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Plot F- Great Jackson St. - Manchester

Summertime Internal Environment

CIBSE TM59 Overheating analysis

QA

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Contents

Executive Summary.....	3
1.0 Introduction	4
2.0 Assessment Methodology and Criteria.....	5
3.0 Model Settings	7
4.0 Results.....	11
5.0 Modelling Inputs	15
6.0 Future Development.....	15
Appendix A – CIBSE TM59 Rooms Gains and Profiles.....	16



Executive Summary

This report has been produced to assess the overheating risk for a full floor plate of each plot of residential towers of the Plot F development.

CIBSE TM59 methodology has been utilised to assess the overheating risk within a relevant selection of units. Compliance with TM59 minimum criteria has been analysed using the Manchester weather Centre data. Current scenario weather files were considered with the possibility of considering future weather files at further stages.

Future understands that some facades of the development are exposed to high noise levels and air quality constraints which may limit the use of natural ventilation for reducing the risk of overheating within the affected dwellings. To account for acoustic requirements, this TM59 study includes profiles on the openable purge ventilation panels to respond to the AVO document.

Plot F1 & F2 Towers pass CIBSE TM59 without further acoustic considerations.

Acoustic proposals

As per advice from Fisher Acoustics to demonstrate consideration with AVO we are restricting window opening times, which is not a TM59 requirement:

- Bedroom ventilation opening hours profile - Open 7am-11pm
- Living room ventilation opening profile - Open 7am-7pm

The Plot F, Great Jackson Street residential development, Manchester was assessed against the requirements of CIBSE TM59. The report outlines the basis of the proposals and the intended overheating mitigation strategy.

The simulation indicated that all the assessed Living Rooms/Kitchens/Bedrooms passed the TM59 simulation.

The Glazing G values were simulated at 0.4 for fixed elements and 0.22 for glazed vent panels, with blinds applied at 0.28 shading coefficient.

Important Notes

Openable glazed panels (vent panels) are simulated as side hung windows (which are able to open inwards to 90 deg from behind a perforated opaque panel).

An estimated 54% free area perforated panel has been simulated achieving 0.71sqm of free area.

The free area openings stated are as required for compliance with TM59 overheating only. An assessment of the required free area for purge ventilation in line with Guide F of the building regulations, has been completed to satisfy building control.

Vent panel opening was simulated only between 07:00 to 19:00 for living/kitchen/dining rooms, to respond to acoustic design advice relating to the AVO document.



The GF and 1F amenity and communal zones have not been assessed for overheating within this report and their G value will ultimately be dictated by the results of the Part L assessment for criterion 3, Limiting Solar Gain.

1.0 Introduction

A thermal model exercise has been undertaken to predict the internal temperatures over a typical year for the proposed residential development known as Plot F, Great Jackson Street, Manchester.

The development is a multi-storey block of residential accommodation, consisting of a number of 1, 2 and 3 bed apartments. There is amenity accommodation situated on the ground and first floors and a number of basement levels containing carparking and back of house areas.

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

11F

Assessing overheating risk in residential developments is a complex issue and not adequately assessed by building regulations. Indeed, it would be wrong to assume that a home that complies with building regulations also gives sufficient assurance of avoidance of overheating. Hence, the CIBSE TM59 recommendation that comfort conditions are separately assessed if it is felt that there could be a risk.

This assessment aims to identify whether the proposals meet the requirements of CIBSE TM59.

The basis of the assessment is generally for Bedrooms and Living/Kitchen areas following the TM59 approach.

2.0 Assessment Methodology and Criteria

TM59 Methodology

The TM59 methodology is a standardised approach to predicting overheating risk for residential building designs using dynamic thermal analysis. The aim is to produce a test that encourages good design that is comfortable within sensible limits, without being so stringent that it over promotes the use of mechanical cooling.

CIBSE TM59 also sets out profiles that represent reasonable usage patterns for a home suitable for evaluating overheating risk. The profiles are developed to test a design and do not cover all usage modes

The Methodology is intended for use by designers in order to influence building design for the better. It could be used at planning stage to assess risk, as well as at later design stages.

This methodology will:

- Allow different designs to be compared based on reasonable assumptions.
- Support design decisions that improve comfort without cooling
- Provide consistency across the industry for overheating risk prediction

This methodology will not:

- Guarantee that people will always be comfortable in compliant spaces, however they act
- Take into account unusual use

The Basis of the design comfort criteria for CIBSE TM59 is:

- CIBSE TM52: Limits of thermal comfort: avoiding overheating (2013) – Provides the principles of thermal comfort
- CIBSE Guide A: Environmental design (2015a) – Includes advice regarding sleep quality

The methodology is prescriptive so as to be consistently applied. It uses thermal modelling tools, defined internal gains profiles and specific weather files with a clearly defined thresholds to provide a clear pass/ fail result.

It is vital that the mitigation options selected as a result of the assessment are fully incorporated into the design or the assessment will have no value.

TM 59 Criteria – Homes

CIBSE TM59 sets out two different overheating criteria for different design strategies. The two strategies are:

- Buildings that are predominantly naturally ventilated

- Buildings that are predominantly mechanically ventilated

This analysis will consider the building with the windows open. As such, the assessment will consider the building as being predominantly naturally ventilated.

For homes that are predominantly naturally ventilated, two criteria apply. These are:

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

The number of hours during which ΔT is greater than or equal to one degree ($^{\circ}K$) 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).

This has been determined as being 110.2 hours a year or less for Bedrooms and 59.6=7 hours or less for Living/Kitchen areas.

2. Bedrooms Only – Sleeping Conditions

During the sleeping hours the operative temperature in the bedroom from 11pm to 7am shall not exceed $26^{\circ}C$ 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 report are estimates of the temperatures that may be experienced in a typical year based on the CIBSE DSY1 (Design Summer Year), weather file for the 2020's, high emissions, 50% percentile scenarios.

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 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

3.0 Model Settings

3.1 Software

The model was created using IES VE 2021 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.

3.2 Drawings

The model is based on the following plans by Simpson Haugh Architects: -

	F1-SHP-G200-PI-Grd-001	F1 General Arrangement Ground Floor
	F1-SHP-G200-PI-01-001	F1 General Arrangement Level 01
	F1-SHP-G200-PI-B1-001	F1 General Arrangement Level B1
	F1-SHP-G200-PI-B2-001	F1 General Arrangement Level B2
	F1-SHP-G200-PI-B3-001	F1 General Arrangement Level B3
	F2-SHP-G200-PI-B1-001	F2 General Arrangement Basement Level 01
	F2-SHP-G200-PI-B2-001	F2 General Arrangement Basement Level 02
	F2-SHP-G200-PI-Grd-001	F2 General Arrangement Ground Floor
	F2-SHP-G200-PI-01-001	F2 General Arrangement Level 01
	Z1-SHP-G100-PI-01-001	Site Plan Level 01
	Z1-SHP-G100-PI-02-001	Site Plan Level 02
	Z1-SHP-G100-PI-04-001	Site Plan Level 04 Typical Plan
	Z1-SHP-G100-PI-05-001	Site Plan Level 05 Typical Plan
	Z1-SHP-G100-PI-11-001	Site Plan Level 11 Maximum Plan
	Z1-SHP-G100-PI-49-001	Site Plan Level 49 Duplex Lower Plan
	Z1-SHP-G100-PI-50-001	Site Plan Level 50 Duplex Upper Plan

3.3 Weather file and weather file characteristics

The Manchester DSY1 2020High50 (Design Summer Year) weather file was used as directed by TM59 methodology, as it is the closest DSY weather file to the site.

3.4 Ventilation

3.4.1 Natural ventilation

In the residential areas, all the Living/Kitchen and Bedroom are assumed to have access to natural ventilation via openable vent panels.

Measurements for vent openings and free areas, have been taken from the plans and elevations and are based on the openable area of the panels, as opened to an angle of 90 degrees (side hung, inwards opening windows behind perforated panels).

Any reduction in the window free areas may affect compliance with the overheating criteria.

Purge ventilation is to be provided via openable windows. The Architect is responsible for ensuring that the window opening areas are sufficiently sized to achieve the building regulations Part F requirements for purge ventilation.

An infiltration rate of 0.1 ach/hr has been applied to all areas as based on a targeted air permeability of 2.5m³.m².hr@50Pa based on CIBSE guide A table 4.16.

3.4.2 Windows and Openings

Window opening is manual. 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 24°C. The opening profile has been set to operate during the daytime hours of 7am to 11pm (for bedrooms) and 7am to 7pm (for LKD rooms), representing a typical manual opening profile.

3.4.3 Perforated panels with openable windows behind

The openable windows are side hung, inwards opening windows, which are to be situated behind perforated opaque panels.

A 54% free area perforated panel has been simulated which would give 0.71m² of free area.

The free area openings stated are as required for compliance with TM59 overheating only. An assessment of the required free area for purge ventilation in line with Guide F of the building regulations, should be made in order to satisfy building control.

Altering the free areas of the perforations will have an effect on the overheating results and therefore will need to be taken into consideration.

3.4.4 Window Free areas tabulated for various window types

PURGE PANEL REF	Openable HEIGHT (M)	Openable WIDTH (M)	Openable Area (m2)	OPENING ANGLE	Free area (M2)	NOTES
All Openable				90	0.71	SIDE HUNG INWARD OPENING C/W 54% FREE AREA PERFORATION

3.5 Auxiliary ventilation

The apartment areas are ventilated with MVHRU's. These supply air to the Bedroom and living spaces and extract air from the bathrooms, WC's and kitchen areas.

The bedrooms and living/kitchen/dining areas 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.

Space Name	Flow (l/s)
1 bed bedrooms	3
2 bed bedrooms	3
3 bed bedrooms	3
3 bed Duplex bedrooms	5
1 bed Living/K/D Areas	4
2 bed Living/K/D Areas (corner)	9
2 bed Living/K/D Areas (Edge)	4
3 bed Living/K/D Areas	10
3 bed Duplex Living/K/D Areas (corner)	24
3 bed Duplex Living/K/D Areas (edge)	10

This is based on Guide F min. vent rate of 0.3 l/s/ per m². The rates have been rounded up to be based on the largest room size of each room type to maximise consistency.

Boosted ventilation rates have been applied to the overheating simulations to meet the standard Part F rates of 29l/sec for a 1 bed and 37l/sec for the 2 and 3 bed units.

Trickle and Boost Rates to all rooms on considered floor (level 11):			
	Apartment Max Boost (l/s)	MV Trickle (l/s)	Boost Rate (l/s)
1 Bed - LKD	29	11	3
1 Bed - Bed		6	9
3 Bed - LKD	37	11	2
3 Bed - Bed		6	2

3.6 Internal Gains

TM59

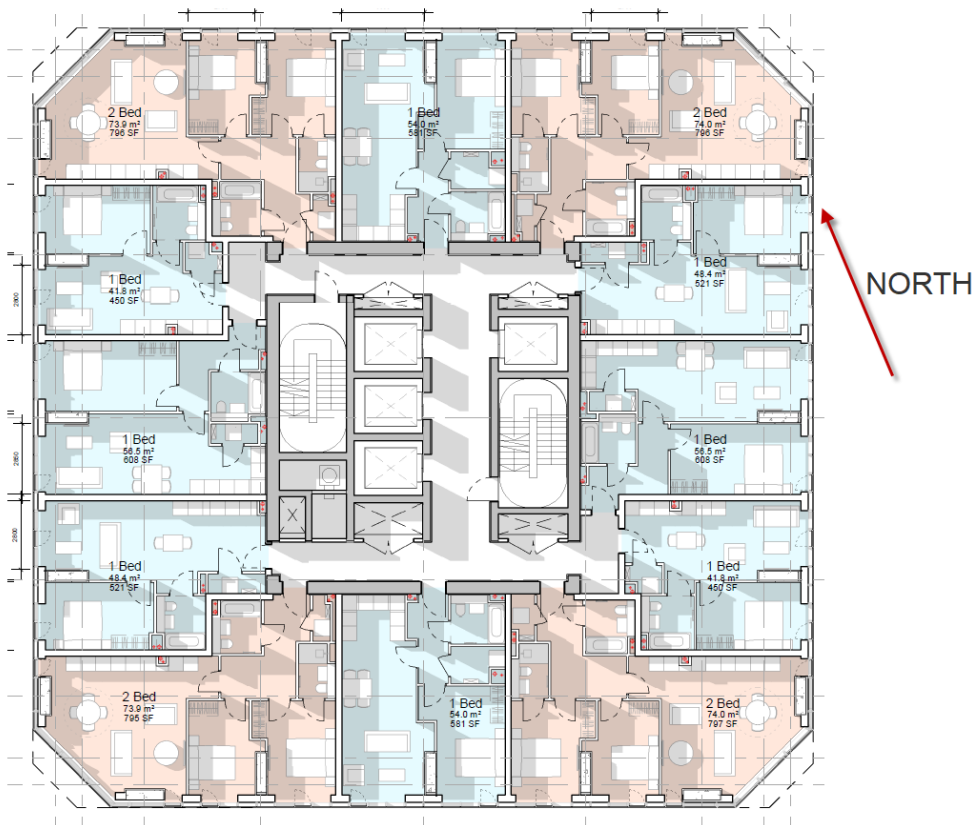
The internal gains and profiles that have been used for the internal temperature analysis model have been taken from CIBSE TM59 and are listed in appendix B.

3.7 Building Fabric Specification

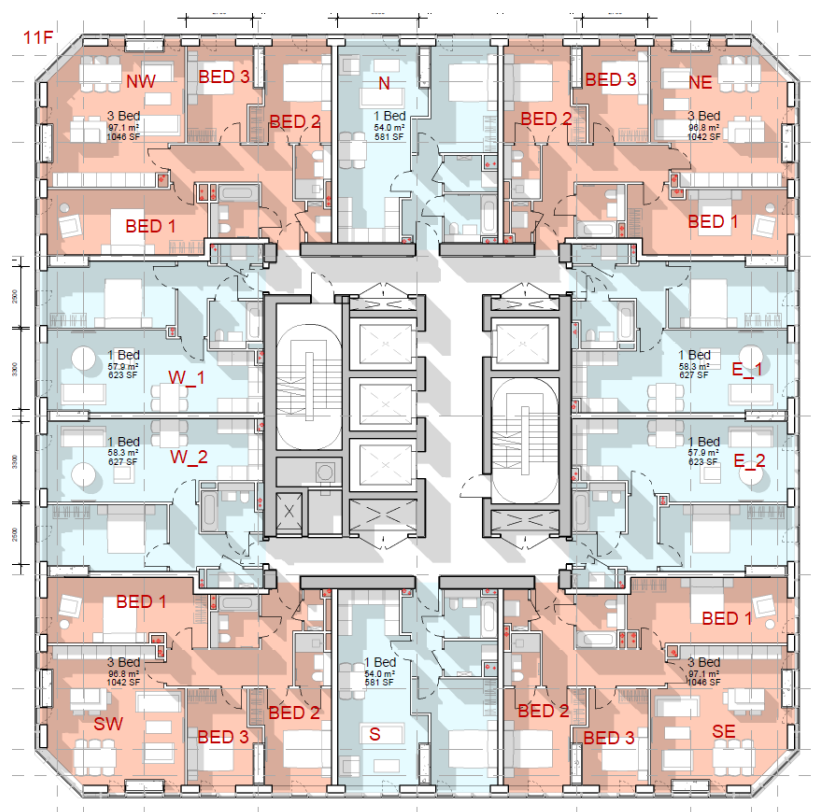
The building specification used in the Initial model is as follows:

- Curtain Walling Façade $U = 0.9$
- G Value 0.4 (All facades) & 0.22 (Glazed vent panels)
- Blinds 0.28 blind shading coefficient

3.8 Building Orientation



Room reference locations: -



4.0 Results

4.1 Summary of TM59 Overheating assessment Results

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 No. of hours $T_{operative} - T_{max} \geq 1K$	<88 hrs	88-98 hrs	99-110.2 hrs	>110.2 hrs
Bedroom Areas Criterion B No. of Hrs above 26°C ($T_{operative}$)	<25 hrs	25-27 hrs	28-32 hrs	>32 hrs

The results for the final overheating simulation can be seen in table 4.1 below.

The results from the Final overheating simulation showed that all of the assessed bedrooms and Kitchen/Living/Dining Areas comply with the TM59 overheating criteria.

None of the assessed living/Kitchen/bedroom areas failed criterion A, whereby the ΔT ($T_{max} - T_{operative}$) is $\geq 1K$ for more than 3% of Occupied Summer Hours.

None of the assessed bedrooms failed criterion B, whereby the $T_{operative}$ exceeds 26°C for more than 1% of the sleeping hours (11pm till 7am).

Room Name	Criteria 1	Criteria 2	Compliance
F1_11F_1B_E_1_L/K/D	0.0	N/A	Pass
F1_11F_1B_E_2_L/K/D	0.0	N/A	Pass
F1_11F_1B_N_L/K/D	0.0	N/A	Pass
F1_11F_1B_S_L/K/D	0.1	N/A	Pass
F1_11F_1B_W_1_L/K/D	0.4	N/A	Pass
F1_11F_1B_W_2_L/K/D	0.3	N/A	Pass
F1_11F_3B_NE_L/K/D	1.8	N/A	Pass
F1_11F_3B_NW_L/K/D	2.3	N/A	Pass
F1_11F_3B_SE_L/K/D	0.9	N/A	Pass
F1_11F_3B_SW_L/K/D	2.9	N/A	Pass
F1_11F_1B_E_1_BED	0.0	31	Pass
F1_11F_1B_E_2_BED	0.0	28	Pass
F1_11F_1B_N_BED	0.0	32	Pass
F1_11F_1B_S_BED	0.0	32	Pass
F1_11F_1B_W_1_BED	0.1	29	Pass
F1_11F_1B_W_2_BED	0.2	27	Pass
F1_11F_3B_NE_BED 1	0.0	19	Pass
F1_11F_3B_NE_BED 2	0.0	19	Pass
F1_11F_3B_NE_BED 3	0.0	27	Pass
F1_11F_3B_NW_BED 1	0.0	21	Pass
F1_11F_3B_NW_BED 2	0.0	25	Pass
F1_11F_3B_NW_BED 3	0.0	30	Pass
F1_11F_3B_SE_BED 1	0.0	16	Pass
F1_11F_3B_SE_BED 2	0.1	27	Pass
F1_11F_3B_SE_BED 3	0.0	26	Pass
F1_11F_3B_SW_BED 1	0.0	16	Pass
F1_11F_3B_SW_BED 2	0.1	28	Pass
F1_11F_3B_SW_BED 3	0.4	25	Pass

Table 4.1 TM59 Assessment Results Table [11th floor Apartments]

4.2 Summary of TM59 Overheating Profiles

The following table identifies the time profiles the vents need to be opened for each month for apartments on different elevations based on the above TM59 compliance.

North Apartment						
LKD				Bedrooms		
May	17:00 - 18:00	(1 hour)		May	17:00 - 18:00	(1 hour)
June	17:00 - 18:00	(1 hour)		June	17:00 - 18:00	(1 hour)
July	17:00 - 18:00	(1 hour)		July	17:00 - 18:00	(1 hour)
Aug	17:00 - 18:00	(1 hour)		Aug	13:00 - 18:00	(5 hour)
Sept	17:00 - 18:00	(1 hour)		Sept	17:00 - 18:00	(1 hour)
North East Apartment						
LKD				Bedrooms		
May	17:00 - 18:00	(1 hour)		May	17:00 - 18:00	(1 hour)
June	17:00 - 18:00	(1 hour)		June	17:00 - 18:00	(1 hour)
July	17:00 - 18:00	(1 hour)		July	17:00 - 21:00	(4 hour)
Aug	17:00 - 18:00	(1 hour)		Aug	07:00 - 22:00	(15 hours)
Sept	17:00 - 18:00	(1 hour)		Sept	17:00 - 18:00	(1 hour)
East Apartment						
LKD				Bedrooms		
May	17:00 - 18:00	(1 hour)		May	17:00 - 18:00	(1 hour)
June	17:00 - 18:00	(1 hour)		June	17:00 - 18:00	(1 hour)
July	17:00 - 18:00	(1 hour)		July	17:00 - 18:00	(1 hour)
Aug	17:00 - 18:00	(1 hour)		Aug	07:00 - 20:00	(13 hours)
Sept	17:00 - 18:00	(1 hour)		Sept	17:00 - 18:00	(1 hour)
South East Apartment						
LKD				Bedrooms		
May	17:00 - 18:00	(1 hour)		May	17:00 - 18:00	(1 hour)
June	17:00 - 18:00	(1 hour)		June	17:00 - 18:00	(1 hour)
July	17:00 - 18:00	(1 hour)		July	17:00 - 21:00	(4 hours)
Aug	17:00 - 18:00	(1 hour)		Aug	07:00 - 22:00	(15 hours)
Sept	17:00 - 18:00	(1 hour)		Sept	17:00 - 18:00	(1 hour)
South Apartment						
LKD				Bedrooms		
May	17:00 - 18:00	(1 hour)		May	17:00 - 18:00	(1 hour)
June	17:00 - 18:00	(1 hour)		June	17:00 - 18:00	(1 hour)
July	17:00 - 18:00	(1 hour)		July	17:00 - 19:00	(2 hours)
Aug	17:00 - 18:00	(1 hour)		Aug	07:00 - 19:00	(12 hours)
Sept	17:00 - 18:00	(1 hour)		Sept	17:00 - 18:00	(1 hour)
South West Apartment						
LKD				Bedrooms		
May	18:00 - 19:00	(1 hour)		May	22:00 - 23:00	(1 hour)
June	18:00 - 19:00	(1 hour)		June	22:00 - 23:00	(1 hour)
July	15:00 - 19:00	(4 hours)		July	22:00 - 23:00	(1 hour)
Aug	13:00 - 19:00	(6 hours)		Aug	13:00 - 23:00	(11 hours)
Sept	18:00 - 19:00	(1 hour)		Sept	22:00 - 23:00	(1 hour)
West Apartment						
LKD				Bedrooms		
May	17:00 - 18:00	(1 hour)		May	17:00 - 18:00	(1 hour)
June	17:00 - 18:00	(1 hour)		June	17:00 - 18:00	(1 hour)
July	17:00 - 18:00	(1 hour)		July	17:00 - 18:00	(1 hour)
Aug	17:00 - 18:00	(1 hour)		Aug	07:00 - 21:00	(14 hours)
Sept	17:00 - 18:00	(1 hour)		Sept	17:00 - 18:00	(1 hour)
North West Apartment						
LKD				Bedrooms		
May	17:00 - 18:00	(1 hour)		May	17:00 - 18:00	(1 hour)
June	17:00 - 18:00	(1 hour)		June	17:00 - 18:00	(1 hour)
July	17:00 - 18:00	(1 hour)		July	17:00 - 19:00	(2 hours)
Aug	17:00 - 18:00	(1 hour)		Aug	07:00 - 22:00	(15 hours)
Sept	17:00 - 18:00	(1 hour)		Sept	17:00 - 18:00	(1 hour)

Table 4.2 - TM59 Opening Vent Profiles Table [Plot F1 - 11th floor Apartments]

4.3 Summary of TM59 Overheating – Vent Panel Opening Occurrences

The following table takes the worst performing apartment for both Plots F1 & F2 on the Southwest corner of the buildings and identifies the hours by which the vents need to be opened in time bands of 3 hourly intervals and advises how many days per month this occurs between May through to September.

South West corner Apartment (F1 11F 3B SW)	Open Plan Living Room/ Kitchen		Bedrooms	
	Hours of window opening to comply with TM59	Occurrence in the month (Days)	Hours of window opening to comply with TM59	Occurrence in the month (Days)
May (31)	0 – 3 hours	31	0 – 3 hours	31
	3 – 6 hours	0	3 – 6 hours	0
	6 – 9 hours	0	6 – 9 hours	0
	9 – 11 hours	0	9 – 12 hours	0
	11 – 13 hours	0	12 – 16 hours	0
June (30)	0 – 3 hours	30	0 – 3 hours	30
	3 – 6 hours	0	3 – 6 hours	0
	6 – 9 hours	0	6 – 9 hours	0
	9 – 11 hours	0	9 – 12 hours	0
	11 – 13 hours	0	12 – 16 hours	0
July (31)	0 – 3 hours	2	0 – 3 hours	31
	3 – 6 hours	29	3 – 6 hours	0
	6 – 9 hours	0	6 – 9 hours	0
	9 – 11 hours	0	9 – 12 hours	0
	11 – 13 hours	0	12 – 16 hours	0
August (31)	0 – 3 hours	0	0 – 3 hours	0
	3 – 6 hours	31	3 – 6 hours	0
	6 – 9 hours	0	6 – 9 hours	0
	9 – 11 hours	0	9 – 12 hours	31
	11 – 13 hours	0	12 – 16 hours	0
September (30)	0 – 3 hours	30	0 – 3 hours	30
	3 – 6 hours	0	3 – 6 hours	0
	6 – 9 hours	0	6 – 9 hours	0
	9 – 11 hours	0	9 – 12 hours	0
	11 – 13 hours	0	12 – 16 hours	0

Table 4.3 TM59 Vent Panel Opening Occurrences [Plots F1 & F2 11th floor Southwest corner Apartment]

5.0 Modelling Inputs

Occupancy and equipment gains are specified by the TM59 guidance. For clarity, the following assumptions have been used and the proposals for purge vent openings are also detailed below:

Assumptions	Target performance
Curtain Walling (W/m ² . K) (including frame and thermal bridging)	0.9
Glazing G-value (all glazing areas excluding purge vents)	0.4
Façade layout	As per floor plan
Weather data	Manchester_DSY1_2020High50.epw
MVHR boost rates – 1bed	29l/sec
MVHR boost rates – 2 & 3 beds	37l/sec
Glazed Vent panel design	Glazed vent panels. G value of 0.22.
Vent panel conditions	54% openable area with 0.71sqm free area.
Bedroom ventilation opening hours profile	Open 7am-11pm and when the temperature exceeds 22°C
Living room ventilation opening profile	Open 7am-7pm and when the temperature exceeds 22°C
Blind shading coefficient	0.28
Blind operational profile	When incident solar irradiance exceeds 300W/m ²

6.0 Future Development

The Plot F1 & F2 buildings are part of the wider Great Jackson Street Framework Area. As part of the framework there is a development plot to the south of this site identified as Plot G. This plot will include a building or buildings of scale which will be developed at a point in the future. This will have a positive impact on the Plot F buildings from an overheating perspective as any future development will provide an element of solar shading due to its geographical position in relation to the sun path.

Solar shading provided by this adjacent construction would act as a solar control measure which could optimise the amount of solar heat gain that is admitted into part of the Plot F buildings. This could have a significant impact on the thermal and visual comfort of the residents, by assisting in protecting against direct solar heat gain and glare on hot or sunny days.

Appendix A – CIBSE TM59 Rooms Gains and Profiles

Extract from TM59: 2017 Section 6

Supplementary information on profile development

7

Table 2 Occupancy and equipment gain descriptions

Unit/ room type	Occupancy	Equipment load
Studio	2 people at 70% gains from 11 pm to 8 am 2 people at 100% gains from 8 am to 11 pm	Peak load of 450 W from 6 pm to 8 pm*. 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and 10 pm to 12 pm Base load of 85 W for the rest of the day
1-bedroom apartment: living room/kitchen	1 person from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
1-bedroom apartment: living room	1 person at 75% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 150 W from 6 pm to 10 pm 60 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 35 W for the rest of the day
1-bedroom apartment: kitchen	1 person at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 300 W from 6 pm to 8 pm Base load of 50 W for the rest of the day
2-bedroom apartment: living room/kitchen	2 people from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
2-bedroom apartment: living room	2 people at 75% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 150 W from 6 pm to 10 pm 60 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 35 W for the rest of the day
2-bedroom apartment: kitchen	2 people at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 300 W from 6 pm to 8 pm Base load of 50 W for the rest of the day
3-bedroom apartment: living room/kitchen	3 people from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
3-bedroom apartment: living room	3 people at 75% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 150 W from 6 pm to 10 pm 60 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 35 W for the rest of the day
3-bedroom apartment: kitchen	3 people at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 300 W from 6 pm to 8 pm base load of 50 W for the rest of the day
Double bedroom	2 people at 70% gains from 11 pm to 8 am 2 people at full gains from 8 am to 9 am and from 10 pm to 11 pm 1 person at full gains in the bedroom from 9 am to 10 pm	Peak load of 80 W from 8 am to 11 pm Base load of 10 W during the sleeping hours
Single bedroom (too small to accommodate double bed)	1 person at 70% gains from 11 pm to 8 am 1 person at full gains from 8 am to 11 pm	Peak load of 80 W from 8 am to 11 pm Base load of 10 W during sleeping hours
Communal corridors	Assumed to be zero	Pipework heat loss only; see section 3.1 above

* All times in GMT

Figure 1 Heat gain profile

Number of people	Description	Peak load (W)		Period																							
		Sensible	Latent	Hour-ending																							
				00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24
		1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00		
1	Single bedroom occupancy	75	55	0.7	0.7	0.7	0.7	0.7	0.7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7		
2	Double bedroom occupancy	150	110	0.7	0.7	0.7	0.7	0.7	0.7	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.7		
2	Studio occupancy	150	110	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
1	1-bed: living/kitchen occupancy	75	55	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	
1	1-bed: living occupancy	75	55	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0	0	
1	1-bed: kitchen occupancy	75	55	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0	0	
2	2-bed: living/kitchen occupancy	150	110	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	
2	2-bed: living occupancy	150	110	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0	0	
2	2-bed: kitchen occupancy	150	110	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0	0	
3	3-bed: living/kitchen occupancy	225	165	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	
3	3-bed: living occupancy	225	165	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0	0	
3	3-bed: kitchen occupancy	225	165	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0	0	
		80		0.13	0.13	0.13	0.13	0.13	0.13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.13		
		80		0.13	0.13	0.13	0.13	0.13	0.13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.13		
		450		0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	1	1	0.44	0.44	0.24	0.24	
		450		0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	1	1	0.44	0.44	0.24	0.24	
		150		0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	1	1	1	1	0.4	0.4		
		300		0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	1	1	0.17	0.17	0.17	0.17		
Lighting profile		2 (W/m2)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0		



Extract from TM59: 2017 Section 5.2

For the purposes of the assessment, lighting energy is assumed to be proportional to floor area, and lighting loads are measured in W/m². From 6 pm to 11 pm, 2 W/m² should be assumed as the default for an efficient new-build home. This assumes that good daylight levels are available (also noting that only May to September is assessed within CIBSE TM52).

For existing buildings, or specialist lighting designs, a calculated higher value should be used.

For communal corridors, use 2 W/m²; this may be assumed as zero if passive infrared (pir) sensors are present.

Communal Corridors

Extract from TM59: 2017 Section 3.9

Communal corridor heat gains should be modelled based on calculated losses from Community Heating pipework

Extract from TM59: 2017 Section 5.2

For communal corridors (Lighting Gains) use 2 W/m²; this may be assumed as zero if passive infrared (PIR) sensors are present.