the development were modelled, to represent the various room types, window types and orientations within the building.

The 12th floor was also modelled beneath level 13 to act as a buffer floor with similar adjacent thermal behaviour.

1.1 Software

The model was created using IES VE 2023 software. The 'Suncast' solar shading software has been used to model the sun path and solar shading effect for the proposed building. 'Macroflo' software has been used to simulate the natural ventilation openings using a selection of appropriate control profiles.

1.2 Drawings

The model is based on the drawings by Hodder and Partners. Consisting of site plan, elevations and GA Floor plans as issued for planning.

1.3 Ventilation

Natural Ventilation

In the residential areas, all the Living/Kitchen and Bedrooms have access to natural ventilation via openable windows or opening sliding glazed doors. An infiltration rate of 0.1 ach/hr has been applied to all areas, corresponding to a 3m3/m2@50pa air permeability in Summertime.

Auxiliary Ventilation

The bedrooms and living/kitchen/dining areas are assumed to have a trickle ventilation rate as supplied by an MVHR unit.

For the purpose of the overheating assessment, the following constant ventilation rates have been applied, with the supply air at external temperature, to simulate a background trickle level of ventilation.

- 1B Beds – 6 l/s
- 2B Beds – 8 l/s
- 1B Living/Kitchen/Dining – 13 l/s
- 2B Living/Kitchen/Dining – 9 l/s

These trickle rates at a minimum must be adhered to, to ensure that compliance is not affected.

For compliance with TM59 it was found due to apartments only being simulated with daytime window opening, that all apartments will require a level of summertime boost ventilation in order to comply with Criterion B of TM59.

The following Summertime Boost ventilation rates were found necessary for compliance:-

- 1B Beds – 11 l/s
- 2B Beds – 12 l/s
- 1B Living/Kitchen/Dining – 21 l/s
- 2B Living/Kitchen/Dining – 13 l/s

Boost rates to be able to be activated for prolonged periods of time, including throughout the night time. Boost rates in the model are simulated as on when internal room temp > 22deg C. In reality these rates could be triggered by a manual boost switch or a temperature sensor.

Example Summary of Total MVHR ventilation rates to meet with minimum rates as simulated:-

Type	Room	Area m2	Overheating Boost		Guide F Boost @ required Extract Rate		Trickle	
			Extract (l/s)	Supply (l/s)	Extract (l/s)	Supply (l/s)	Extract (l/s)	Supply (l/s)
2 BED 2 BATH 3P	<i>wholehouse (Min required) based on 0.3l/s/m2</i>	65.1					19.5	19.5
	Living/Kitch/Dining		13	13	13	13	8.5	9
	Bed 1			12		12		8
	Bed 2			12		12		8
	ensuite 1		8		8		5.5	
	bathroom		8		8		5.5	
	Utility Cupb		8		8		5.5	
	Wholehouse (actual)		37	37	37	37	25	25
1 BED	<i>wholehouse (Min required) based on 0.3l/s/m2</i>	50.3					15.1	15.1
	Living/Kitch/Dining		14	21	13	19	9	13
	Bed 1		0	11		10		6
	bathroom		9	0	8		5	
	Utility Cupb		9	0	8		5	
	Wholehouse (actual)		32	32	29	29	19	19
2 BED 2 BATH 4P	<i>wholehouse (Min required) based on 0.3l/s/m2</i>	71.5					21.5	21.5
	Living/Kitch/Dining		13	13	13	13	8.5	9
	Bed 1			12		12		8
	Bed 2			12		12		8

			Overheating Boost		Guide F Boost @ required Extract Rate		Trickle	
Type	Room	Area m2	Extract (l/s)	Supply (l/s)	Extract (l/s)	Supply (l/s)	Extract (l/s)	Supply (l/s)
	ensuite 1		8		8		5.5	
	bathroom		8		8		5.5	
	Utility Cupb		8		8		5.5	
	Wholehouse (actual)		37	37	37	37	25	25

TM59

1.5 Building Fabric Specification

- Exposed Floor $U = 0.10 \text{ W/m}^2\text{K}$ (Residential/occupied zones)
- External Wall $U = 0.15 \text{ W/m}^2\text{K}$
- Roof $U = 0.10 \text{ W/m}^2\text{K}$
- Windows (General) $U = 1.2 \text{ W/m}^2\text{K}$ Nett incl Frame
- G Value 0.63 (North) 0.4 (South, (East and West))

all other glazing G values simulated at 0.4

0.63 Glazing G Value

North

Cheetham Hill Road

Room labels and area measurements:

- 2B3P 61.0 Sq. m
- 2B4P 71.5 Sq. m
- 2B3P 61.0 Sq. m
- 1B2P 50.0 Sq. m
- 1B2P 50.0 Sq. m
- 2B3P 61.0 Sq. m
- 2B3P 61.1 Sq. m
- 1B2P 50.3 Sq. m

1.6 Window Openings

Window opening is manual. Inline with Guide O, Windows have been set to begin to open when the internal temperature exceeds 22°C. The Windows will be fully open when the internal temperature reaches 26°C.

All apartments

The window opening profile has been set to operate during the daytime hours of 8am to 11pm, representing a typical manual opening profile. Windows shut at night.

This window opening set up should be reviewed and revised as necessary following a full acoustic review.

The windows have been modelled as top opening windows opening outwards to a max. of 30 degrees.

The glazed doors have been modelled as openable for ventilation purposes, using the same opening profile as the windows.

For all openable windows, the estimated openable areas have been measured from elevations, taking into consideration the frame areas seen.

1.7 Window Free areas tabulated for various window types

WINDOW REF	Gross HEIGHT (M)	Gross WIDTH (M)	Area (m2)	Openable HEIGHT (M)	Openable WIDTH (M)	Openable Area (m2)	Openable %	Geometric Free area (M2)	Equivalent orifice area as calculated by IES Macroflo
Standard Window top hung opening outwards 30deg *	1.12	0.91	1.03	1.05	0.816	0.86	83	0.77*	0.51 m2*
Sliding Opening Door (Balcony)	2.2	1.13	2.49	1.98	1.017	2.01	81	2.01	2.01

*The windows have had a 24% reduction in free area applied due to the potential restriction caused by the left hand/right hand side protruding wall element adjacent the window, this can be seen to one side of each window and would cause some reduction to the resulting free area as illustrated below.

The resulting free areas have been estimated based on what is assumed to be the openable area of the windows/glazed doors. i.e. the throat area that remains nett of the surrounding frames.

2.0 Results

The results from the overheating simulation show that with the parameters applied as stated within this technical note, all of the assessed bedrooms and Kitchen/Living/Dining Areas comply with the TM59 overheating criteria.

- Summertime Boost mechanical ventilation for all apartments.
- Windows closed night time 11pm to 8am but openable in daytime.
- Windows triggered to open >22 deg C (internal) and fully open at 26 degC (internal).

Futureserv have created a banding category for risk of overheating, which helps to illustrate more clearly which rooms might be at a higher risk of overheating, despite potentially complying with the TM59 criteria.

The banding values can be seen below:

COLOUR KEY	LOW RISK	MED RISK	HIGH RISK	OVERHEATING
Living Areas Criterion A	<47 hrs	47-52 hrs	53-59.7 hrs	>59.7 hrs
Bedroom Areas Criterion A	<88 hrs	88-98 hrs	99-110.2 hrs	>110.2 hrs
Bedroom Areas Criterion B	<25 hrs	25-27 hrs	28-32 hrs	>32 hrs

Location	Criterion a				Criterion b		Overall
	May-Sept				Annual 10pm - 7am		
	Occupied Summer Hours	3% of Occupied Summer Hours	No. of hours Top - Tmax ≥ 1K	Pass/Fail criterion A	< 32 Hrs above 26°C (Top)	Pass/Fail criterion B	Pass/Fail Overall
12_2B3P_NW_LKD	1989	59.7	15	Pass	N/A	N/A	Pass
12_2B3P_SW1_LKD	1989	59.7	8	Pass	N/A	N/A	Pass
12_1B2P_S_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
12_2B3P_SW2_LKD	1989	59.7	8	Pass	N/A	N/A	Pass
12_2B3P_SE_LKD	1989	59.7	1	Pass	N/A	N/A	Pass
12_1B2P_E_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
12_2B3P_NE_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
12_2B4P_N_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
13_2B3P_NW_LKD	1989	59.7	22	Pass	N/A	N/A	Pass
13_2B3P_SW1_LKD	1989	59.7	18	Pass	N/A	N/A	Pass

	Criterion a				Criterion b		Overall
	May-Sept				Annual 10pm - 7am		
Location	Occupied Summer Hours	3% of Occupied Summer Hours	No. of hours Top - Tmax ≥ 1K	Pass/Fail criterion A	< 32 Hrs above 26°C (Top)	Pass/Fail criterion B	Pass/Fail Overall
13_1B2P_S_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
13_2B3P_SW2_LKD	1989	59.7	7	Pass	N/A	N/A	Pass
13_2B3P_SE_LKD	1989	59.7	4	Pass	N/A	N/A	Pass
13_1B2P_E_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
13_2B3P_NE_LKD	1989	59.7	1	Pass	N/A	N/A	Pass
13_2B4P_N_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
14_2B4P_N_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
14_2B3P_NE_LKD	1989	59.7	1	Pass	N/A	N/A	Pass
14_1B2P_E_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
14_2B3P_SE_LKD	1989	59.7	4	Pass	N/A	N/A	Pass
14_2B3P_SW2_LKD	1989	59.7	14	Pass	N/A	N/A	Pass
14_1B2P_S_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
14_2B3P_SW1_LKD	1989	59.7	8	Pass	N/A	N/A	Pass
14_2B3P_NW_LKD	1989	59.7	16	Pass	N/A	N/A	Pass
21_2B3P_SW2_LKD	1989	59.7	8	Pass	N/A	N/A	Pass
21_2B3P_SE_LKD	1989	59.7	4	Pass	N/A	N/A	Pass
21_1B2P_E_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
21_2B3P_NE_LKD	1989	59.7	2	Pass	N/A	N/A	Pass
21_1B2P_NW_LKD	1989	59.7	12	Pass	N/A	N/A	Pass
22_2B3P_NE_LKD	1989	59.7	1	Pass	N/A	N/A	Pass
22_1B2P_E_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
22_2B3P_SE_LKD	1989	59.7	4	Pass	N/A	N/A	Pass
22_2B3P_SW2_LKD	1989	59.7	14	Pass	N/A	N/A	Pass

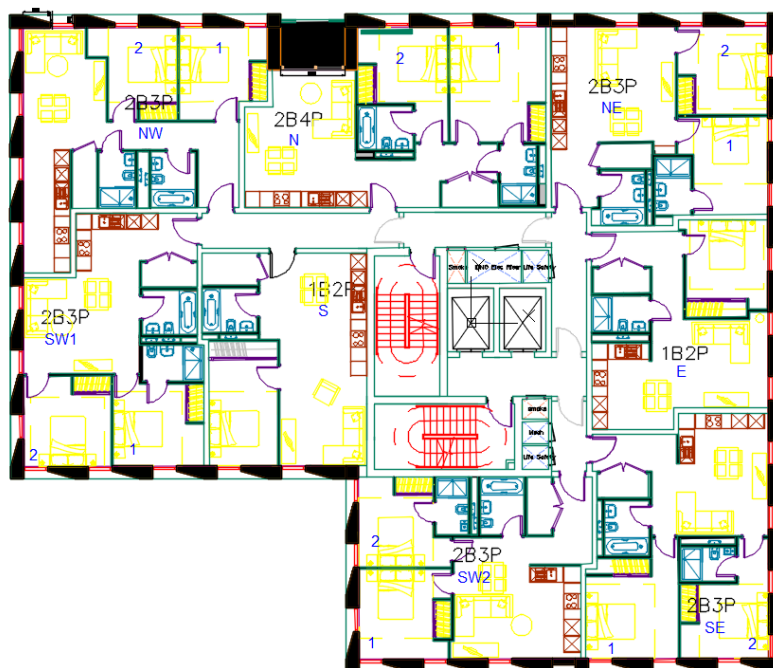
	Criterion a				Criterion b		Overall
	May-Sept				Annual 10pm - 7am		
Location	Occupied Summer Hours	3% of Occupied Summer Hours	No. of hours Top - Tmax ≥ 1K	Pass/Fail criterion A	< 32 Hrs above 26°C (Top)	Pass/Fail criterion B	Pass/Fail Overall
22_1B2P_NW_LKD	1989	59.7	6	Pass	N/A	N/A	Pass
23_2B3P_SW2_LKD	1989	59.7	7	Pass	N/A	N/A	Pass
23_2B3P_SE_LKD	1989	59.7	3	Pass	N/A	N/A	Pass
23_1B2P_E_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
23_2B3P_NE_LKD	1989	59.7	2	Pass	N/A	N/A	Pass
23_1B2P_NW_LKD	1989	59.7	12	Pass	N/A	N/A	Pass
24_2B3P_NE_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
24_1B2P_E_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
24_2B3P_SE_LKD	1989	59.7	1	Pass	N/A	N/A	Pass
24_2B3P_SW2_LKD	1989	59.7	8	Pass	N/A	N/A	Pass
24_1B2P_NW_LKD	1989	59.7	4	Pass	N/A	N/A	Pass
12_2B3P_NW_BED 2	3672	110.2	3	Pass	0	Pass	Pass
12_2B3P_NW_BED 1	3672	110.2	0	Pass	8	Pass	Pass
12_2B3P_SW1_BED 1	3672	110.2	19	Pass	8	Pass	Pass
12_2B3P_SW1_BED 2	3672	110.2	16	Pass	3	Pass	Pass
12_1B2P_S_BED	3672	110.2	2	Pass	13	Pass	Pass
12_2B3P_SW2_BED 1	3672	110.2	15	Pass	3	Pass	Pass
12_2B3P_SW2_BED 2	3672	110.2	9	Pass	13	Pass	Pass
12_2B3P_SE_BED 1	3672	110.2	4	Pass	15	Pass	Pass
12_2B3P_SE_BED 2	3672	110.2	6	Pass	0	Pass	Pass
12_1B2P_E_BED	3672	110.2	0	Pass	5	Pass	Pass
12_2B3P_NE_BED 2	3672	110.2	0	Pass	0	Pass	Pass
12_2B3P_NE_BED 1	3672	110.2	0	Pass	12	Pass	Pass

	Criterion a				Criterion b		Overall
	May-Sept				Annual 10pm - 7am		
Location	Occupied Summer Hours	3% of Occupied Summer Hours	No. of hours Top - Tmax ≥ 1K	Pass/Fail criterion A	< 32 Hrs above 26°C (Top)	Pass/Fail criterion B	Pass/Fail Overall
12_2B4P_N_BED 2	3672	110.2	0	Pass	0	Pass	Pass
12_2B4P_N_BED 1	3672	110.2	0	Pass	1	Pass	Pass
13_2B3P_NW_BED 2	3672	110.2	7	Pass	14	Pass	Pass
13_2B3P_NW_BED 1	3672	110.2	0	Pass	6	Pass	Pass
13_2B3P_SW1_BED 1	3672	110.2	8	Pass	26	Pass	Pass
13_2B3P_SW1_BED 2	3672	110.2	15	Pass	7	Pass	Pass
13_1B2P_S_BED	3672	110.2	0	Pass	22	Pass	Pass
13_2B3P_SW2_BED 1	3672	110.2	14	Pass	7	Pass	Pass
13_2B3P_SW2_BED 2	3672	110.2	28	Pass	10	Pass	Pass
13_2B3P_SE_BED 1	3672	110.2	10	Pass	13	Pass	Pass
13_2B3P_SE_BED 2	3672	110.2	2	Pass	5	Pass	Pass
13_1B2P_E_BED	3672	110.2	0	Pass	22	Pass	Pass
13_2B3P_NE_BED 2	3672	110.2	0	Pass	0	Pass	Pass
13_2B3P_NE_BED 1	3672	110.2	0	Pass	11	Pass	Pass
13_2B4P_N_BED 2	3672	110.2	0	Pass	17	Pass	Pass
13_2B4P_N_BED 1	3672	110.2	0	Pass	5	Pass	Pass
14_2B4P_N_BED 1	3672	110.2	0	Pass	15	Pass	Pass
14_2B4P_N_BED 2	3672	110.2	0	Pass	6	Pass	Pass
14_2B3P_NE_BED 1	3672	110.2	0	Pass	24	Pass	Pass
14_2B3P_NE_BED 2	3672	110.2	1	Pass	2	Pass	Pass
14_1B2P_E_BED	3672	110.2	0	Pass	12	Pass	Pass
14_2B3P_SE_BED 2	3672	110.2	8	Pass	3	Pass	Pass
14_2B3P_SE_BED 1	3672	110.2	8	Pass	26	Pass	Pass

	Criterion a				Criterion b		Overall
	May-Sept				Annual 10pm - 7am		
Location	Occupied Summer Hours	3% of Occupied Summer Hours	No. of hours Top - Tmax ≥ 1K	Pass/Fail criterion A	< 32 Hrs above 26°C (Top)	Pass/Fail criterion B	Pass/Fail Overall
14_2B3P_SW2_BED 2	3672	110.2	14	Pass	27	Pass	Pass
14_2B3P_SW2_BED 1	3672	110.2	17	Pass	8	Pass	Pass
14_1B2P_S_BED	3672	110.2	3	Pass	19	Pass	Pass
14_2B3P_SW1_BED 2	3672	110.2	16	Pass	4	Pass	Pass
14_2B3P_SW1_BED 1	3672	110.2	20	Pass	11	Pass	Pass
14_2B3P_NW_BED 1	3672	110.2	0	Pass	14	Pass	Pass
14_2B3P_NW_BED 2	3672	110.2	3	Pass	6	Pass	Pass
21_2B3P_SW2_BED 1	3672	110.2	15	Pass	8	Pass	Pass
21_2B3P_SW2_BED 2	3672	110.2	30	Pass	13	Pass	Pass
21_2B3P_SE_BED 1	3672	110.2	11	Pass	16	Pass	Pass
21_2B3P_SE_BED 2	3672	110.2	2	Pass	5	Pass	Pass
21_1B2P_E_BED	3672	110.2	0	Pass	24	Pass	Pass
21_2B3P_NE_BED 2	3672	110.2	0	Pass	2	Pass	Pass
21_2B3P_NE_BED 1	3672	110.2	0	Pass	12	Pass	Pass
21_1B2P_NW_BED	3672	110.2	0	Pass	6	Pass	Pass
22_2B3P_NE_BED 1	3672	110.2	0	Pass	24	Pass	Pass
22_2B3P_NE_BED 2	3672	110.2	1	Pass	1	Pass	Pass
22_1B2P_E_BED	3672	110.2	0	Pass	12	Pass	Pass
22_2B3P_SE_BED 2	3672	110.2	7	Pass	3	Pass	Pass
22_2B3P_SE_BED 1	3672	110.2	8	Pass	25	Pass	Pass
22_2B3P_SW2_BED 2	3672	110.2	12	Pass	27	Pass	Pass
22_2B3P_SW2_BED 1	3672	110.2	17	Pass	8	Pass	Pass
22_1B2P_NW_BED 1	3672	110.2	0	Pass	12	Pass	Pass

	Criterion a				Criterion b		Overall
	May-Sept				Annual 10pm - 7am		
Location	Occupied Summer Hours	3% of Occupied Summer Hours	No. of hours Top - Tmax ≥ 1K	Pass/Fail criterion A	< 32 Hrs above 26°C (Top)	Pass/Fail criterion B	Pass/Fail Overall
23_2B3P_SW2_BED 1	3672	110.2	14	Pass	7	Pass	Pass
23_2B3P_SW2_BED 2	3672	110.2	28	Pass	11	Pass	Pass
23_2B3P_SE_BED 1	3672	110.2	9	Pass	13	Pass	Pass
23_2B3P_SE_BED 2	3672	110.2	2	Pass	4	Pass	Pass
23_1B2P_E_BED	3672	110.2	0	Pass	22	Pass	Pass
23_2B3P_NE_BED 2	3672	110.2	0	Pass	0	Pass	Pass
23_2B3P_NE_BED 1	3672	110.2	0	Pass	11	Pass	Pass
23_1B2P_NW_BED	3672	110.2	0	Pass	3	Pass	Pass
24_2B3P_NE_BED 1	3672	110.2	0	Pass	15	Pass	Pass
24_2B3P_NE_BED 2	3672	110.2	1	Pass	0	Pass	Pass
24_1B2P_E_BED	3672	110.2	0	Pass	10	Pass	Pass
24_2B3P_SE_BED 2	3672	110.2	5	Pass	0	Pass	Pass
24_2B3P_SE_BED 1	3672	110.2	3	Pass	20	Pass	Pass
24_2B3P_SW2_BED 2	3672	110.2	9	Pass	19	Pass	Pass
24_2B3P_SW2_BED 1	3672	110.2	14	Pass	4	Pass	Pass
24_1B2P_NW_BED 1	3672	110.2	0	Pass	7	Pass	Pass
118				0		0	0

Room Number Key:-



3.0 Window Opening Periods

Window opening period based on the following:-

- Summertime Boost mechanical ventilation for all apartments.
- Windows closed night time 11pm to 8am but openable in daytime.
- Windows triggered to open >22 deg C (internal) and fully open at 26 degC (internal).

Windows may only be partially open during this time period.

Windows can be open a max. of 15 hours in a day (8am to 11pm)

Daily openable hours recorded for 3rd week in every month from May-Sept and averages taken.

Note: Window are triggered to start open when the internal room temp exceeds 22degC and be fully open at 26degC. Therefor the below window opening hrs are the result of this control function. They are not the minimum opening hours required to achieve TM59.

	May wk 3	Jun wk 3	Ju1 wk 3	Aug wk 3	Sept wk 3	May-September week 3
	Average	Average	Average	Average	Average	Average Daily
Location	hrs	hrs	hrs	hrs	hrs	hrs
12_2B3P_NW_BED 2	14	14	15	15	12	14
12_2B3P_NW_BED 1	13	11	15	15	10	13
12_2B3P_NW_LKD	13	13	15	15	11	13
12_2B3P_SW1_LKD	10	11	15	15	10	12

	May wk 3	Jun wk 3	Ju1 wk 3	Aug wk 3	Sept wk 3	May-September week 3
	Average	Average	Average	Average	Average	Average Daily
Location	hrs	hrs	hrs	hrs	hrs	hrs
12_2B3P_SW1_BED 1	12	11	15	15	11	13
12_2B3P_SW1_BED 2	12	11	15	15	10	13
12_1B2P_S_LKD	4	5	14	15	5	9
12_1B2P_S_BED	10	9	15	15	11	12
12_2B3P_SW2_BED 1	12	11	15	15	10	13
12_2B3P_SW2_BED 2	9	8	15	15	9	11
12_2B3P_SW2_LKD	12	12	15	15	12	13
12_2B3P_SE_BED 1	10	7	15	15	10	12
12_2B3P_SE_BED 2	13	11	15	15	10	13
12_2B3P_SE_LKD	13	12	15	15	12	13
12_1B2P_E_BED	14	13	15	15	13	14
12_1B2P_E_LKD	7	7	14	15	4	10
12_2B3P_NE_BED 2	14	13	15	15	11	14
12_2B3P_NE_BED 1	13	10	15	15	11	13
12_2B3P_NE_LKD	14	14	15	15	12	14
12_2B4P_N_BED 2	14	14	15	15	11	14
12_2B4P_N_BED 1	12	11	15	15	10	13
12_2B4P_N_LKD	13	13	15	15	12	14
13_2B3P_NW_BED 2	13	12	15	15	12	13
13_2B3P_NW_BED 1	15	14	15	15	12	14
13_2B3P_NW_LKD	13	13	15	15	11	13
13_2B3P_SW1_LKD	13	13	15	15	12	13
13_2B3P_SW1_BED 1	12	9	15	15	11	12
13_2B3P_SW1_BED 2	12	11	15	15	11	13
13_1B2P_S_LKD	6	6	15	15	7	10

	May wk 3	Jun wk 3	Ju1 wk 3	Aug wk 3	Sept wk 3	May-September week 3
	Average	Average	Average	Average	Average	Average Daily
Location	hrs	hrs	hrs	hrs	hrs	hrs
13_1B2P_S_BED	12	10	15	15	13	13
13_2B3P_SW2_BED 1	13	11	15	15	11	13
13_2B3P_SW2_BED 2	12	12	15	15	12	13
13_2B3P_SW2_LKD	13	12	15	15	13	13
13_2B3P_SE_BED 1	13	11	15	15	12	13
13_2B3P_SE_BED 2	14	11	15	15	11	13
13_2B3P_SE_LKD	14	13	15	15	13	14
13_1B2P_E_BED	14	12	15	15	14	14
13_1B2P_E_LKD	11	9	15	15	9	12
13_2B3P_NE_BED 2	14	14	15	15	12	14
13_2B3P_NE_BED 1	14	12	15	15	12	14
13_2B3P_NE_LKD	14	13	15	15	13	14
13_2B4P_N_BED 2	14	12	15	15	12	13
13_2B4P_N_BED 1	14	14	15	15	12	14
13_2B4P_N_LKD	14	13	15	15	13	14
14_2B4P_N_LKD	14	13	15	15	13	14
14_2B4P_N_BED 1	14	13	15	15	12	14
14_2B4P_N_BED 2	15	14	15	15	12	14
14_2B3P_NE_LKD	14	14	15	15	13	14
14_2B3P_NE_BED 1	14	11	15	15	12	13
14_2B3P_NE_BED 2	15	13	15	15	12	14
14_1B2P_E_LKD	10	8	14	15	7	11
14_1B2P_E_BED	15	14	15	15	14	15
14_2B3P_SE_LKD	14	13	15	15	13	14
14_2B3P_SE_BED 2	14	12	15	15	11	13

	May wk 3	Jun wk 3	Ju1 wk 3	Aug wk 3	Sept wk 3	May-September week 3
	Average	Average	Average	Average	Average	Average Daily
Location	hrs	hrs	hrs	hrs	hrs	hrs
14_2B3P_SE_BED 1	13	9	15	15	11	13
14_2B3P_SW2_LKD	13	13	15	15	13	14
14_2B3P_SW2_BED 2	12	11	15	15	11	13
14_2B3P_SW2_BED 1	13	12	15	15	12	13
14_1B2P_S_BED	11	9	15	15	12	12
14_1B2P_S_LKD	6	6	14	15	6	10
14_2B3P_SW1_BED 2	12	11	15	15	10	13
14_2B3P_SW1_BED 1	12	11	15	15	11	13
14_2B3P_SW1_LKD	12	10	15	15	10	12
14_2B3P_NW_LKD	13	12	15	15	11	13
14_2B3P_NW_BED 1	13	11	15	15	10	13
14_2B3P_NW_BED 2	14	14	15	15	12	14
21_2B3P_SW2_BED 1	13	12	15	15	11	13
21_2B3P_SW2_BED 2	13	13	15	15	12	14
21_2B3P_SW2_LKD	13	12	15	15	13	14
21_2B3P_SE_BED 1	13	11	15	15	12	13
21_2B3P_SE_BED 2	14	11	15	15	11	13
21_2B3P_SE_LKD	14	13	15	15	13	14
21_1B2P_E_BED	15	12	15	15	14	14
21_1B2P_E_LKD	12	9	15	15	9	12
21_2B3P_NE_BED 2	15	14	15	15	12	14
21_2B3P_NE_BED 1	15	13	15	15	13	14
21_2B3P_NE_LKD	14	13	15	15	13	14
21_1B2P_NW_BED	15	14	15	15	14	15
21_1B2P_NW_LKD	11	10	15	15	9	12

	May wk 3	Jun wk 3	Ju1 wk 3	Aug wk 3	Sept wk 3	May-September week 3
	Average	Average	Average	Average	Average	Average Daily
Location	hrs	hrs	hrs	hrs	hrs	hrs
22_2B3P_NE_LKD	14	14	15	15	13	14
22_2B3P_NE_BED 1	14	11	15	15	12	13
22_2B3P_NE_BED 2	14	13	15	15	12	14
22_1B2P_E_LKD	10	8	15	15	7	11
22_1B2P_E_BED	15	14	15	15	14	15
22_2B3P_SE_LKD	14	13	15	15	13	14
22_2B3P_SE_BED 2	14	12	15	15	10	13
22_2B3P_SE_BED 1	12	9	15	15	11	13
22_2B3P_SW2_LKD	13	13	15	15	13	14
22_2B3P_SW2_BED 2	12	11	15	15	11	13
22_2B3P_SW2_BED 1	13	12	15	15	11	13
22_1B2P_NW_BED 1	14	13	15	15	13	14
22_1B2P_NW_LKD	11	10	15	15	9	12
23_2B3P_SW2_BED 1	13	12	15	15	11	13
23_2B3P_SW2_BED 2	13	13	15	15	12	13
23_2B3P_SW2_LKD	13	12	15	15	13	13
23_2B3P_SE_BED 1	13	11	15	15	12	13
23_2B3P_SE_BED 2	14	11	15	15	11	13
23_2B3P_SE_LKD	14	13	15	15	13	14
23_1B2P_E_BED	14	12	15	15	14	14
23_1B2P_E_LKD	11	9	15	15	9	12
23_2B3P_NE_BED 2	15	14	15	15	12	14
23_2B3P_NE_BED 1	14	12	15	15	12	14
23_2B3P_NE_LKD	14	13	15	15	13	14
23_1B2P_NW_BED	15	14	15	15	13	14

	May wk 3	Jun wk 3	Jul wk 3	Aug wk 3	Sept wk 3	May-September week 3
	Average	Average	Average	Average	Average	Average Daily
Location	hrs	hrs	hrs	hrs	hrs	hrs
23_1B2P_NW_LKD	11	9	14	15	8	12
24_2B3P_NE_LKD	14	13	15	15	12	14
24_2B3P_NE_BED 1	13	10	15	15	11	13
24_2B3P_NE_BED 2	14	12	15	15	11	14
24_1B2P_E_LKD	8	7	14	15	4	10
24_1B2P_E_BED	15	13	15	15	13	14
24_2B3P_SE_LKD	14	12	15	15	12	14
24_2B3P_SE_BED 2	13	10	15	15	10	13
24_2B3P_SE_BED 1	11	7	15	15	10	12
24_2B3P_SW2_LKD	13	12	15	15	12	13
24_2B3P_SW2_BED 2	10	9	15	15	9	12
24_2B3P_SW2_BED 1	12	11	15	15	10	13
24_1B2P_NW_BED 1	14	12	15	15	10	13
24_1B2P_NW_LKD	11	9	14	15	7	11
Peak Value	15	14	15	15	14	15
Average Value	13	11	15	15	11	13

4.0 Window Opening Periods (less reactive window opening scenario)

Window opening periods based on a less reactive window opening strategy. i.e. The windows are opened when internal temp exceed 23 degC:-

All rooms are still compliant with TM59, except that some would be in a higher risk category due to being closer to the point of failure. Windows are open for less average hours.

- Summertime Boost mechanical ventilation for all apartments.
- Windows closed night time 11pm to 8am but openable in daytime.
- **Windows triggered to open >23 deg C** (internal) and fully open at 26 degC (internal).

Windows may only be partially open during this time period.

Windows can be open a max. of 15 hours in a day (8am to 11pm)

Daily openable hours recorded for 3rd week in every month from May-Sept and averages taken.

Note: Window are triggered to start open when the internal room temp exceeds 23degC and be fully open at 26degC. Therefor the below window opening hrs are the result of this control function. They are not the minimum opening hours required to achieve TM59.

	May wk 3	Jun wk 3	Ju1 wk 3	Aug wk 3	Sept wk 3	May-September week 3
	Average	Average	Average	Average	Average	Average Daily
Location	hrs	hrs	hrs	hrs	hrs	hrs
12_2B3P_NW_BED 2	10	8	15	15	6	11
12_2B3P_NW_BED 1	9	5	15	15	4	10
12_2B3P_NW_LKD	10	9	14	15	7	11
12_2B3P_SW1_LKD	7	7	14	15	6	10
12_2B3P_SW1_BED 1	7	5	14	15	6	9
12_2B3P_SW1_BED 2	8	6	14	15	6	10
12_1B2P_S_LKD	1	2	10	15	1	6
12_1B2P_S_BED	4	4	14	15	4	8
12_2B3P_SW2_BED 1	8	5	14	15	6	9
12_2B3P_SW2_BED 2	5	4	14	15	2	8
12_2B3P_SW2_LKD	8	8	14	15	9	11
12_2B3P_SE_BED 1	6	4	14	15	4	9
12_2B3P_SE_BED 2	10	6	14	15	6	10
12_2B3P_SE_LKD	10	8	14	15	9	11

	May wk 3	Jun wk 3	Ju1 wk 3	Aug wk 3	Sept wk 3	May-September week 3
	Average	Average	Average	Average	Average	Average Daily
Location	hrs	hrs	hrs	hrs	hrs	hrs
12_1B2P_E_BED	9	6	15	15	5	10
12_1B2P_E_LKD	3	2	11	15	2	6
12_2B3P_NE_BED 2	11	7	15	15	7	11
12_2B3P_NE_BED 1	9	5	15	15	4	9
12_2B3P_NE_LKD	11	9	14	15	9	12
12_2B4P_N_BED 2	10	7	15	15	5	10
12_2B4P_N_BED 1	8	5	15	15	3	9
12_2B4P_N_LKD	9	8	14	15	7	11
13_2B3P_NW_BED 2	10	6	15	15	6	11
13_2B3P_NW_BED 1	11	7	15	15	7	11
13_2B3P_NW_LKD	11	10	14	15	8	12
13_2B3P_SW1_LKD	9	8	14	15	8	11
13_2B3P_SW1_BED 1	7	4	14	15	6	9
13_2B3P_SW1_BED 2	9	6	14	15	6	10
13_1B2P_S_LKD	2	2	11	15	2	6
13_1B2P_S_BED	6	4	14	15	5	9
13_2B3P_SW2_BED 1	9	6	14	15	7	10
13_2B3P_SW2_BED 2	8	5	15	15	5	9
13_2B3P_SW2_LKD	9	8	14	15	9	11
13_2B3P_SE_BED 1	9	5	14	15	7	10
13_2B3P_SE_BED 2	10	6	14	15	7	10
13_2B3P_SE_LKD	12	9	14	15	10	12
13_1B2P_E_BED	10	6	15	15	6	10
13_1B2P_E_LKD	6	5	13	15	3	9
13_2B3P_NE_BED 2	11	8	15	15	7	11

	May wk 3	Jun wk 3	Ju1 wk 3	Aug wk 3	Sept wk 3	May-September week 3
	Average	Average	Average	Average	Average	Average Daily
Location	hrs	hrs	hrs	hrs	hrs	hrs
13_2B3P_NE_BED 1	11	7	15	15	7	11
13_2B3P_NE_LKD	11	10	14	15	9	12
13_2B4P_N_BED 2	9	5	15	15	5	10
13_2B4P_N_BED 1	10	7	15	15	7	11
13_2B4P_N_LKD	11	9	14	15	9	12
14_2B4P_N_LKD	11	10	15	15	9	12
14_2B4P_N_BED 1	10	6	15	15	6	10
14_2B4P_N_BED 2	11	8	15	15	6	11
14_2B3P_NE_LKD	13	11	15	15	10	13
14_2B3P_NE_BED 1	10	6	15	15	6	10
14_2B3P_NE_BED 2	11	7	15	15	7	11
14_1B2P_E_LKD	6	3	12	15	3	8
14_1B2P_E_BED	11	7	15	15	7	11
14_2B3P_SE_LKD	12	9	14	15	10	12
14_2B3P_SE_BED 2	11	7	14	15	7	11
14_2B3P_SE_BED 1	8	5	14	15	6	10
14_2B3P_SW2_LKD	11	9	14	15	10	12
14_2B3P_SW2_BED 2	7	5	14	15	5	9
14_2B3P_SW2_BED 1	9	6	14	15	6	10
14_1B2P_S_BED	5	4	14	15	4	8
14_1B2P_S_LKD	2	2	11	15	2	6
14_2B3P_SW1_BED 2	8	6	14	15	6	10
14_2B3P_SW1_BED 1	8	5	14	15	6	9
14_2B3P_SW1_LKD	7	7	14	15	6	10
14_2B3P_NW_LKD	10	9	14	15	7	11

	May wk 3	Jun wk 3	Ju1 wk 3	Aug wk 3	Sept wk 3	May-September week 3
	Average	Average	Average	Average	Average	Average Daily
Location	hrs	hrs	hrs	hrs	hrs	hrs
14_2B3P_NW_BED 1	9	5	15	15	5	10
14_2B3P_NW_BED 2	11	8	15	15	6	11
21_2B3P_SW2_BED 1	9	6	14	15	7	10
21_2B3P_SW2_BED 2	8	6	15	15	6	10
21_2B3P_SW2_LKD	10	8	14	15	9	11
21_2B3P_SE_BED 1	9	5	14	15	7	10
21_2B3P_SE_BED 2	10	6	14	15	7	10
21_2B3P_SE_LKD	12	9	14	15	10	12
21_1B2P_E_BED	11	6	15	15	6	10
21_1B2P_E_LKD	7	5	13	15	3	9
21_2B3P_NE_BED 2	12	9	15	15	7	11
21_2B3P_NE_BED 1	11	7	15	15	7	11
21_2B3P_NE_LKD	12	10	14	15	9	12
21_1B2P_NW_BED	11	9	15	15	7	11
21_1B2P_NW_LKD	7	6	13	15	4	9
22_2B3P_NE_LKD	12	11	15	15	10	13
22_2B3P_NE_BED 1	10	6	15	15	6	10
22_2B3P_NE_BED 2	11	8	15	15	7	11
22_1B2P_E_LKD	5	3	12	15	3	8
22_1B2P_E_BED	11	7	15	15	7	11
22_2B3P_SE_LKD	12	9	14	15	10	12
22_2B3P_SE_BED 2	11	7	14	15	7	11
22_2B3P_SE_BED 1	8	5	14	15	6	10
22_2B3P_SW2_LKD	10	9	14	15	10	12
22_2B3P_SW2_BED 2	7	5	15	15	4	9

	May wk 3	Jun wk 3	Ju1 wk 3	Aug wk 3	Sept wk 3	May-September week 3
	Average	Average	Average	Average	Average	Average Daily
Location	hrs	hrs	hrs	hrs	hrs	hrs
22_2B3P_SW2_BED 1	9	6	14	15	6	10
22_1B2P_NW_BED 1	10	6	15	15	6	11
22_1B2P_NW_LKD	8	6	13	15	4	9
23_2B3P_SW2_BED 1	9	6	14	15	7	10
23_2B3P_SW2_BED 2	8	6	15	15	5	10
23_2B3P_SW2_LKD	9	8	14	15	9	11
23_2B3P_SE_BED 1	9	5	14	15	7	10
23_2B3P_SE_BED 2	10	6	14	15	7	10
23_2B3P_SE_LKD	12	9	14	15	10	12
23_1B2P_E_BED	10	6	15	15	5	10
23_1B2P_E_LKD	6	5	13	15	3	9
23_2B3P_NE_BED 2	11	9	15	15	7	11
23_2B3P_NE_BED 1	11	7	14	15	7	11
23_2B3P_NE_LKD	11	9	14	15	9	12
23_1B2P_NW_BED	11	8	15	15	7	11
23_1B2P_NW_LKD	7	5	12	15	3	9
24_2B3P_NE_LKD	11	9	14	15	8	12
24_2B3P_NE_BED 1	9	6	14	15	3	9
24_2B3P_NE_BED 2	11	7	14	15	6	11
24_1B2P_E_LKD	3	2	11	15	2	7
24_1B2P_E_BED	10	6	14	15	5	10
24_2B3P_SE_LKD	10	8	14	15	8	11
24_2B3P_SE_BED 2	10	6	14	15	6	10
24_2B3P_SE_BED 1	7	4	14	15	4	9
24_2B3P_SW2_LKD	9	8	14	15	9	11

	May wk 3	Jun wk 3	Ju1 wk 3	Aug wk 3	Sept wk 3	May-September week 3
	Average	Average	Average	Average	Average	Average Daily
Location	hrs	hrs	hrs	hrs	hrs	hrs
24_2B3P_SW2_BED 2	6	4	14	15	2	8
24_2B3P_SW2_BED 1	8	5	14	15	5	9
24_1B2P_NW_BED 1	9	6	15	15	3	9
24_1B2P_NW_LKD	7	6	13	15	2	9
Peak Value	13	11	15	15	10	13
Average Value	9	6	14	15	6	10

4.1 Overheating Results TM59 (less reactive window opening scenario)

Window opening periods based on a less reactive window opening strategy. i.e. The windows are opened when internal temp exceed 23 degC:-

All rooms are still compliant with TM59, except that some would be in a higher risk category due to being closer to the point of failure. Windows are open for less average hours.

- Summertime Boost mechanical ventilation for all apartments.
- Windows closed night time 11pm to 8am but openable in daytime.
- **Windows triggered to open >23 deg C** (internal) and fully open at 26 degC (internal).

COLOUR KEY	LOW RISK	MED RISK	HIGH RISK	OVERHEATING
Living Areas Criterion A	<47 hrs	47-52 hrs	53-59.7 hrs	>59.7 hrs
Bedroom Areas Criterion A	<88 hrs	88-98 hrs	99-110.2 hrs	>110.2 hrs
Bedroom Areas Criterion B	<25 hrs	25-27 hrs	28-32 hrs	>32 hrs

	Criterion a				Criterion b		Overall
	May-Sept				Annual 10pm - 7am		
Location	Occupied Summer Hours	3% of Occupied Summer Hours	No. of hours Top - Tmax ≥ 1K	Pass/Fail criterion A	< 32 Hrs above 26°C (Top)	Pass/Fail criterion B	Pass/Fail Overall
12_2B3P_NW_LKD	1989	59.7	18	Pass	N/A	N/A	Pass
12_2B3P_SW1_LKD	1989	59.7	11	Pass	N/A	N/A	Pass
12_1B2P_S_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
12_2B3P_SW2_LKD	1989	59.7	11	Pass	N/A	N/A	Pass
12_2B3P_SE_LKD	1989	59.7	3	Pass	N/A	N/A	Pass
12_1B2P_E_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
12_2B3P_NE_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
12_2B4P_N_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
13_2B3P_NW_LKD	1989	59.7	25	Pass	N/A	N/A	Pass
13_2B3P_SW1_LKD	1989	59.7	20	Pass	N/A	N/A	Pass
13_1B2P_S_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
13_2B3P_SW2_LKD	1989	59.7	10	Pass	N/A	N/A	Pass

	Criterion a				Criterion b		Overall
	May-Sept				Annual 10pm - 7am		
Location	Occupied Summer Hours	3% of Occupied Summer Hours	No. of hours Top - Tmax ≥ 1K	Pass/Fail criterion A	< 32 Hrs above 26°C (Top)	Pass/Fail criterion B	Pass/Fail Overall
13_2B3P_SE_LKD	1989	59.7	5	Pass	N/A	N/A	Pass
13_1B2P_E_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
13_2B3P_NE_LKD	1989	59.7	2	Pass	N/A	N/A	Pass
13_2B4P_N_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
14_2B4P_N_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
14_2B3P_NE_LKD	1989	59.7	3	Pass	N/A	N/A	Pass
14_1B2P_E_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
14_2B3P_SE_LKD	1989	59.7	5	Pass	N/A	N/A	Pass
14_2B3P_SW2_LKD	1989	59.7	18	Pass	N/A	N/A	Pass
14_1B2P_S_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
14_2B3P_SW1_LKD	1989	59.7	12	Pass	N/A	N/A	Pass
14_2B3P_NW_LKD	1989	59.7	18	Pass	N/A	N/A	Pass
21_2B3P_SW2_LKD	1989	59.7	10	Pass	N/A	N/A	Pass
21_2B3P_SE_LKD	1989	59.7	5	Pass	N/A	N/A	Pass
21_1B2P_E_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
21_2B3P_NE_LKD	1989	59.7	3	Pass	N/A	N/A	Pass
21_1B2P_NW_LKD	1989	59.7	13	Pass	N/A	N/A	Pass
22_2B3P_NE_LKD	1989	59.7	3	Pass	N/A	N/A	Pass
22_1B2P_E_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
22_2B3P_SE_LKD	1989	59.7	5	Pass	N/A	N/A	Pass
22_2B3P_SW2_LKD	1989	59.7	17	Pass	N/A	N/A	Pass
22_1B2P_NW_LKD	1989	59.7	10	Pass	N/A	N/A	Pass
23_2B3P_SW2_LKD	1989	59.7	10	Pass	N/A	N/A	Pass

	Criterion a				Criterion b		Overall
	May-Sept				Annual 10pm - 7am		
Location	Occupied Summer Hours	3% of Occupied Summer Hours	No. of hours Top - Tmax ≥ 1K	Pass/Fail criterion A	< 32 Hrs above 26°C (Top)	Pass/Fail criterion B	Pass/Fail Overall
23_2B3P_SE_LKD	1989	59.7	5	Pass	N/A	N/A	Pass
23_1B2P_E_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
23_2B3P_NE_LKD	1989	59.7	2	Pass	N/A	N/A	Pass
23_1B2P_NW_LKD	1989	59.7	13	Pass	N/A	N/A	Pass
24_2B3P_NE_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
24_1B2P_E_LKD	1989	59.7	0	Pass	N/A	N/A	Pass
24_2B3P_SE_LKD	1989	59.7	3	Pass	N/A	N/A	Pass
24_2B3P_SW2_LKD	1989	59.7	11	Pass	N/A	N/A	Pass
24_1B2P_NW_LKD	1989	59.7	4	Pass	N/A	N/A	Pass
12_2B3P_NW_BED 2	3672	110.2	4	Pass	4	Pass	Pass
12_2B3P_NW_BED 1	3672	110.2	0	Pass	12	Pass	Pass
12_2B3P_SW1_BED 1	3672	110.2	23	Pass	10	Pass	Pass
12_2B3P_SW1_BED 2	3672	110.2	17	Pass	5	Pass	Pass
12_1B2P_S_BED	3672	110.2	4	Pass	17	Pass	Pass
12_2B3P_SW2_BED 1	3672	110.2	16	Pass	6	Pass	Pass
12_2B3P_SW2_BED 2	3672	110.2	12	Pass	19	Pass	Pass
12_2B3P_SE_BED 1	3672	110.2	7	Pass	19	Pass	Pass
12_2B3P_SE_BED 2	3672	110.2	7	Pass	1	Pass	Pass
12_1B2P_E_BED	3672	110.2	0	Pass	8	Pass	Pass
12_2B3P_NE_BED 2	3672	110.2	1	Pass	0	Pass	Pass
12_2B3P_NE_BED 1	3672	110.2	0	Pass	17	Pass	Pass
12_2B4P_N_BED 2	3672	110.2	0	Pass	2	Pass	Pass
12_2B4P_N_BED 1	3672	110.2	0	Pass	11	Pass	Pass

	Criterion a				Criterion b		Overall
	May-Sept				Annual 10pm - 7am		
Location	Occupied Summer Hours	3% of Occupied Summer Hours	No. of hours Top - Tmax ≥ 1K	Pass/Fail criterion A	< 32 Hrs above 26°C (Top)	Pass/Fail criterion B	Pass/Fail Overall
13_2B3P_NW_BED 2	3672	110.2	8	Pass	22	Pass	Pass
13_2B3P_NW_BED 1	3672	110.2	1	Pass	9	Pass	Pass
13_2B3P_SW1_BED 1	3672	110.2	12	Pass	28	Pass	Pass
13_2B3P_SW1_BED 2	3672	110.2	16	Pass	10	Pass	Pass
13_1B2P_S_BED	3672	110.2	1	Pass	29	Pass	Pass
13_2B3P_SW2_BED 1	3672	110.2	16	Pass	10	Pass	Pass
13_2B3P_SW2_BED 2	3672	110.2	30	Pass	16	Pass	Pass
13_2B3P_SE_BED 1	3672	110.2	12	Pass	18	Pass	Pass
13_2B3P_SE_BED 2	3672	110.2	2	Pass	8	Pass	Pass
13_1B2P_E_BED	3672	110.2	0	Pass	29	Pass	Pass
13_2B3P_NE_BED 2	3672	110.2	0	Pass	5	Pass	Pass
13_2B3P_NE_BED 1	3672	110.2	0	Pass	14	Pass	Pass
13_2B4P_N_BED 2	3672	110.2	0	Pass	21	Pass	Pass
13_2B4P_N_BED 1	3672	110.2	0	Pass	8	Pass	Pass
14_2B4P_N_BED 1	3672	110.2	0	Pass	21	Pass	Pass
14_2B4P_N_BED 2	3672	110.2	0	Pass	9	Pass	Pass
14_2B3P_NE_BED 1	3672	110.2	0	Pass	27	Pass	Pass
14_2B3P_NE_BED 2	3672	110.2	1	Pass	5	Pass	Pass
14_1B2P_E_BED	3672	110.2	0	Pass	19	Pass	Pass
14_2B3P_SE_BED 2	3672	110.2	10	Pass	6	Pass	Pass
14_2B3P_SE_BED 1	3672	110.2	12	Pass	29	Pass	Pass
14_2B3P_SW2_BED 2	3672	110.2	17	Pass	31	Pass	Pass
14_2B3P_SW2_BED 1	3672	110.2	18	Pass	13	Pass	Pass

	Criterion a				Criterion b		Overall
	May-Sept				Annual 10pm - 7am		
Location	Occupied Summer Hours	3% of Occupied Summer Hours	No. of hours Top - Tmax ≥ 1K	Pass/Fail criterion A	< 32 Hrs above 26°C (Top)	Pass/Fail criterion B	Pass/Fail Overall
14_1B2P_S_BED	3672	110.2	5	Pass	28	Pass	Pass
14_2B3P_SW1_BED 2	3672	110.2	17	Pass	8	Pass	Pass
14_2B3P_SW1_BED 1	3672	110.2	24	Pass	15	Pass	Pass
14_2B3P_NW_BED 1	3672	110.2	0	Pass	19	Pass	Pass
14_2B3P_NW_BED 2	3672	110.2	4	Pass	10	Pass	Pass
21_2B3P_SW2_BED 1	3672	110.2	16	Pass	12	Pass	Pass
21_2B3P_SW2_BED 2	3672	110.2	31	Pass	19	Pass	Pass
21_2B3P_SE_BED 1	3672	110.2	14	Pass	22	Pass	Pass
21_2B3P_SE_BED 2	3672	110.2	2	Pass	8	Pass	Pass
21_1B2P_E_BED	3672	110.2	0	Pass	30	Pass	Pass
21_2B3P_NE_BED 2	3672	110.2	0	Pass	6	Pass	Pass
21_2B3P_NE_BED 1	3672	110.2	0	Pass	16	Pass	Pass
21_1B2P_NW_BED	3672	110.2	0	Pass	9	Pass	Pass
22_2B3P_NE_BED 1	3672	110.2	0	Pass	27	Pass	Pass
22_2B3P_NE_BED 2	3672	110.2	1	Pass	5	Pass	Pass
22_1B2P_E_BED	3672	110.2	0	Pass	19	Pass	Pass
22_2B3P_SE_BED 2	3672	110.2	10	Pass	6	Pass	Pass
22_2B3P_SE_BED 1	3672	110.2	11	Pass	29	Pass	Pass
22_2B3P_SW2_BED 2	3672	110.2	17	Pass	31	Pass	Pass
22_2B3P_SW2_BED 1	3672	110.2	18	Pass	13	Pass	Pass
22_1B2P_NW_BED 1	3672	110.2	0	Pass	19	Pass	Pass
23_2B3P_SW2_BED 1	3672	110.2	16	Pass	10	Pass	Pass
23_2B3P_SW2_BED 2	3672	110.2	30	Pass	16	Pass	Pass

	Criterion a				Criterion b		Overall
	May-Sept				Annual 10pm - 7am		
Location	Occupied Summer Hours	3% of Occupied Summer Hours	No. of hours Top - Tmax ≥ 1K	Pass/Fail criterion A	< 32 Hrs above 26°C (Top)	Pass/Fail criterion B	Pass/Fail Overall
23_2B3P_SE_BED 1	3672	110.2	11	Pass	17	Pass	Pass
23_2B3P_SE_BED 2	3672	110.2	2	Pass	8	Pass	Pass
23_1B2P_E_BED	3672	110.2	0	Pass	29	Pass	Pass
23_2B3P_NE_BED 2	3672	110.2	0	Pass	5	Pass	Pass
23_2B3P_NE_BED 1	3672	110.2	0	Pass	15	Pass	Pass
23_1B2P_NW_BED	3672	110.2	0	Pass	7	Pass	Pass
24_2B3P_NE_BED 1	3672	110.2	0	Pass	24	Pass	Pass
24_2B3P_NE_BED 2	3672	110.2	1	Pass	3	Pass	Pass
24_1B2P_E_BED	3672	110.2	0	Pass	12	Pass	Pass
24_2B3P_SE_BED 2	3672	110.2	6	Pass	3	Pass	Pass
24_2B3P_SE_BED 1	3672	110.2	7	Pass	25	Pass	Pass
24_2B3P_SW2_BED 2	3672	110.2	11	Pass	27	Pass	Pass
24_2B3P_SW2_BED 1	3672	110.2	15	Pass	7	Pass	Pass
24_1B2P_NW_BED 1	3672	110.2	0	Pass	13	Pass	Pass
118				0		0	0

5.0 Apartments Ventilation Strategy

The apartment ventilation systems shall be Continuous mechanical supply and extract with heat recovery inline with Part F 2021.

This will allow the construction of a tightly sealed and correctly ventilated environment reducing thermal heat loss through reduced infiltration, whilst at the same time improving air quality and reducing the occurrence of moisture and mould.

To provide fresh air into the apartments each dwelling will be provided with a whole house mechanical ventilation heat recovery (MVHR) system. This system comprises of a continuous mechanical supply and extract ventilation unit located within a service cupboard within each apartment.

The unit will be provided with heat recovery efficiency in line with part L 2021 compliance of the Building Regulations.

Each unit will intake fresh air and discharge extract air through each apartment façade window soffits.

The MVHR unit will be fitted with G3 filters as standard. During occupation the tenants have the option to replace these filters inline with the MVHR installation and user guide replacement with G3 filters or enhanced filtration of M5 or F7. Heat Recovery units require regular maintenance. The unit shall be designed to facilitate access to enable maintenance to be carried out easily. The MVHR unit shall display a warning symbol, code, light or similar to confirm cleaning or replacement filters is overdue.

The ventilation unit will remove air from the bathrooms and kitchens and provide air to the habitable rooms; namely the bedrooms and the living room, this will be via a rigid flat ductwork system with supply and extract air grilles located in the ceilings.

The air volumes will be determined to satisfy the requirements of the Approved Document Part F 2021 c of the Building Regulations (refer to table below).

Table 1.2 Minimum extract ventilation rates for continuous extract systems ⁽¹⁾		
Room	High rate (l/s)	Continuous rate
Kitchen	13	The sum of all extract ventilation in the dwelling on its continuous rate should be at least the whole dwelling ventilation rate given in Table 1.3
Utility room	8	
Bathroom	8	
Sanitary accommodation	6	
NOTE:		
1. If the continuous rate of ventilation provided in a room is equal to or higher than the minimum high rate specified in the table, no extra ventilation is needed.		

Table 1.3 Minimum whole dwelling ventilation rates determined by the number of bedrooms

Number of bedrooms ⁽¹⁾⁽²⁾	Minimum ventilation rate by number of bedrooms (l/s)
1	19
2	25
3	31
4	37
5	43

NOTES:

1. If the dwelling only has one habitable room, a minimum ventilation rate of 13l/s should be used.
2. For each additional bedroom, add 6l/s to the values in Table 1.3.

The whole dwelling ventilation rate shall be determined in accordance with table 1.3 as the minimum low trickle ventilation rate to habitable rooms and bathrooms/kitchens with a boost high rate as per the continuous extract rate in table 1.2. Cooker hoods shall be of the re-circulation type.

Minimum Overheating Boost Rates

The apartment MVHR Ventilation system shall have the ability via a summer overheating boost switch to boost the mechanical ventilation system to the below minimum boost rates to comply with CIBSE TM59 Overheating Criteria

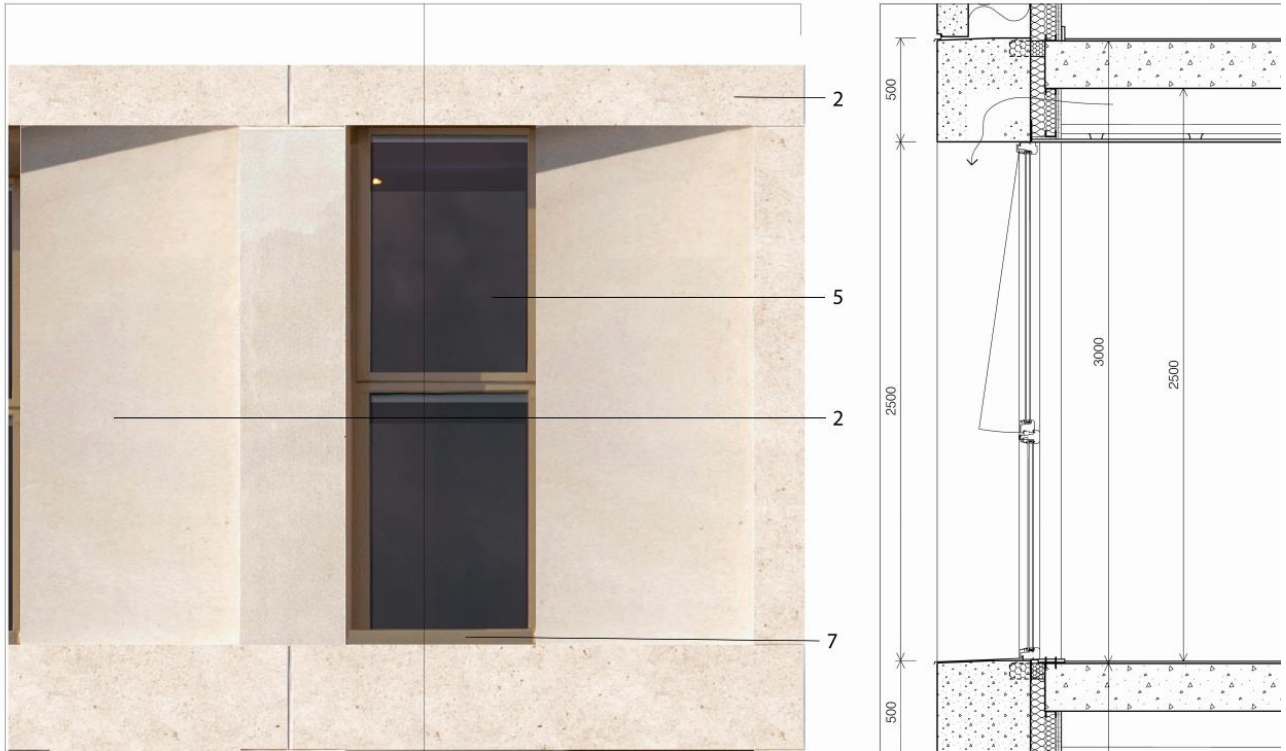
Room	Overheating Boost Rate (l/s)
1 Bed Apartment Bedroom	11
2 Bed Apartment Bedroom	12
1 Bed Apartment Living Room	21
2 Bed Apartment Living Room	13

Purge Ventilation

Purge Ventilation shall be achieved by opening windows inline with Table 1.4 below

Table 1.4 Purge ventilation openings

Opening type	Minimum total area of openings
Hinged or pivot windows with an opening angle of 15 to 30 degrees	1/10 of the floor area of the room
Hinged or pivot windows with an opening angle of greater than or equal to 30 degrees	1/20 of the floor area of the room
Opening sash windows	
External doors	



Typical Apartment Window Assembly Elevation

6.0 Commercial Units (Use Class E) & Amenity Area Ventilation Strategy

The commercial areas and Amenity will be designed to a shell and core for future fit out.

Ventilation systems will be designed in accordance with the Building Regulations approved document Part F and all relevant guidance documentation.

Provision has been made for ventilation panel bands at high level ground floor and first floor level on the façade for the future fit out to connect the general supply and extract ventilation systems which shall take the form of void mounted supply and extract heat recovery ventilation units, no specialised Kitchen Extract systems or provision shall be provided as these spaces.



Typical Commercial Unit/Amenity Ventilation Panel Elevation

7.0 Communal Areas Ventilation Strategy

Common landlord areas will be ventilated as follows:

- Electrical Plant Rooms – Natural ventilation via ventilation panels
- Entrance - Natural ventilation via opening doors
- Potable Tank Room - Natural ventilation via ventilation panels
- Firefighting Tank Room - Natural ventilation via ventilation panels
- Bin Stores – Natural ventilation via ventilation panels
- Cycle Rooms – Natural ventilation via ventilation panels
- Lift Shafts - Natural ventilation as directed by the lift specialist.
- Cleaners Stores Consisting of local void mounted extract fans with exhaust ductwork to atmosphere via the façade

8.0 Conclusion

The ventilation strategy improves on the fundamental principles of the Building Regulations, and will make a contribution to reducing the annual CO₂ emissions of the development by the use of a Continuous mechanical supply and extract with heat recovery in the apartments to provide background ventilation which omits the requirements for background ventilators. Compliance with CIBSE TM59 Overheating criteria and Part O of the building regulations has been achieved.