



CIBSE TM59 – Overheating Assessment Ducie Street Residential Development

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Approvals

This document requires the following approvals.

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1.0 Executive Summary

The following report outlines the parameters which have been included within the thermal model for the Ducie Street scheme, located in Lomax Street, Manchester, to achieve compliance with CIBSE Technical Memoranda 59: Design methodology for the assessment of overheating risk in homes (TM59).

The report details the assessments which have been carried out on all of dwellings within the development, representing differing occupancies, floors and orientations, which are outlined herein.

A compliant strategy has been provided and as such, displays that thermal comfort is achievable within the assessed dwelling types, with the design variables used. If the design parameters (such as air temperature, u-values, ventilation rates, air tightness etc) are altered, the overheating assessment will need to be re-run.

2.0 Introduction

King Associates Ltd have undertaken overheating assessment calculations in-line with methodologies set out within the 'Chartered Institute of Building Services Engineer' (CIBSE) guidance document, Technical Memorandum 59 (TM59): Design Methodology for the Assessment of Overheating Risk in Homes.

Compliance with this guide is widely recognised as being the benchmark for assessing the risk of overheating within new build residential developments and is advised by Manchester City Council. However, there are no mandatory requirements, such as Building Regulations, that state an overheating assessment is required.

2.1 Weather Data

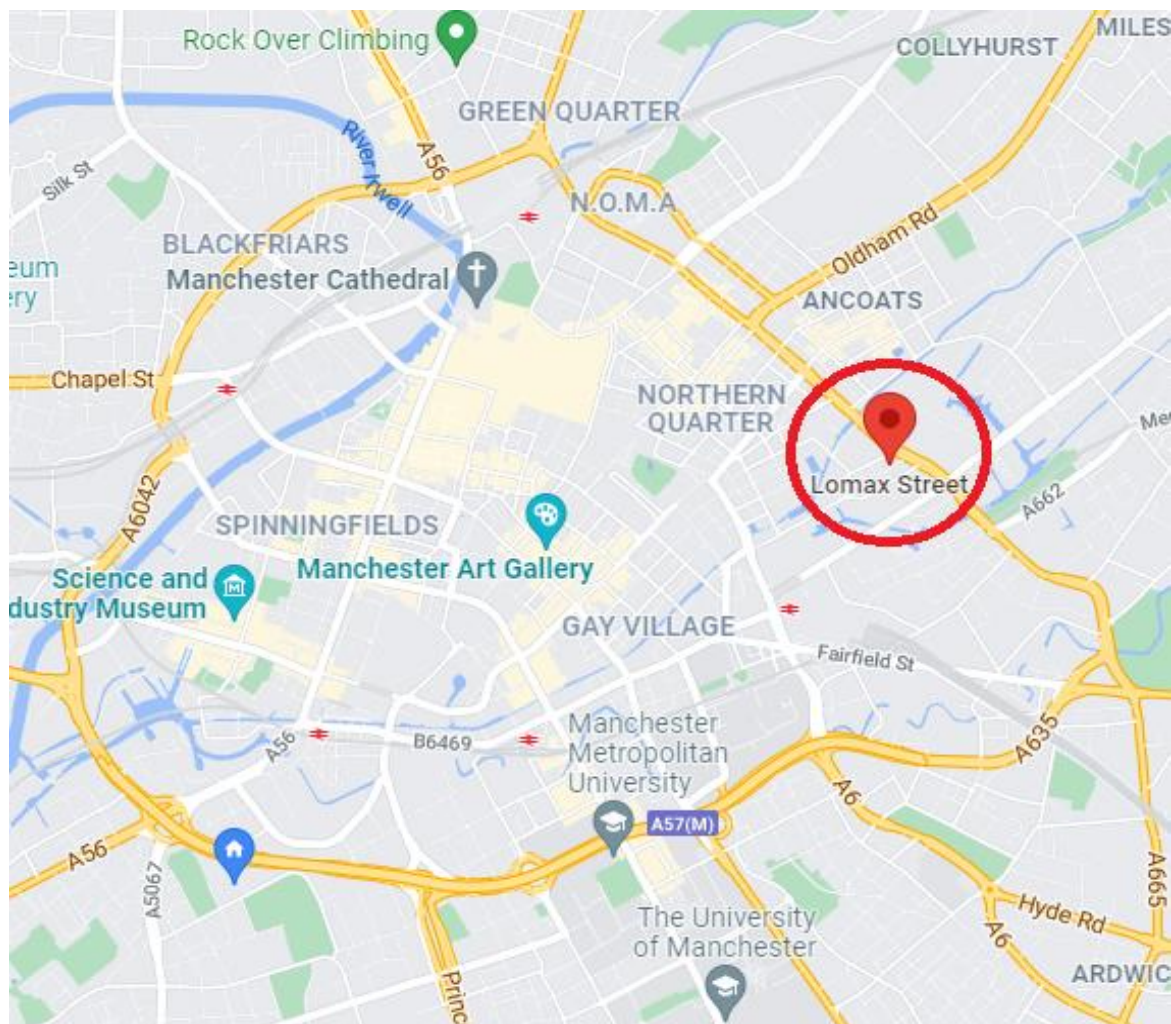


Figure 1. Location of site

The site is in Manchester City Centre therefore the Manchester DSY1 2020 high emissions scenario 50th percentile weather data has been used for the overheating calculations, as a mandatory requirement for TM59 methodology.

The Manchester DSY1 2020 high emissions scenario 50th percentile air temperature profile is shown in Appendix A.

Additional weather files have not been tested for this development as it is not considered to be of particular concern (e.g. the presence of vulnerable occupants) and mitigation for extreme events of heatwave plans are not outlined within the client's brief.

2.2 Thermal Model

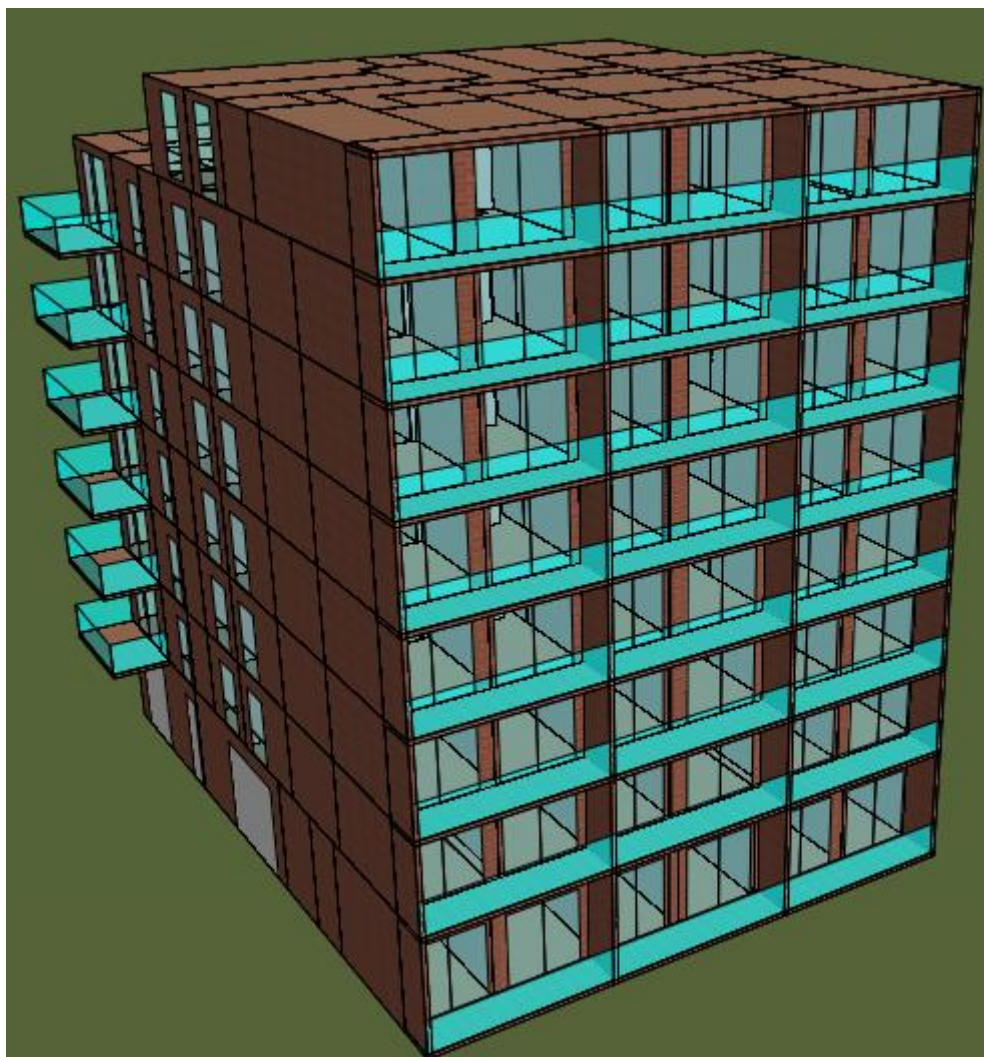


Figure 2. View of thermal model in IES-VE software



2.3 Modelling Disclaimer

The building has been modelled with accredited software package IESve version 2021.3.1.0 which is dynamic simulation software approved for the purpose of demonstrating compliance with the energy efficiency and carbon emission requirements of the building regulations.

These assessments were undertaken by an Energy Specialist; an individual who has acquired substantial expertise or a recognised qualification for undertaking assessments, designs and installations of Low and Zero Carbon solutions in the buildings sector, and is not professionally connected to a single Low and Zero Carbon technology or manufacturer.

It should be noted that the data generated by this work is obtained using computer simulations. These simulations are the best means of predicting the performance of the building at this stage. Full certainty can only be achieved by measuring the performance of the building and associated systems after a period of use.

Whilst the simulations have been undertaken in good faith using reasonable skill and care, King Associates Limited can take no responsibility for differences between the computer simulations and the actual performance of the completed building due to the inherent complexity and variability of the physics in a building and its environment.



3.0 Assessment Methodology

3.1 CIBSE TM59

CIBSE TM59 is a standardised approach to predicting overheating risk for residential building designs, using dynamic thermal analysis. The testing of the methodology is based on apartments but can also be transferred to other living establishments and houses.

The methodology provides a set of profiles which represent reasonable usage patterns for a home, suitable for evaluating overheating risk, based on previous CIBSE guidance. Profiles are developed to test the building design and not to directly mimic usage modes. To prevent deviation from the defined methodology it is not acceptable to alter the TM59 set profiles. Full usage profiles are located in Appendix B of this document.

Compliance with this assessment methodology does not ensure that people will always be comfortable in their homes, due to variations on the intended use, however it does aim to limit the length of time during which discomfort may be felt.

All assumptions and mitigations made within this report must form part of the construction contract, or the model will need to be re-run to prove compliance incorporating any changes. Any inclusion of blinds, windows g values, zone flow rates, construction etc must not be ignored.

3.2 CIBSE TM59 – Criteria for homes predominantly mechanically ventilated

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 hours (CIBSE Guide A 2015).



4.0 Input Parameters

4.1 Fabric Parameters

	Thermal value
Wall	0.20 W/m ² K (high density plasterboard (Rigidur H (12.5mm)
Windows	1.4 W/m ² K Transparent elements: South facing - g value 0.35 Other orientations – g value – 0.4
Internal Blind	Shading Coefficient* – 0.28
Ground Floor	0.10 W/m ² K
Roof	0.11 W/m ² K
Air permeability	3 m ³ /hr/m ² @ 50 Pa

Table 2. Fabric Parameters

*The shading coefficient for window shades is expressed as a number between 0 and 1. The lower the window shading coefficient, the less solar heat it transmits and the greater shading ability it has. A window covering that reduces heat by 75% has a shading factor of 0.25.

4.2 Blinds

Blinds and shading devices can be used for the analysis only if specifically included in the design, provided in the base build and explained within an associated home user guidance manual. Blinds included within the calculation are integrated or fixed.



Figure 3. Examples of integrated/fitted blinds

Where blinds are used to enable a pass, TM59 methodology states that results without blinds must also be included within the report. These can be found in Appendix C.



4.3 Ventilation Strategy

The overall apartment ventilation strategy is proposed to be predominantly Mechanical Ventilation with Heat Recovery (MVHR).

All apartments include a MVHR. The size of the MVHR has been oversized to allow windows to always remain closed.

In one & two-bedroom apartments the MVHR units are sized to achieve a maximum flow rate of 115l/s.

Two-bedroom apartment ventilation design strategy:

- a) Bedrooms - 25% (supply)
- b) Living rooms - 50% (supply)
- c) Extract split between kitchen and bathroom

One bedroom apartment ventilation design strategy:

- a) Bedroom – 25%(supply)
- b) Living rooms – 75%(supply)
- c) Extract split between kitchen and bathroom

In both one and two-bedroom apartments, the ventilation operates as follows:

- a) 30% of the maximum flow rate 115l/s - up to 18oC (internal room air temp-Normal Mode)
- b) 50% of the maximum flow rate 115l/s - up to 21oC (internal room air temp-Boost Mode)
- c) 100% of the maximum flow rate 115l/s - greater than 21oC (internal room air temp-Purge Mode)

4.4 Window Openings / Acoustic Considerations

The overheating assessment has been undertaken with due consideration of the interdependence between acoustic and thermal comfort, with the following acoustic factors being applied and assessed as part of the overheating assessment:

- The opening of windows shall be avoided.

Refer to the acoustic report 25369/NIA1 from Hann Tucker Associates, section 7.3.



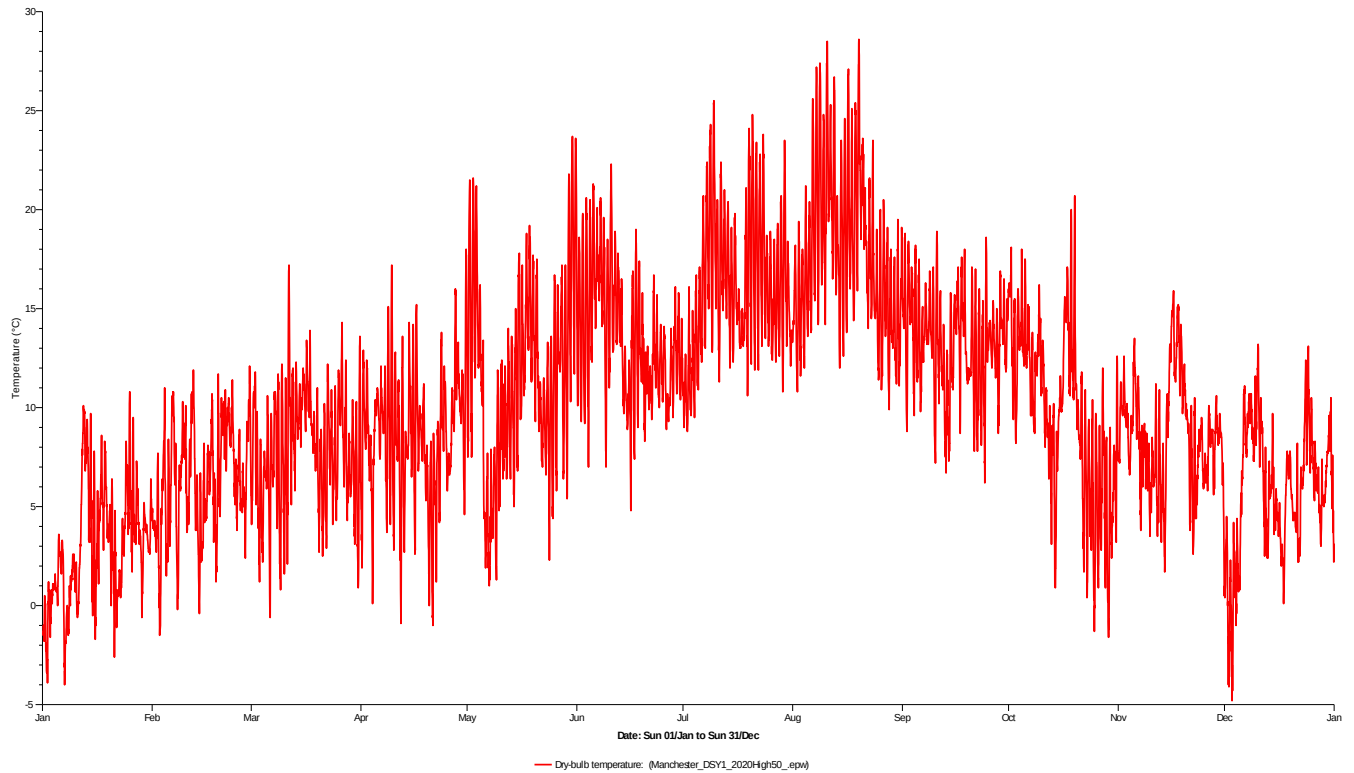
5.0 Results

Results can be seen in Appendix C, where all rooms are passing the TM59 assessment. Occupied spaces which have less than 3% of the occupied annual hours over 26°C are considered as to not be 'overheating', in line with the assessment criteria outlined in TM59 for residences which are predominantly mechanically ventilated.

On the basis that the method of heating within the residential building is of electric type (and no heating pipework within communal corridor ceiling voids), we are not required by TM59 to simulate or report on the communal corridors' operative temperatures. As such this has been excluded from the simulation.



6.0 Appendix A – Annual Weather Data



The CIBSE future Design Summer Year (DSY) 2020 - 50th percentile high emissions scenario air temperature profile is given here. The DSY weather data is a single continuous year rather than a composite one made up from average months and used for overheating analysis.



7.0 Appendix B – TM59 Prescribed Usage Profiles

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	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1	Single bedroom occupancy	75	55	0.7	0.7	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	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	0.5	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	
1	1-bed: living/kitchen occupancy	75	55	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	
1	1-bed: living occupancy	75	55	0	0	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	0.75	0	
1	1-bed: kitchen occupancy	75	55	0	0	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	0.25	0	
2	2-bed: living/kitchen occupancy	150	110	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	
2	2-bed: living occupancy	150	110	0	0	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	0.75	0	
2	2-bed: kitchen occupancy	150	110	0	0	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	0.25	0	
3	3-bed: living/kitchen occupancy	225	165	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	
3	3-bed: living occupancy	225	165	0	0	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	0.75	0	
3	3-bed: kitchen occupancy	225	165	0	0	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	0.25	0	
	Single bedroom equipment	80		0.13	0.13	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	
	Double bedroom equipment	80		0.13	0.13	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	
	Studio equipment	450		0.19	0.19	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
	Living/kitchen equipment	450		0.19	0.19	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
	Living equipment	150		0.23	0.23	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	0.4	1	1	1	1	0.4	0.4
	Kitchen equipment	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	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	0	0	0	1	1	1	1	1	0

The above heat gains are based on CIBSE Guide A and Addendum G to ANSI/ASHRAE Standard 55-2010: Thermal environmental conditions for human occupancy. A full break down of these gains with descriptions can be found in the TM59 methodology.



8.0 Appendix D – Apartment Results

4013 - Ducie Street	Operative temperature (TM 52/CIBSE) (°C) - % hours in range	Less than 3%?
Occupied Room	> 26.00	
L07-703 2B LIVING ROOM	2.4	PASS
L07-703-2B-BEDROOM	1.2	PASS
L07-703-2B-BEDROOM	0.6	PASS
L07-703-2B-KITCHEN	1	PASS
L07-APT 701 2B BEDROOM	1.1	PASS
L07-APT 701 2B BEDROOM	1	PASS
L07-APT-701-2B-KITCHEN	0.6	PASS
L07-APT701-2B-LIVINGROOM	3	PASS
L0-APT001-2B-KITCHEN	0.2	PASS
L0-APT001-2B-LIVING ROOM	1.7	PASS
L0-APT002-2B-KITCHEN	0.1	PASS
L0-APT002-2B-LIVING	1.1	PASS
L1-APT101-2B-KITCHEN	2.7	PASS
L1-APT101-2B-LIVINGROOM	2.2	PASS
L1-APT103-2B-BEDROOM	0.5	PASS
L1-APT103-2B-KITCHEN	0.8	PASS
L1-APT103-2B-LIVING ROOM	1.7	PASS
L1-APT104-2B-BEDROOM	1.4	PASS
L1-APT104-2B-BEDROOM	0.7	PASS
L1-APT104-2B-KITCHEN	0.3	PASS
L1-APT104-2B-LIVING ROOM	1.7	PASS
L1-APT106-2B-BEDROOM	1.3	PASS
L1-APT-106-2B-BEDROOM	1.2	PASS
L1-APT-106-2B-BEDROOM	1	PASS
L1-APT-106-2B-KITCHEN	0.4	PASS
L1-APT-106-2B-LIVINGROOM	1.6	PASS
L2-APT201-2B-BEDROOM	1.3	PASS
L2-APT201-2B-BEDROOM	1.2	PASS
L2-APT201-2B-KITCHEN	3	PASS
L2-APT201-2B-LIVINGROOM	2.3	PASS
L2-APT203-2B-BEDROOM	1.4	PASS



L2-APT203-2B-KITCHEN	0.8	PASS
L2-APT203-2B-LIVING ROOM	1.8	PASS
L2-APT204-2B-BEDROOM	1.7	PASS
L2-APT204-2B-BEDROOM	0.9	PASS
L2-APT204-2B-KITCHEN	0.3	PASS
L2-APT204-2B-LIVING ROOM	1.8	PASS
L2-APT206-2B-BEDROOM	1.2	PASS
L2-APT-206-2B-BEDROOM	1.3	PASS
L2-APT-206-2B-BEDROOM	1.2	PASS
L2-APT-206-2B-KITCHEN	0.4	PASS
L2-APT-206-2B-LIVINGROOM	1.6	PASS
L2-APT303-2B-BEDROOM	0.7	PASS
L3-APT301-2B-BEDROOM	1.3	PASS
L3-APT301-2B-BEDROOM	1.2	PASS
L3-APT301-2B-KITCHEN	3	PASS
L3-APT301-2B-LIVINGROOM	2.4	PASS
L3-APT303-2B-BEDROOM	1.4	PASS
L3-APT303-2B-BEDROOM	0.7	PASS
L3-APT303-2B-KITCHEN	0.8	PASS
L3-APT303-2B-LIVING ROOM	1.8	PASS
L3-APT304-2B-BEDROOM	1.8	PASS
L3-APT304-2B-BEDROOM	0.9	PASS
L3-APT304-2B-KITCHEN	0.3	PASS
L3-APT304-2B-LIVING ROOM	1.8	PASS
L3-APT306-2B-BEDROOM	1.2	PASS
L3-APT-306-2B-BEDROOM	1.3	PASS
L3-APT-306-2B-BEDROOM	1.2	PASS
L3-APT-306-2B-KITCHEN	0.4	PASS
L3-APT-306-2B-LIVINGROOM	1.5	PASS
L4-APT401-2B-BEDROOM	1.3	PASS
L4-APT401-2B-BEDROOM	1.2	PASS
L4-APT401-2B-KITCHEN	3	PASS
L4-APT401-2B-LIVINGROOM	2.4	PASS
L4-APT403-2B-BEDROOM	1.5	PASS
L4-APT403-2B-BEDROOM	0.7	PASS
L4-APT403-2B-KITCHEN	0.8	PASS



L4-APT403-2B-LIVING ROOM	1.8	PASS
L4-APT404-2B-BEDROOM	1.9	PASS
L4-APT404-2B-BEDROOM	0.9	PASS
L4-APT404-2B-KITCHEN	0.3	PASS
L4-APT404-2B-LIVING ROOM	1.8	PASS
L4-APT406-2B-BEDROOM	1.2	PASS
L4-APT-406-2B-BEDROOM	1.3	PASS
L4-APT-406-2B-BEDROOM	1.2	PASS
L4-APT-406-2B-KITCHEN	0.4	PASS
L4-APT-406-2B-LIVINGROOM	1.5	PASS
L5-APT501-2B-BEDROOM	1.3	PASS
L5-APT501-2B-BEDROOM	1.3	PASS
L5-APT501-2B-KITCHEN	3	PASS
L5-APT501-2B-LIVINGROOM	2.4	PASS
L5-APT503-2B-BEDROOM	1.5	PASS
L5-APT503-2B-BEDROOM	0.8	PASS
L5-APT503-2B-KITCHEN	0.8	PASS
L5-APT503-2B-LIVING ROOM	1.8	PASS
L5-APT504-2B-BEDROOM	1.9	PASS
L5-APT504-2B-BEDROOM	0.9	PASS
L5-APT504-2B-KITCHEN	0.3	PASS
L5-APT504-2B-LIVING ROOM	1.8	PASS
L5-APT506-2B-BEDROOM	1.2	PASS
L5-APT-506-2B-BEDROOM	1.3	PASS
L5-APT-506-2B-BEDROOM	1.2	PASS
L5-APT-506-2B-KITCHEN	0.4	PASS
L5-APT-506-2B-LIVINGROOM	1.6	PASS
L6-APT601-2B-BEDROOM	1.3	PASS
L6-APT601-2B-BEDROOM	1.3	PASS
L6-APT601-2B-KITCHEN	3	PASS
L6-APT601-2B-LIVINGROOM	2.1	PASS
L6-APT603-2B-BEDROOM	1.3	PASS
L6-APT603-2B-BEDROOM	0.7	PASS
L6-APT603-2B-KITCHEN	0.6	PASS
L6-APT603-2B-LIVING ROOM	1.5	PASS
L6-APT604-2B-BEDROOM	1.9	PASS



L6-APT604-2B-BEDROOM	0.9	PASS
L6-APT604-2B-KITCHEN	0.4	PASS
L6-APT604-2B-LIVING ROOM	1.8	PASS
L6-APT606-2B-BEDROOM	1.1	PASS
L6-APT-606-2B-BEDROOM	1.3	PASS
L6-APT-606-2B-BEDROOM	1.1	PASS
L6-APT-606-2B-KITCHEN	0.4	PASS
L6-APT-606-2B-LIVINGROOM	1.6	PASS