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CIBSE TM59 2017 Compliance Summary

Project:	Spofforth Hill, Wetherby, LS22 6TY
Assessment Date:	12/01/2023
Assessor:	IH

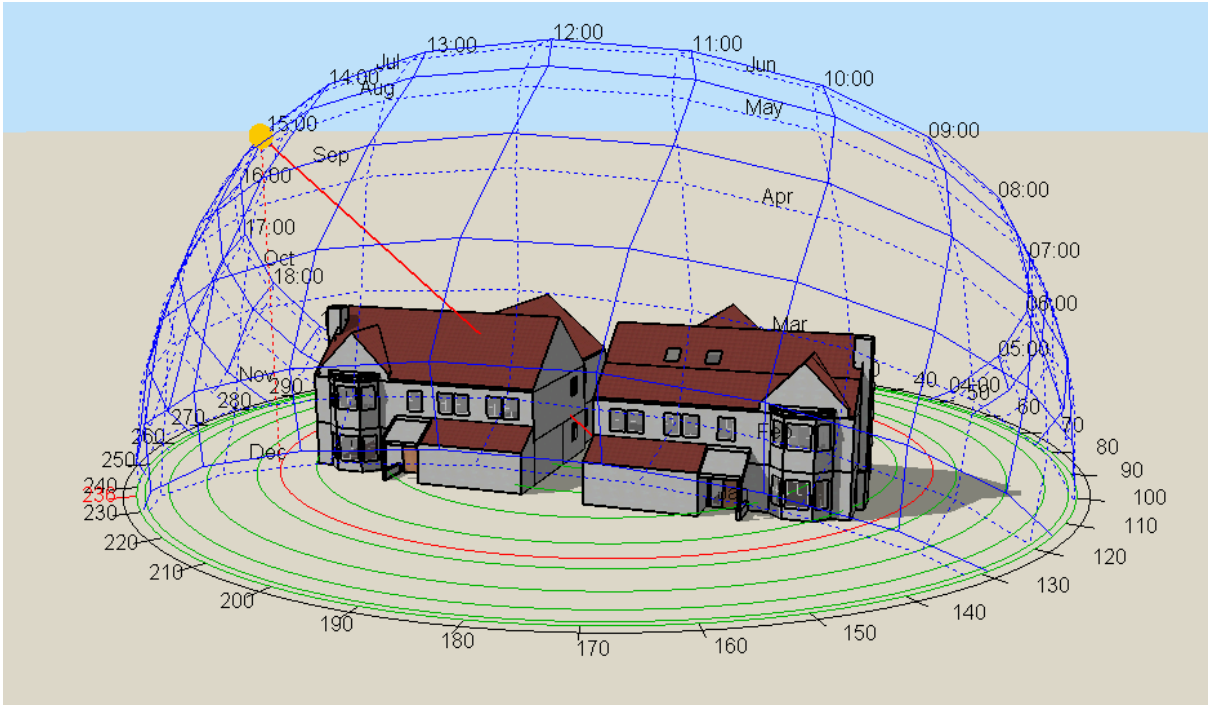

Figure 1.

The building has been modelled using DesignBuilder Dynamic Simulation Modelling Software, using the EnergyPlus Simulation Engine.

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1. Executive Summary

This report details the methodology and findings of a study into the overheating risk for the proposed development at Spofforth Hill, Wetherby, LS22 6TY using dynamic simulation modelling.

The reason for undertaking the work is to investigate the potential overheating risk within the dwelling and to provide possible mitigation strategies for current and future climate change scenarios.

Whilst what constitutes “too hot” is subjective, and will depend on both human and environmental factors, the health and wellbeing impacts of overheating can be severe. For example, very high temperatures (>35°C) can lead to stress, anxiety and even early deaths for vulnerable occupants, whilst high bedroom temperatures (>26°C) can lead to sleep deprivation.

This report provides an assessment of compliance against the CIBSE TM59 thermal comfort metric.

In providing a prescriptive approach with clearly defined pass/fail criteria, CIBSE TM59:

- allows different designs to be compared with a common approach, based on reasonable assumptions;
- supports design decisions that improve comfort without cooling; and
- provides consistency across the industry, with all consultants using the same standardised methodology for the assessment of overheating risk in homes.

It should be noted the TM59 methodology will not guarantee that people will always be comfortable in compliant spaces, however they act, nor does it take into account unusual use.

Thermal analysis of the building has been carried out using DesignBuilder software. This software is fully accredited and compliant with CIBSE AM11 methodology.

As required by CIBSE TM59, results have first been presented without any shading from internal blinds and curtains. CIBSE TM59 states that if internal shading is to form part of the mitigation strategy then these shading devices must be included in the base build.

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2. CIBSE TM59 "Design methodology for the assessment of overheating risk in homes"

2.1 Criteria for homes predominantly naturally ventilated

Based on the principals of CIBSE TM52, CIBSE Technical Memorandum 59 sets two simplified criteria for compliance:

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

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

Criteria 2 and 3 of CIBSE TM52 may fail to be met, but both (A) and (B) of CIBSE TM59 must be passed for all relevant rooms.

2.2 Criteria for homes predominantly mechanically ventilated

CIBSE TM59 states that the "predominantly mechanically ventilated" criteria should be applied to homes that are predominantly mechanically ventilated because they have either no opportunity or extremely limited opportunities for opening windows (e.g. due to noise levels or air quality). CIBSE TM59 recommends the minimum opening area for natural ventilation should be at least 1/20th of the room floor area.

For homes falling within the "predominantly mechanically ventilated" definition, the CIBSE fixed temperature test must be followed, i.e. all occupied rooms should not exceed an operative temperature of 26˚C for more than 3% of the annual occupied annual hours (CIBSE Guide A (2015a)).

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3. The Model

The following factors affect the calculation of predicted indoor temperature by dynamic simulation model:

i. Mean outdoor temperatures.
ii. Geometry.
iii. External shading.
iv. Internal shading.
v. Fabric.
vi. Glazing.
vii. Infiltration.
viii. Internal gains.
ix. Natural ventilation.
x. Mechanical ventilation.
xi. Active cooling.
xii. Heat losses from pipework and heat interface units (HIUs)

3.1 Mean outdoor temperatures

In accordance with the guidance and recommendations of CIBSE TM59, representative dwellings have been modelled against the DSY1 weather file most appropriate to the site location (in this case the Leeds weather file location), for the 2020s, high emissions, 50% percentile scenario.

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3.2 Geometry

A 3-D model of the dwelling has been created based on information contained within the set of architect drawings provided.

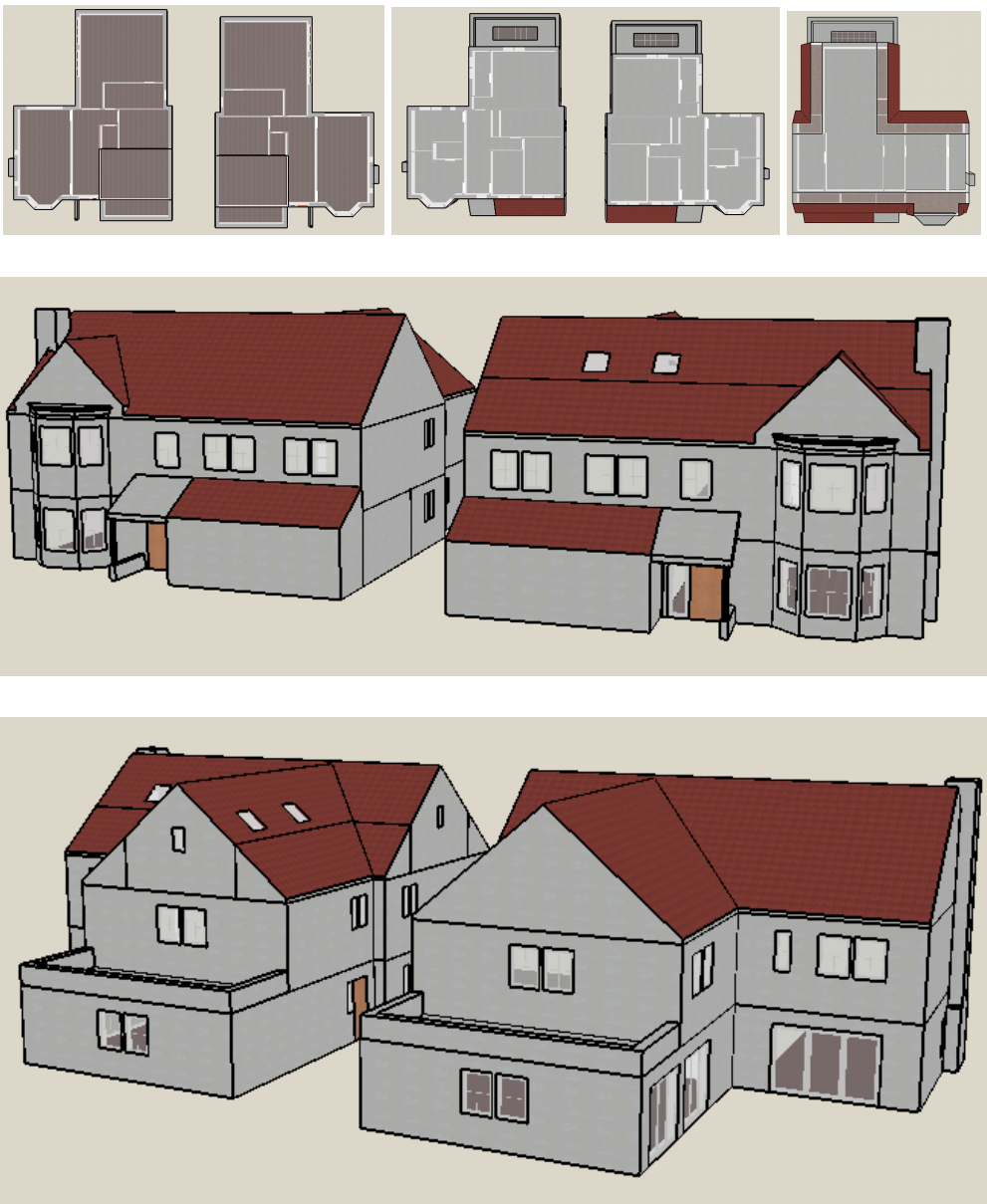

Figure 2. External and internal renders

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3.3 Zoning

TM59 performance criteria only apply to rooms falling within the following classifications: living area, kitchen area, circulation areas, bedrooms

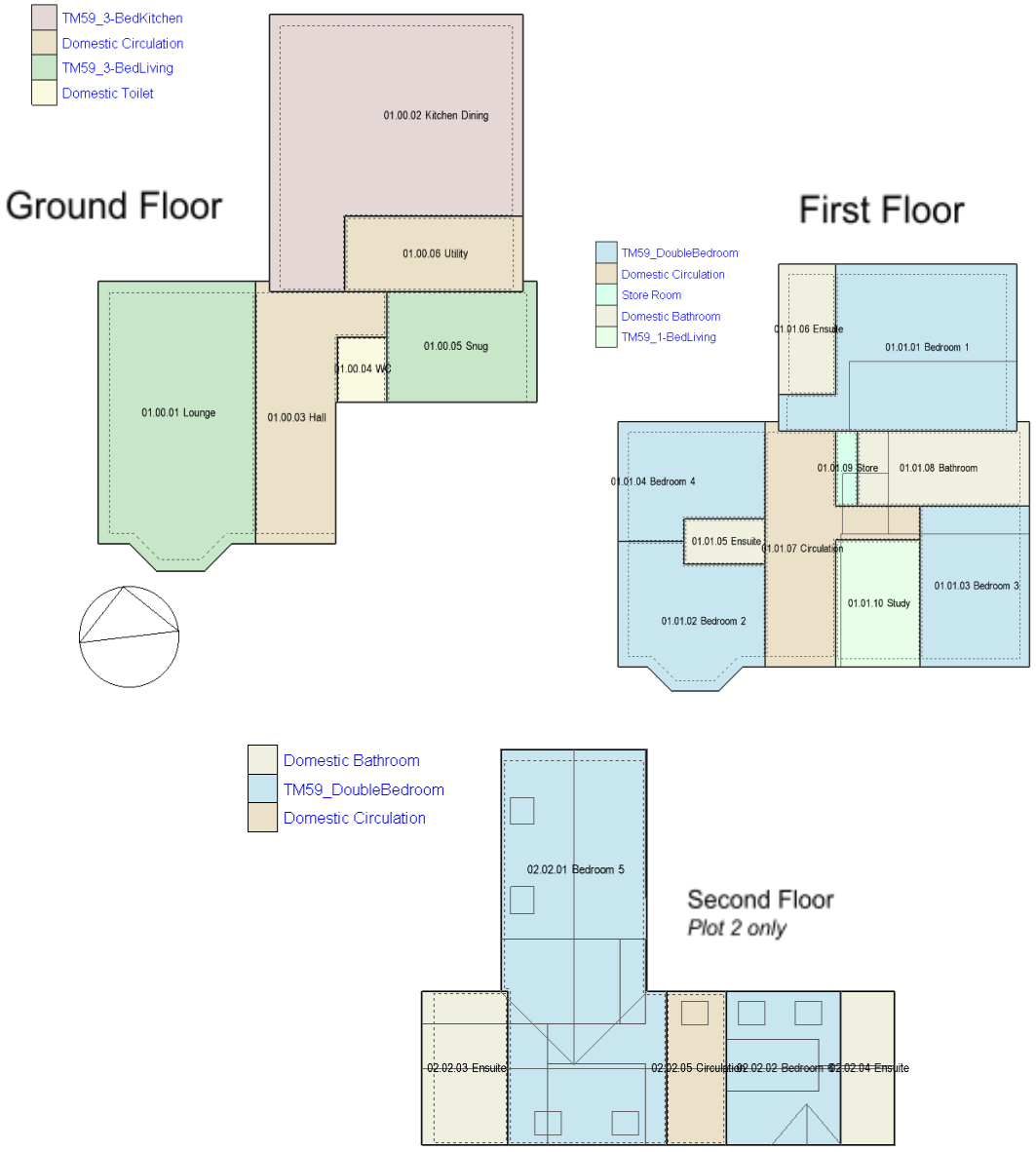

Figure 3. – Internal zone layout

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4. Design Specifications

The following information has been used to produce the dwelling model:

Drawings	
Drawing Pack	REV_._PROPOSED_SITE_LAYOUT-4114699 2319-HT-P1-01 - Plot 1 Floor Plans - Spofforth 2319-P1-07 Section AA - Spofforth, Wetherby 2319-HT-P1-02 - Plot 1 Elevations - Spofforth
Weather Data	
Data File	Leeds weather file (*this relates to the nearest weather file available to the location of the project*)
Building Services	
HVAC	As per SAP calculations
Lighting	TM59 Template
Construction Properties	
Timber Frame Walls	103mm brick, 50mm clear cavity, Protect TF200 Thermo, 9mm OSB, 120mm Rigid insulation between 140mm timber studs, Protect VC Foil Ultra, 12.5mm plasterboard on 25mm timber battens
Semi-exposed timber frame walls (walls to garage)	12.5mm plasterboard, 120mm Rigid insulation between 140mm timber studs, Protect VC Foil Ultra, 12.5mm plasterboard on 25mm timber battens
Internal Walls	Timber stud partitions throughout
Joisted Roof	300mm Loft Roll 44 over joists, 100mm Loft Roll 44 between joists, 12.5mm plasterboard
Rafter Roof	140mm Rigid Insulation (0.022 W/m.K) between rafters, 50mm Rigid Insulation (0.022 W/m.K) below rafters, 12.5mm plasterboard on battens
Flat Roofs	18mm plywood on 150mm Rigid Insulation (0.022 W/m.K) on 18mm plywood deck on timber joists, 12.5mm plasterboard
Ground Floor	50mm screed on 150mm Rigid Insulation (0.022 W/m.K) on RC slab
Internal Floor	22mm chipboard on 100mm mineral wool (0.044 W/m.K) between timber joists, 12.5mm plasterboard to u/s
External Glazing	Window U value = 1.20 W/m²K G value = 0.50

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	Light Transmission = 0.73
Roof Light	Window U value = 1.20 W/m²K G value = 0.63 Light Transmission = 0.70
Infiltration Rate	5.01 at 50 Pa (m3/h-m2)
Ventilation Strategy	
Natural (purge) ventilation is provided by opening windows. *The windows are simulated to be opened when a room is occupied and the operative temperature in the room is above 22 °C.* MVHR units capable of providing Design air flow rates no less than 260 m³/hr to be installed in both units.	

4.1 Design Windows / Doors reference identifier labels

For reference, Figure 4. shows the window / door reference identifier labels.

Ref	Window Hung	S/O Area	Openable Width (m)	Openable Height (m)	Opening Angle °
	Side	1.09	0.83	1.12	45
	Side	0.48	0.38	0.97	45
	Side	0.55	0.38	1.12	45
	Top/Bottom	1.69	1.17	1.27	15
	Top/Bottom	1.87	1.17	1.42	15
	Side	1.20	0.72	1.42	45
	Side	1.08	0.72	1.27	45
	Side	4.98	2.09	2.00	90
	Side	6.63	2.82	2.00	90
	Side	0.47	0.38	0.97	45
	Fixed	1.41	0.00	0.00	0
	Fixed	2.15	0.00	0.00	0

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Figure 4. – Window / Door Reference Identifiers

4.2 Design Results

CIBSE TM59 - Plot 1				
Level	Zone	Criterion A (%)	Criterion B (hr)	Pass/Fail
Ground Floor	Lounge	0.52	N/A	Pass
	Kitchen / Dining	1.71	N/A	Pass
	Snug	0.00	N/A	Pass
First Floor	Bedroom 1	0.05	6.17	Pass
	Bedroom 2	0.55	131.67	Fail
	Bedroom 3	0.71	176.50	Fail
	Bedroom 4	0.21	18.83	Pass
	Study	1.45	N/A	Pass

CIBSE TM59 - Plot 2				
Level	Zone	Criterion A (%)	Criterion B (hr)	Pass/Fail
Ground Floor	Lounge	0.51	N/A	Pass
	Kitchen / Dining	0.76	N/A	Pass
	Snug	0.00	N/A	Pass
First Floor	Bedroom 1	0.07	5.50	Pass
	Bedroom 2	0.52	121.50	Fail
	Bedroom 3	0.60	157.17	Fail
	Bedroom 4	0.21	17.00	Pass
	Study	1.38	N/A	Pass
	Bedroom 5	1.21	34.50	Fail
	Bedroom 6	0.93	4217	Fail

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5. Design changes

Due to the front windows being closed at night, several rooms on this aspect show a risk of overheating, as illustrated in the Section 4.2 results.

As the overheating risk is in connection to Criteria B, it is proposed that MVHR systems should be installed to increase the total air changes to allow excess heat to be removed during the night when external temperatures drop.

5.1 Updated results

CIBSE TM59 - Plot 1				
Level	Zone	Criterion A (%)	Criterion B (hr)	Pass/Fail
Ground Floor	Lounge	0.48	N/A	Pass
	Kitchen / Dining	1.58	N/A	Pass
	Snug	0.00	N/A	Pass
First Floor	Bedroom 1	0.00	3.33	Pass
	Bedroom 2	0.35	27.00	Pass
	Bedroom 3	0.32	31.67	Pass
	Bedroom 4	0.13	10.33	Pass
	Study	0.74	N/A	Pass

CIBSE TM59 - Plot 2				
Level	Zone	Criterion A (%)	Criterion B (hr)	Pass/Fail
Ground Floor	Lounge	0.45	N/A	Pass
	Kitchen / Dining	0.67	N/A	Pass
	Snug	0.00	N/A	Pass
First Floor	Bedroom 1	0.00	3.33	Pass
	Bedroom 2	0.35	23.17	Pass
	Bedroom 3	0.29	27.83	Pass
	Bedroom 4	0.10	9.50	Pass
	Study	0.72	N/A	Pass
	Bedroom 5	0.99	22.50	Pass
	Bedroom 6	0.58	20.33	Pass

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6. Conclusions

It should be demonstrated to the building control body that all practicable passive means of limiting unwanted solar gains and removing excess heat have been used first before adopting mechanical cooling to comply with Part O of the Building Regulations and with CIBSE TM59 Standards.

Following the proposed design specification detailed in Section 4, it can be seen that the proposed design satisfies Criteria A but does show a risk of overheating in several rooms under Criteria B due to windows needing to be shut during the night.

In order to remove excess heat from the affected bedrooms, it was proposed to install MVHR units to provide a constant supply of fresh air, while removing the warm air. Following additional simulations, it was found that a design flow rate of 260 m^3/hr would be sufficient in removing the excess heat and therefore demonstrating compliance with Part O.