



Thermal Comfort Assessment

**23a Crimsworth Avenue
Manchester
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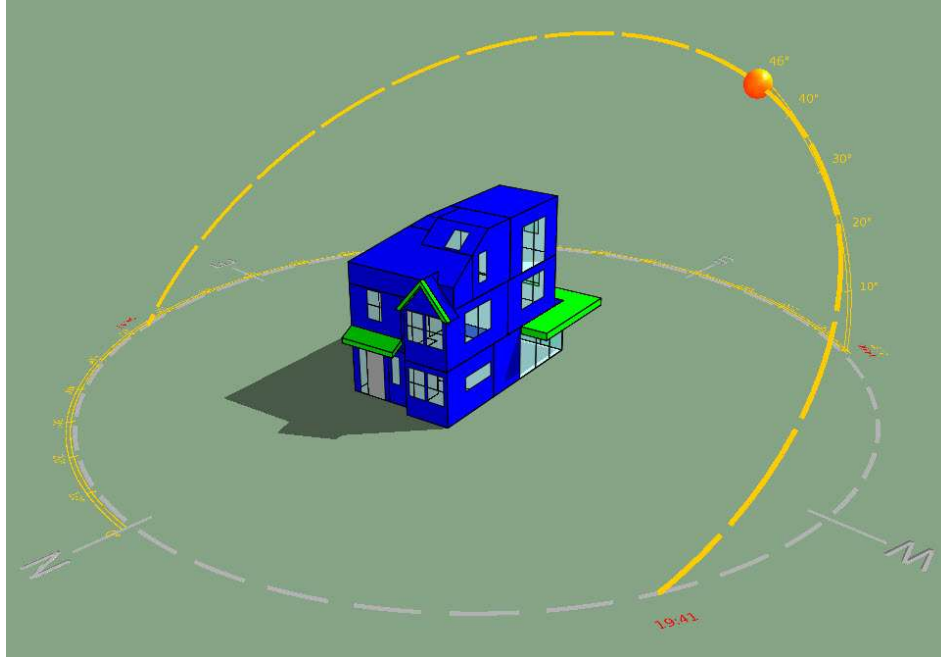
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Introduction

This report aims to assess the risk of overheating in the proposed new dwelling at 23a Crimsworth Avenue, Manchester, using dynamic simulation modelling and the CIBSE TM 59 guidance (Design methodology for the assessment of overheating risk in homes).



Methodology

The following calculations were undertaken using IES Virtual Environment ApacheSim, a whole building energy simulation programme. Weather data is taken from the CIBSE DSY1 weather file for Manchester, which is the closest weather data location.

The geometry of the model is based on drawings created by Martin Degnen. Input data has been taken from the design drawings, which is also used in the SAP calculations for Part L of the Building Regulations.

CIBSE TM59 has been used to assess the risk of overheating and the criteria for predominantly naturally ventilated dwellings are as follows:

- Criterion 1 of TM52 should also be met for domestic style living rooms, kitchens and bedrooms. Limiting the number of hours that the actual operative temperature can exceed the threshold comfort temperature (upper limit range of comfort temperature) by 1°K or more during the occupied hours of a typical non-heating season (1 May to 30 September).
- Operative temperature shall not exceed 26°C for more than 1% of annual hours, between the hours of 10pm and 7am. 1% of the hours during this time frame annually equates to 32 hours, thus 33 or more hours above 26°C would be recorded as a fail.
- Communal corridors should not exceed an operative temperature of 28°C for more than 3% of the annual hours.

The communal corridor criterion is excluded from this assessment, as this is a standalone dwelling.

Building fabric

Based on the supplied design criteria, the building has been modelled using the following fabric performance: -

Element	U value (W/m ² K)	Cm value (kJ/(m ² K))
External walls	0.18	61.25
Ground floor	0.13	83.6
Internal Ceiling/Floor	1.09	95
Internal Partition	1.79	8.75
Pitched roof	0.13	17.61
Flat roof	0.13	40.49

Ventilation strategy

The building is designed with a mechanical ventilation system, however it also has a reasonable amount of openable windows and glazed doors.

Window and glazed doors have been modelled from the plans and schedules supplied. Thermal and solar performance figures used are: -

Type	U value (W/m ² K)	G value	Location
Windows / glazed doors	1.40	0.69	All
Rooflights	2.30	0.55	Roof

Window openings have been modelled to open to an angle of 30°. Glazed doors have been modelled so that they can fully slide open if required.

Openable windows and glazed doors have been set to open when the room is occupied and the air temperature exceeds 22°C, as per TM59 guidance.

The design proposal incorporates a continuous mechanical supply and extract heat recovery system. Ventilation rates are not yet known, as the design is yet to be finalised and as such, Part F ventilation rates have been used for occupied rooms, as per the table below: -

Room	Ventilation type	Ventilation rate
Bedroom	Supply	29 l/s
Kitchen/dining	Supply	29 l/s
Living	Supply	29 l/s

The building has been modelled to include outside air infiltration of 0.25 air changes per hour.

Occupancy profiles

Occupancy profiles are set up as required by CIBSE TM59, varying for bedrooms and living spaces.

Internal gains

Occupancy, lighting and equipment gains for occupied spaces, bedrooms and kitchen/living areas, have been taken directly from the TM59 guidance.

Results

For the kitchen / living / dining rooms, criterion A must be met. For bedrooms, both criteria must be met. Cells highlighted in green demonstrate compliance and those in red are non-compliant. Grey cells indicate the criterion is not assessed for that room type. The tables below detail the results room by room.

Bedrooms

Room Name	Criterion a - % Hours (Top-Tmax >= 1K)	Criterion b (Night Hours Top > 26)
Bedroom 1	0.68	0
Bedroom 2	0.76	0
Bedroom 3	0.14	0.06
Bedroom 4	0.95	0

Living areas

Room Name	Criterion a - % Hours (Top-Tmax >= 1K)
Kitchen area	0
Living / dining	0.41

All rooms are compliant with the CIBSE TM59 overheating criteria.

Appendix

Below are some example charts of room profiles showing the operative temperature, solar gains, internal gains as well as gains / losses from the mechanical ventilation and window opening capabilities.

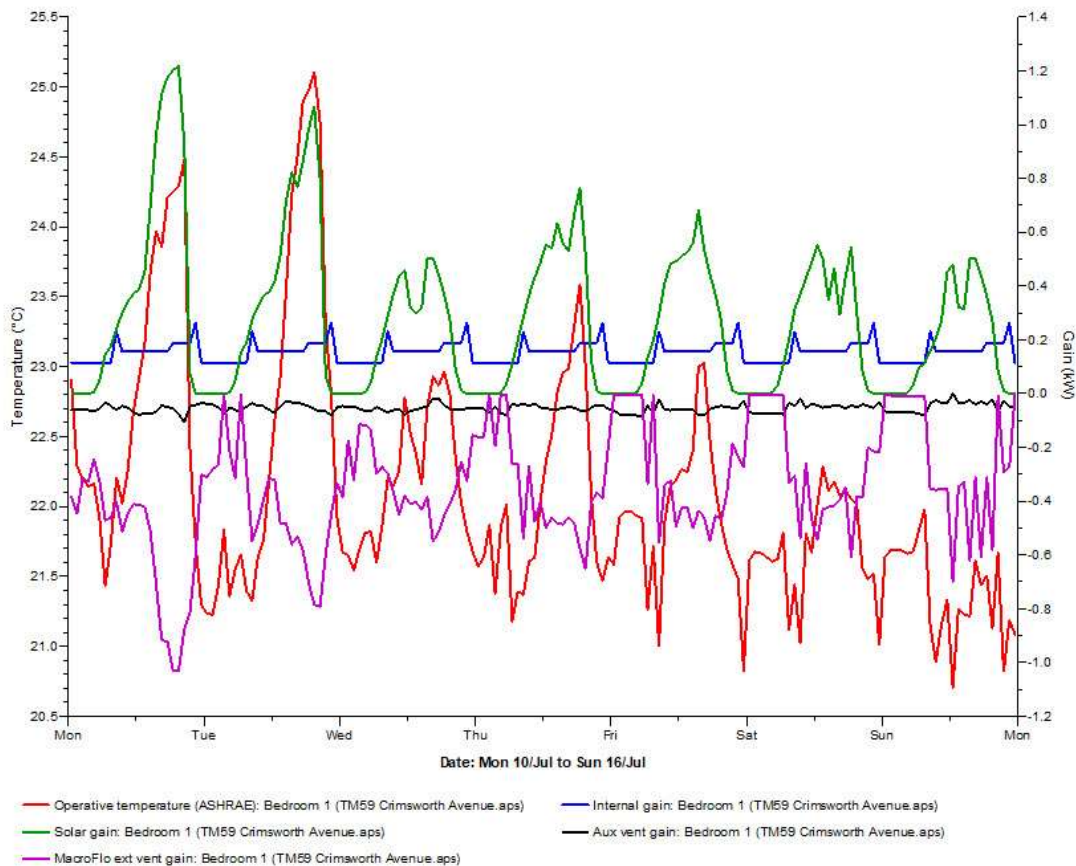
Some terms used in the charts, which are references from the dynamic simulation software, are as follows:

Aux vent gain – heat gains in the room, or heat reduction, if a negative value, associated with the mechanical ventilation system.

MacroFlo ext vent gain – heat gains in the room, or heat reduction, if a negative value, associated with heat flow through the external windows and doors.

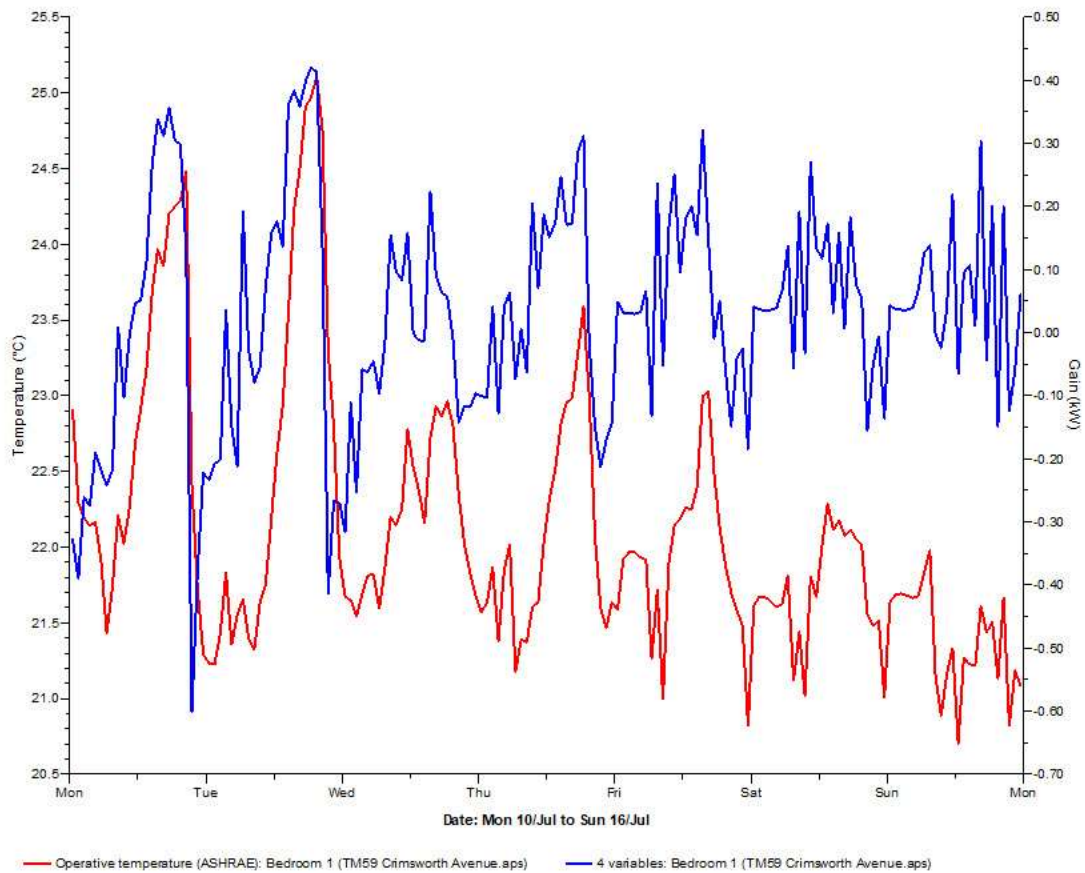
Bedroom 1 – July week with individual variables

This shows the operative temperature (red) and the individual gains (or losses) (internal, solar, MV system and window/door openings)



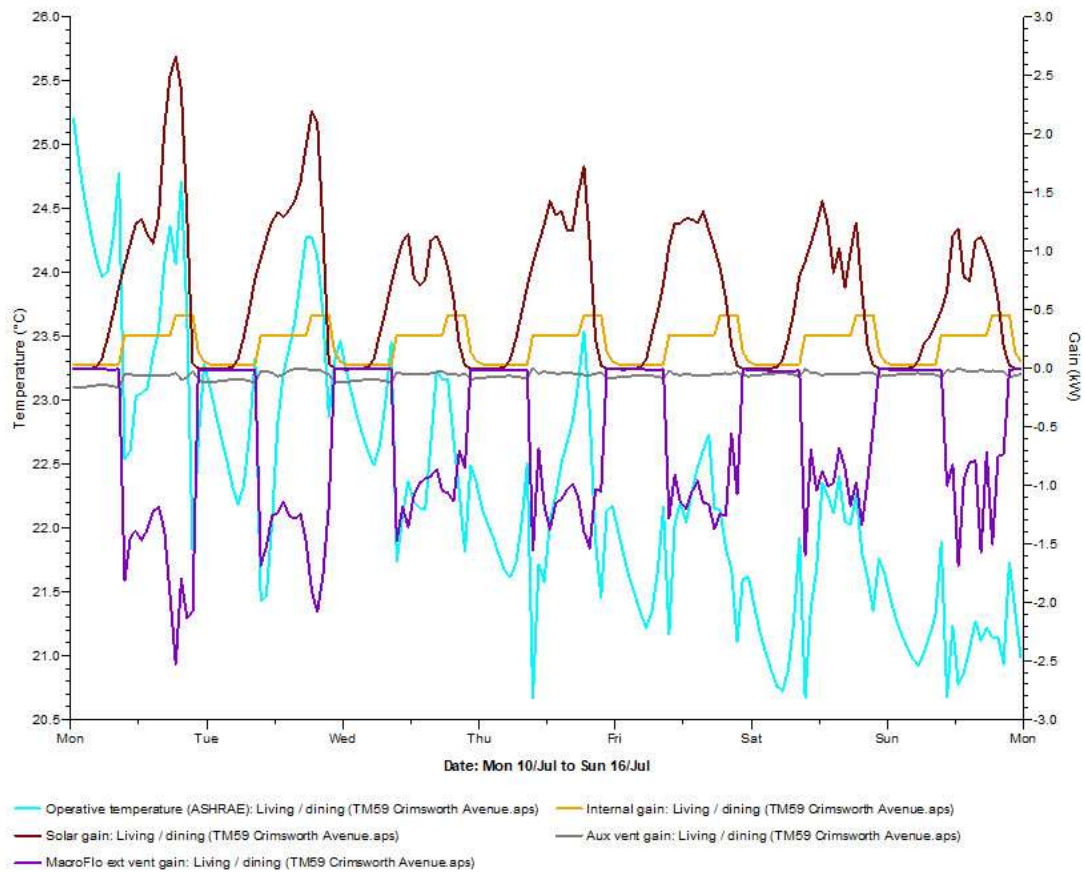
Bedroom 1 – July week with combined variables

This shows the internal, solar, MV system and window/door opening gains (or losses) combined. The blue line generally oscillates around the 0.00 Gain (kW) value on the right axis, meaning heat gains (solar and internal) are offset by heat losses (ventilation and window/door opening).



Living area – July week with individual variables

This shows the operative temperature (cyan) and the individual gains (or losses) (internal, solar, MV system and window/door openings)



Living area – July week with combined variables

This shows the internal, solar, MV system and window/door opening gains (or losses) combined. The blue line generally oscillates around the 0.00 Gain (kW) value on the right axis, meaning heat gains (solar and internal) are offset by heat losses (ventilation and window/door opening).

