



Abbeyfield School Extension Phase 01

PART L AND OVERHEATING RISK ASSESSMENT REPORT

RIBA Stage 4





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QUALITY CONTROL

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EXECUTIVE SUMMARY

This report presents the outcomes of dynamic thermal modelling undertaken to assess **Building Regulations Part L 2021 compliance** and **BB101 Overheating Risk Assessment (2018)** for the proposed **Abbeyfield School Extension Phase 01, Chippenham**, forming part of the **RIBA Stage 4** design submission. The assessment has been carried out using IES Virtual Environment version 2025.1.0.0 to evaluate the proposed building fabric and services strategy for Part L 2021 compliance and overheating risk in accordance with BB101: Ventilation, Thermal Comfort and Indoor Air Quality in Schools.

The assessment has been undertaken with reference to:

- **Building Regulations Part L 2021, Volume 2: Buildings other than dwellings**, for regulated energy and carbon compliance; and
- **BB101: Ventilation, Thermal Comfort and Indoor Air Quality in Schools**, which adopts the **CIBSE TM52** adaptive thermal comfort methodology for the assessment of overheating risk in free-running school buildings.

Part L 2021 compliance:

The proposed design has been assessed against the Part L 2021 notional building using updated BRUKL outputs. Compliance with the principal Part L performance targets is demonstrated as follows:

- **Target Emission Rate (TER):** 3.72 kgCO₂/m²·yr
- **Building Emission Rate (BER):** 2.08 kgCO₂/m²·yr
- **Target Primary Energy Rate (TPER):** 39.81 kWh/m²·yr
- **Building Primary Energy Rate (BPER):** 20.7 kWh/m²·yr

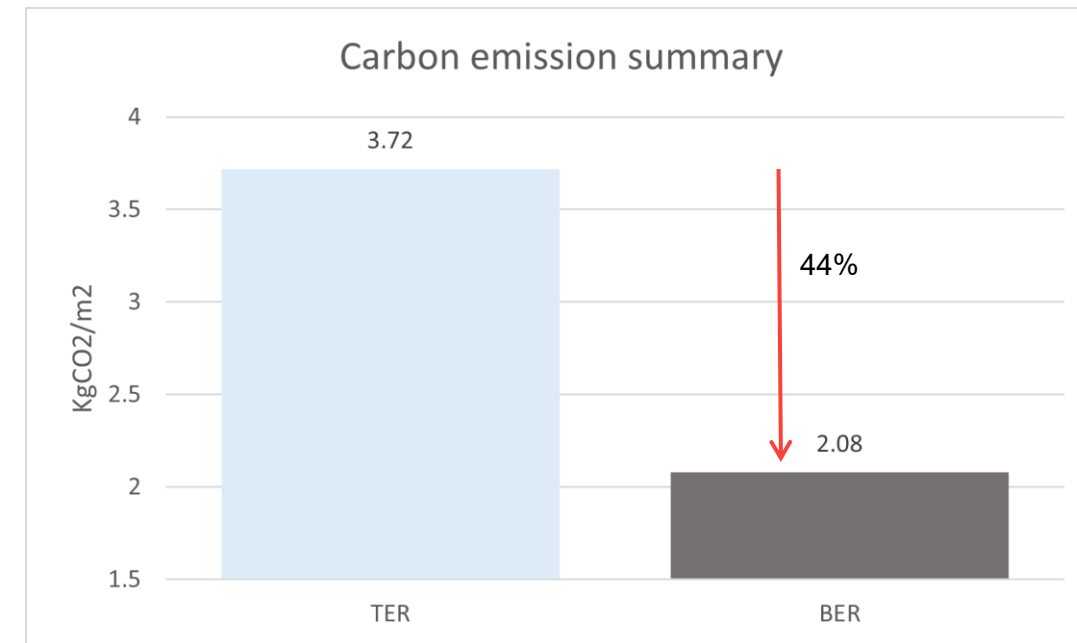
The regulated energy performance of the proposed building is primarily influenced by:

- **Domestic Hot Water demand (11.97 kWh/m²·yr)** associated with electric point-of-use systems.
- **Auxiliary energy consumption (4.48 kWh/m²·yr)** reflecting fan and pump energy associated with the MVHR-based ventilation strategy; and
- **Lighting demand (6.04 kWh/m²·yr)**, which remains lower than the equivalent notional building due to the specified lighting control strategy.

The proposed design achieves an approximately 44% reduction in regulated carbon emissions and an approximately 48% reduction in primary energy demand. Heating demand within the proposed building remains comparatively low due to the adoption of an all-electric Air Source Heat Pump (ASHP) system coupled with a low-temperature underfloor heating distribution network. The proposal also incorporates a roof-mounted photovoltaic (PV) array, with the BRUKL showing 14.76 kWh/m²·yr of electricity generation attributed to the photovoltaic system within the compliance model.

Overall compliance with Part L 2021 is therefore demonstrated through the primary performance metrics, with the BER remaining below the TER and the BPER remaining below the TPER for the proposed design.

Figure 1 Carbon Emission per annum Summary for Abbeyfield School Extension Phase 01



Overheating Risk Assessment (BB101)

The overheating assessment has been undertaken in accordance with BB101 using the CIBSE DSY1 2020 High 50th percentile weather file for Swindon / Brize Norton.

The adopted hybrid ventilation strategy comprises:

- **MVHR systems** serving teaching and support spaces.
- **Motorised louvres** for boost and night-time purge ventilation; and
- **A roof cowl / windcatcher-based ventilation strategy** serving the main hall.

Overheating performance has been assessed using the adaptive methodology described in BB101, which adopts the TM52 three-criterion approach.

Assessment results indicate that all evaluated occupied spaces satisfy the BB101 overheating criteria under the modelled DSY1 scenario:

- **Criterion 1 – Hours of Exceedance:** Satisfied in all assessed spaces (mandatory requirement)
- **Criterion 2 – Daily Weighted Exceedance:** Satisfied in all assessed spaces (advisory)
- **Criterion 3 – Upper Limit Temperature:** Satisfied in all assessed spaces (advisory)

At the current Stage 4 design level, and subject to delivery of the design intent and control strategy represented within the thermal model, the proposed Abbeyfield School Extension Phase 01 is demonstrated to:

- Comply with the applicable Part L 2021 energy performance targets; and
- Satisfy the stated BB101 overheating risk assessment criteria for all assessed teaching, office, social and hall spaces.

1 TECHNICAL GUIDANCE

1.1 PART L 2021 COMPLIANCE

NATIONAL POLICY

The assessment of regulated energy performance has been undertaken with reference to Building Regulations Part L 2021, Volume 2: Buildings other than dwellings, which sets out the requirements for limiting heat gains and losses, improving the energy efficiency of fixed building services, and reducing regulated carbon emissions associated with new non-domestic buildings in England. Compliance is demonstrated using approved National Calculation Methodology (NCM) software and is assessed primarily through comparison of the proposed building against the notional building defined under Part L 2021.

Five criteria must be satisfied to achieve compliance:

Criterion 1 – Achievement of the Target Emission Rate (TER) and Target Primary Energy Rate (TPER)

The building carbon emission rate (BER) must not exceed the target carbon emission rate (TER), as calculated in line with the 2021 National Calculation Methodology using approved modelling software. The BER and TER are calculated based on the regulated demands of space heating, space cooling, lighting, fans and pumps and domestic hot water heating. Unregulated energy such as plug loads, lifts and escalators are not considered.

In addition, Part L2A England (2021) requires the building primary energy consumption (BPEC) to be no greater than the target primary energy consumption (TPEC).

Criterion 2 – Limits on Design Flexibility

Each individual element of building fabric and fixed building services must comply with its respective minimum standards as described within the Part L Approved Document 2021.

It should be noted that to comply with Criterion 1, the general performance parameters will need to exceed these minimum standards. The limits on design flexibility exist only to define a backstop in cases where the design team wishes to trade off a poorly performing element against a higher performing element. For example, a design team may choose to relax the requirement for building air tightness to the minimum standard, but they would then need to significantly improve the lighting efficiency or some other component to compensate for the increase in heating energy.

Table 1-1: Limiting Fabric Parameters and Notional Building Specifications, Part L2 England (2021)

Building Fabric Element	Limiting Value	Notional value
Roof (Flat Roof)	0.18 W/m ² ·K	0.11 W/m ² ·K
External Wall	0.26 W/m ² ·K	0.15 W/m ² ·K
Floor	0.18 W/m ² ·K	0.13 W/m ² ·K
Windows, roof windows, roof-light, curtain walling and pedestrian doors	1.60 W/m ² ·K	1.40 W/m ² ·K

Vehicle access and similar large doors	1.30 W/m ² ·K	1.0 W/m ² ·K
High-usage entrance doors	3.0 W/m ² ·K	3.0 W/m ² ·K
Roof ventilators (ducted louvres)	3.00 W/m ² ·K	3.00 W/m ² ·K
Air permeability	8.00 m ³ /(h·m ²) at 50Pa	5.00 m ³ /(h·m ²) at 50Pa

Criterion 3 – Limiting the Effect of Solar Gain in Summer

For each space in the building that is occupied, or mechanically cooled, reasonable provision must be shown for limiting the effects of solar gain in summer. For the purposes of Part L, this could be demonstrated by showing that for each applicable space, the aggregated solar gains from April to September are less than a calculated limit. This test is automatically carried out as part of the Part L analysis and the results are shown on the Building Regulation UK Part L report (BRUKL), found in Appendix A.

Criterion 4 – (Post Completion) Building Performance Consistent with the BER

The completed building should be constructed and commissioned such that its performance is consistent with that assumed in the BER calculation. This requires delivery of the design intent in relation to fabric performance, airtightness, fixed building services and associated controls.

Criterion 5 – Provision for Energy Efficient Operation in Building

The owner of the building should be provided with sufficient information about the building, its fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is intended and reasonable in the circumstances. A way of showing compliance with this requirement would be to produce a building logbook that may draw upon other documents such as the Operation and Maintenance Manuals.

1.2 OVERHEATING ASSESSMENT BB101 2018

The overheating risk assessment for the proposed Abbeyfield School Extension Phase 01 has been undertaken in accordance with BB101: Ventilation, Thermal Comfort and Indoor Air Quality in Schools (2018).

BB101 sets out requirements for ventilation, indoor air quality and thermal comfort in educational buildings and is the applicable guidance for assessing overheating risk in school environments. For naturally ventilated or free-running buildings, BB101 adopts the adaptive thermal comfort methodology described in CIBSE TM52 to evaluate summertime thermal performance.

The overheating assessment has therefore been carried out using the BB101 adaptive thermal comfort criteria, which utilise the three-criterion approach defined in CIBSE TM52 to assess the risk of overheating in occupied spaces.

In accordance with BB101 guidance:

- The assessment is undertaken over the non-heating season, from 1 May to 30 September.
- Only occupied spaces are required to comply with the overheating criteria; and

- An occupied space is defined as a room that is likely to be occupied for 30 minutes or more.

Ancillary spaces such as circulation areas, storerooms and plant rooms are excluded from the overheating compliance assessment.

BB101 Criterion 1 (Hours of Exceedance) represents the mandatory requirement for compliance in educational buildings. Criteria 2 (Daily Weighted Exceedance) and 3 (Upper Limit Temperature) are reported for completeness but are considered advisory in line with BB101 guidance.

The performance standards for summertime overheating applied in this assessment are summarised in the table below.

Table 1-2 - CIBSE BB101 overheating criteria applied in this assessment

CIBSE BB101 criterions	
1 – Hours of Exceedance	For schools, the number of hours during which ΔT is greater than or equal to one degree (K) during the period 1 st May to 30 th September for the defined hours inclusive shall not be more than 40 hours.
2 – Daily weighted Exceedance *	To allow for the severity of overheating the weighted exceedance shall be less than or equal to 6 in any one day.
3 – Upper Limit Temperature *	To set an absolute maximum value for the indoor operative temperature the value of ΔT shall not exceed 4K.

**Note: criterions 2 and 3 are advisory and not mandatory.*

2 SOFTWARE AND WEATHER FILE

The assessment has been undertaken using accredited dynamic thermal modelling software. The model provides a virtual representation of the proposed building form, site orientation, fabric performance and building services strategy, and has been used to assess both regulated energy compliance and overheating performance.

Software

The thermal model was developed in IES Virtual Environment (IESVE 2025.1.0.0) using the Apache simulation engine and the MacroFlo airflow network module for modelling natural ventilation and hybrid ventilation strategies associated with the BB101 overheating assessment. IESVE is an approved platform for carrying out Part L compliance modelling and dynamic thermal analysis.

Site Location and Weather Data

The Abbeyfield School site is located in **Chippenham**. The chosen site location for modelling purposes is Swindon, identified as the closest proximity to the actual building location. CIBSE weather data has been employed in the modelling process to enhance accuracy and reliability. Several weather files are currently available for the entire UK territory with the TRY (Test Reference Year) and DSY (Design Summer Year) being used widely in the industry. TRY files are used to demonstrate compliance with Part L and are representative of an average year with mild temperatures during summer; for this reason, this is not deemed a suitable file to test the overheating risk within the built environment. DSY weather files have been originally designed to represent a year with a hot, but not extreme summer and were based on data collected from the last 21 years (1984-2004). Since the last update (2016), the new DSY weather files have been based on a much longer period (30 years, from 1984 to 2013) and have been split in three different groups:

- **DSY1** – A moderately warm summer: Summers will have a 1-in-7 chance of being equal or hotter than this DSY.
- **DSY2** – A summer with a short intense warm spell: An intense summer with a heat event the same length of that of DSY1, but with a higher intensity.
- **DSY3** – A summer with a long less intense warm spell: The heat event is less intense than that of DSY2, but it has a higher intensity than DSY1. It has a longer duration than that of DSY1.

In addition to the mentioned DSY files, CIBSE has also released a set of weather files for all the UK territory to cover the future weather scenarios. This additional weather files represents the likely weather conditions for the years 2050 and 2080. The DSY1 2020 High 50th percentile weather file represents a probabilistic future weather scenario developed by CIBSE using UKCP18 climate projections. The “High 50” designation refers to the 50th percentile (median) projection under a high emissions scenario, representing a typical future warm summer year for the 2020s climate period. This weather file is recommended for assessing overheating risk in line with BB101 guidance, as it provides a realistic representation of near-future summertime conditions for naturally ventilated school buildings.

The Weather files used for this analysis are as follows –

- **Part L** - Swindon_Brize_Norton_TRY.epw
- **Overheating** - Swindon_Brize_Norton_DSY1_2020High50_.epw

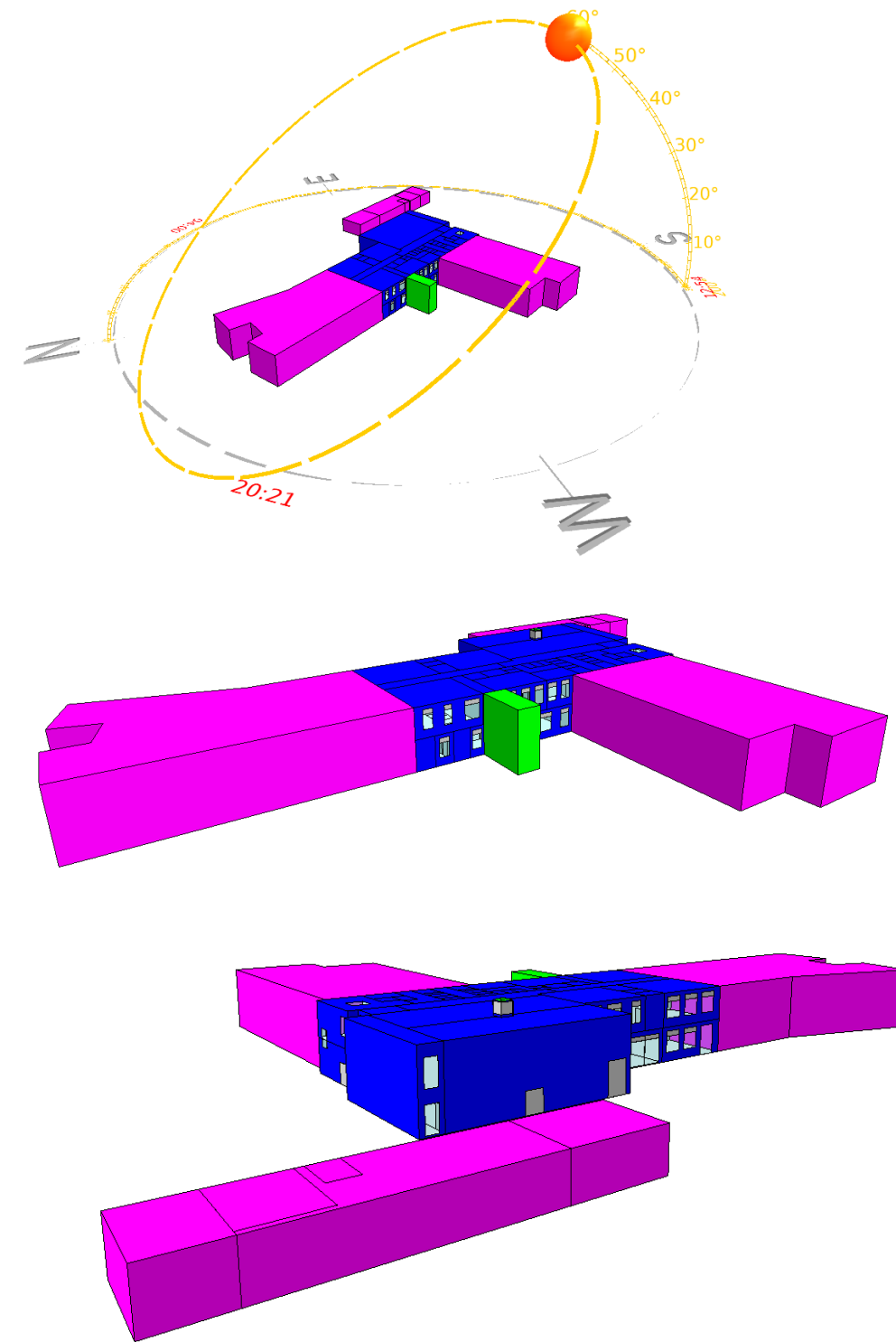


Figure 2-1: Model Geometry – Northwest and Southeast Views.

3 THERMAL MODEL INPUTS

Geometry

A comprehensive geometric and thermal model was developed based on the latest available architectural design information for the proposed Abbeyfield School Extension Phase 01. The model geometry has been prepared to represent the current Stage 4 design basis for the thermal modelling assessments. The thermal model was developed based on the most recent architectural Revit model.

Table 3-1 - Architectural information

Revision / Date	Drawing / Model
20/01/2026	26CD07-NVB-90-1XX-M-A-90001

Building Fabric

The thermal performance values adopted for the building fabric are based on the previous design-stage information inherited for the Abbeyfield School Extension Phase 01 and have been used as the current input values within the thermal model. These values represent the working fabric specification applied in the assessment and have been retained for the purposes of the Stage 4 modelling exercise unless superseded by updated design information. This approach is consistent with the wider Abbeyfield project context, where the current commission relates to Stage 4 and earlier design information was already in place from previous stages.

The fabric properties are described below:

Table 3-2 - Thermal envelope performances

Fabric Detail	Value
Ground floor U-value	0.11 W/m²•K
External wall U-value	0.15 W/m²•K
Roof U-value	0.11 W/m²•K
Door U-value	1.30 W/m²•K
Windows including frames	1.40 W/m²•K
Glazed doors including frames	1.40 W/m²•K
Rooflights including frame	1.40 W/m²•K
Glazing g-value and light transmission	0.3 and 50%
Building air permeability target	3.0 m³/m².h @ 50Pa

NCM Activity Types and HVAC Systems

The NCM building type adopted for the Part L assessment is **D1: Primary or Secondary School (Secondary)**. NCM activity templates have been assigned at room level according to the closest appropriate activity type for each space.

Heating System Details

Space heating to the building is provided by a centralised Air Source Heat Pump (ASHP) system. Heat is distributed via a hydronic underfloor heating (UFH) system serving all occupied and circulation areas across the school. Variable-speed circulation pumps distribute low-temperature hot water from the ASHP plant to the UFH circuits. The seasonal efficiency of the heating system is summarised in in the table below.

Table 3-3 - Mechanical Heating System details

Heating and Cooling system details	
UFH	
Rooms applied	Classrooms, social areas, staff areas, WCs, circulation, stairs and main hall
Emitter type	Under Floor Heating
Heating method	ASHP
Seasonal efficiency	3.24
Pump type	Constant

Cooling System Details

Mechanical cooling is limited to the server room only. No comfort cooling is provided to occupied spaces within the school. The server room cooling demand is met by a dedicated direct expansion (DX) split system to maintain suitable operating conditions for IT equipment. The system performance is represented using a modelled Seasonal Energy Efficiency Ratio (SEER) of 4.5. Details of the mechanical cooling provision are summarised in the table below.

Table 3-4 - Mechanical cooling System details

Cooling system details	
DX	
Rooms applied	Server room
Cooling method	Dx split system
SEER	4.5

Domestic Hot Water

Domestic hot water (DHW) provision is designed to reflect the low and intermittent hot water demand profile of the school building. Point-of-use (PoU) electric water heaters are provided throughout the building, with a combination of instantaneous units and localised storage where required. This approach minimises distribution pipework, reduces standing and distribution losses, and is suitable for areas with prolonged periods of non-use.

DHW energy demand has been modelled using electric point-of-use systems, including local storage provision at tea points and cleaner cupboards where applicable. Details of the DHW systems are summarised in Table below.

Table 3-5 - DHW system details

DHW System detail	
DHW_Instant	
Rooms applied	Entire Building
DHW heating Source	Electric Point of Use
Seasonal efficiency	100%
Thermal store volume	NA
Storage losses	NA
DHW_Storage	
Rooms applied	Tea points and Cleaner Cupboard
DHW heating Source	Electric Point of Use
Seasonal efficiency	100%
Thermal store volume	45 litres
Insulation	Factory Insulated 25mm

Mechanical Ventilation Details

The spaces assessed within the model are served by a combination of MVHR-based ventilation, roof cowl / windcatcher-based ventilation to the main hall, in accordance with the assumed design intent for the current Stage 4 assessment. For more information about the ventilation rates, please refer to mechanical design package.

Table 3-6 - Mechanical ventilation design

Mechanical Ventilation – MVHR & Windcatcher	
Mechanical Ventilation - Type 1: MVHR	
Rooms applied	Classrooms and study spaces; office / staff / meeting spaces; WCs; changing rooms; tea points; repro; and selected circulation spaces.
System type	MVHRs

Heat recovery		Full summer bypass
Heat Recovery efficiency		80%
Heat Exchanger type		Plate heat exchanger
Specific Fan Power (SFP)**		Classroom, social –0.9 W/l/s WC, office, tea point, changing, circulation, entrance foyer – 1.5 W/l/s
Air flow*	Teaching spaces	248 l/s per room
	Offices, Meeting & Staff	40–120 l/s per room
	Social spaces	96–240 l/s per room
	Changing rooms	68 l/s per room
	WCs	6 l/s per room (with 12 l/s to Hygiene and 16 l/s to Staff WC circulation)
	Tea points	15 l/s
	Repro	20 L/s
	Selected circulation spaces	9–67 l/s
Operation profile		Termtime weekdays, 6:30-19:00, with demand-controlled modulation linked to indoor temperature, supply when: - Indoor temperature exceeds 23°C and - CO₂ level is greater than 900ppm.
Mechanical Ventilation - Type 2: Windcatcher		
Rooms applied		Main hall
System type		Roof cowl / windcatcher-based ventilation
Heat Recovery efficiency		50%
Specific Fan Power (SFP)		0.18 W/l/s
Air flow*		1920 l/s
Operation profile		06: 30 to 19: 00 responds to temperature and CO ₂

* Flow rates are applied only for Overheating assessment. The Ventilation for part L assessment shall be as per NCM templates only. Full list of flow rates can be found in Appendix C.

** Supply and extract assumed 60/40 split of the SFP for thermal modelling purpose

3.1 PART L SPECIFIC INPUTS

Lighting Controls

Lighting energy demand is reduced through the use of presence detection and daylight-linked controls, where appropriate, in accordance with the functional requirements of each space. Presence detection is provided in classrooms, circulation areas, WCs, changing areas, plant rooms and ancillary spaces to prevent unnecessary operation when spaces are unoccupied.

Daylight-linked photoelectric controls with dimming are provided in areas with good access to natural daylight, including classrooms, offices, the entrance foyer and social areas. Teaching and administrative areas incorporate absence detection with manual-on and automatic-off operation, while circulation and ancillary spaces operate on automatic on/off control. The main hall is provided with manual on/off control only.

The lighting control strategies for room types can be seen in the table below. For further information, please refer to the electrical lighting design.

Table 3-7 - Lighting Control

Room type	Lighting Control Strategy	Photoelectric Options
Classroom	Manual on, auto off	Dimming
Store	None	None
Circulation	Auto on/off	None
Stair	Auto on/off	None
Entrance Foyer	Auto on/off	Dimming
WC	Auto on/off	None
Office	Manual on, auto off	Dimming
Changing Area	Auto on/off	None
Social Area	Auto on/off	Dimming
Mail Hall	Manual on/off	None
Tea Point	Auto on/off	None
MEP Plant	Auto on/off	None
Comms	Auto on/off	None
Repro	Auto on/off	None

Lighting Power Densities

Internal lighting has been modelled using the issued room-by-room Dialux lighting calculations, with lighting efficacy values assigned on a room-type basis in accordance with the final electrical lighting design. These updated inputs have been incorporated within the Part L compliance model and are reflected in the associated BRUKL output.

Table 3-8 - Summary of luminaire efficacy by room type from issued DIALux calculations

Room type	Luminous efficiency (Lm/W)
Teaching / classroom spaces	118.7
Office spaces	117.5
Social / foyer spaces	97.8–120.4
Corridors / circulation spaces	97.8–114.4
Tea points / kitchenette spaces	97.8–103.9
WC / hygiene spaces	100.4–111.8
Store / cleaner / server / ancillary spaces	103.9–179.7
Meeting / repro spaces	97.8
Stair spaces	97.8
Plant / switch room spaces	156.6
Main Hall	170

Electrical

Building-level electrical parameters can be found below:

Table 3-9 - General control settings

Detail	Value
Building electric power factor	<0.90
Do lighting systems have provision for metering?	Yes
Does metering warn of out-of-range values?	Yes

Renewables

A roof-mounted photovoltaic (PV) system with an installed capacity of 23.66 kWp has been incorporated within the compliance model. The system comprises 52 modules, each with a minimum peak output of 455 W, mounted at an inclination of 10° on a flat roof, with a total array area of approximately 106 m². In the updated BRUKL, the PV system contributes 14.76 kWh/m²·yr of on-site renewable electricity generation, equivalent to approximately 18,959 kWh/yr across the modelled floor area. This renewable contribution materially reduces the building primary energy demand and regulated carbon emissions and supports compliance with Part L 2021.

Table 3-10 - Renewable system details

Detail	Value
Installed PV system capacity	23.66 kWp
Total PV annual yield	18,959 kWh/yr
Estimated Total PV Array active area	106 m²
Azimuth	270 deg from North
Inclination (deg from horizontal)	10

3.2 OVERHEATING SPECIFIC INPUTS

Natural Ventilation Details

Natural Ventilation is considered for the purpose of Overheating assessment. The assessed rooms benefit from hybrid ventilation, incorporating natural ventilation through louver openings along with mechanical ventilation supplied mainly by MVHRs.

A summary of natural ventilation inputs is outlined below. For further information on opening types, please refer to architectural drawings.

Table 3-11 - Natural ventilation details

Natural Ventilation – Horizontal Louver*	
Rooms applied	All teaching and social spaces, Tea point (Perimeter)
Openable orifice area	40%
Opening modulating profile	available for boost ventilation during occupied periods and purge ventilation where required.

* Location of the openable louvers can be found in Appendix D.

Internal Gains

Lighting energy is release in the space in form of thermal radiation and heat gains. These gains, together with the equipment and occupancy gains, have been modelled and the table below summarises some of the inputs. The operation profiles are considered as 0900 to 1600 with 1 hour break between 1200-1300.

Please review Appendix E for a full list of operation profiles.

Table 3-12 - Internal gains for overheating assessment

Room type	Lighting load*	Occupancy load	Equipment load
Teaching spaces	7.2 W/m²	30–31 people, depending on room type	10 W/m²
Offices, Meeting spaces, & Staff	7.2 W/m²	4–12 people, depending on room type-intermittent	10 W/m²
Tea points	7.2 W/m²	2–3 people-intermittent	10 W/m²
Main Hall	7.2 W/m²	240 People-intermittent	10 W/m²

**Note: The lighting loads presented in Table 3-12 have been adopted for the overheating assessment only. For the Part L compliance model, internal lighting has been updated separately using the issued Dialux room-by-room lighting calculations.*

4 RESULTS

4.1 BUILDING REGULATION PART L RESULT

The Part L 2021 assessment has been undertaken using the updated BRUKL outputs for the proposed Abbeyfield School Extension Phase 01. The proposed building has been assessed against the Part L notional building using the National Calculation Methodology (NCM).

The regulated energy performance of the proposed design is characterised by the following:

- The proposed building achieves a **Building Emission Rate (BER)** of **2.08 kgCO₂/m²·yr**, which is lower than the **Target Emission Rate (TER)** of **3.72 kgCO₂/m²·yr**, demonstrating compliance with the regulated carbon emissions target.
- Compliance with the primary energy requirement is also achieved, with a **Building Primary Energy Rate (BPER)** of **20.7 kWhPE/m²·yr**, compared with a **Target Primary Energy Rate (TPER)** of **39.81 kWhPE/m²·yr**.
- The regulated energy demand profile of the proposed building is primarily influenced by:
 - Domestic Hot Water demand (11.97 kWh/m²·yr)** associated with electric point-of-use systems.
 - Auxiliary energy consumption (4.48 kWh/m²·yr)** reflecting fan and pump energy associated with the MVHR-based ventilation strategy; and
 - Lighting demand (6.04 kWh/m²·yr)**, which remains lower than the equivalent notional building due to the specified lighting control strategy.
- Heating demand within the proposed building remains comparatively low (**4.87 kWh/m²·yr**) due to the adoption of an all-electric **Air Source Heat Pump (ASHP)** system coupled with a low-temperature underfloor heating distribution network.
- On-site renewable energy generation is incorporated through a roof-mounted photovoltaic (PV) system, contributing approximately **14.76 kWh/m²·yr** of regulated energy offset within the compliance model.
- The end-use breakdown shows that the proposed all-electric design performs favourably in terms of lighting demand relative to the notional building. Domestic hot water, heating and auxiliary energy remain the dominant regulated loads, with auxiliary energy reflecting the impact of the selected ventilation strategy and associated fan and pump energy within the updated BRUKL model. Renewable energy generation from the roof-mounted photovoltaic array contributes to achieving compliance by offsetting part of the regulated energy demand. No additional renewable energy sources beyond photovoltaic generation are currently proposed.

Overall compliance with Part L 2021 is confirmed through the primary performance metrics, with both the Building Emission Rate (BER) and the Building Primary Energy Rate (BPER) remaining below their respective target values. The proposed design achieves a BER of 2.08 kgCO₂/m²·yr against a TER of 3.72 kgCO₂/m²·yr, and a BPER of 20.7 kWhPE/m²·yr against a TPER of 39.81 kWhPE/m²·yr.

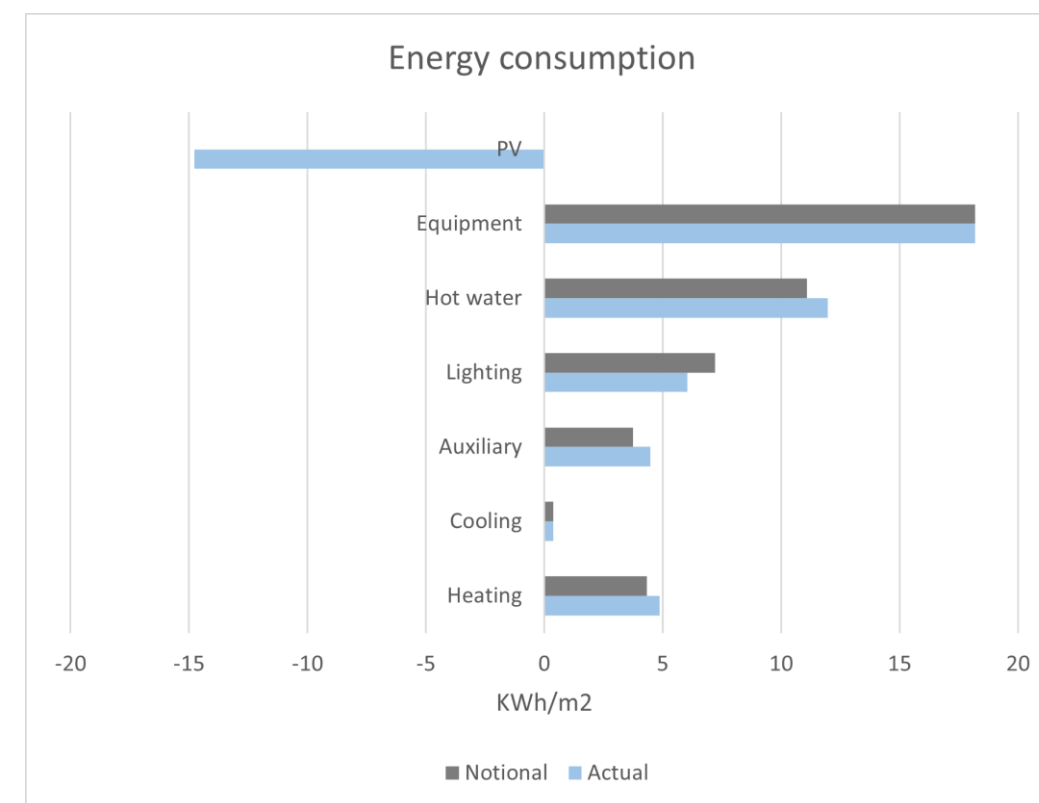


Figure 4-1 - Energy End Use Breakdown of Abbeyfield School extension Phase 1

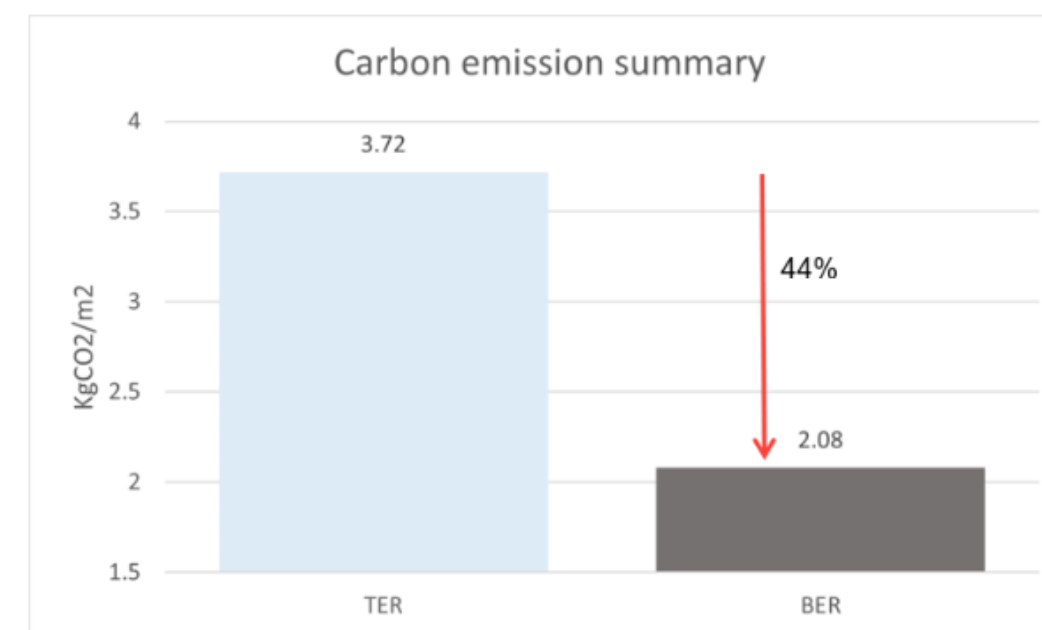


Figure 4-2 - Carbon Emission Summary for Abbeyfield School Extension Phase 01

4.2 THERMAL COMFORT ASSESSMENT RESULT

By incorporating the inputs and assumptions detailed thermal model inputs section, all evaluated spaces in Abbeyfield School meet the requirements of the overheating risk assessment, demonstrating compliance with the BB101 overheating criteria, which adopt the CIBSE TM52 adaptive thermal comfort methodology for free-running buildings.

Table 4-1 provides a summary of the results for the occupied spaces assessed under the TM52 criteria. The detail of the results can be found in Appendix B.

Overheating Assessment Summary (BB101 / TM52):

- **Overall outcome:** All **occupied rooms pass** the BB101/TM52 overheating criteria, with no failures recorded.
- **Teaching and learning spaces:** Classrooms and teaching spaces comply with all three TM52 and BB101 criteria during occupied summer periods, indicating effective control of internal temperatures under adaptive comfort conditions.
- **Large and high-occupancy spaces:** The main hall and social spaces also pass despite higher occupancy and internal gains, demonstrating adequate ventilation effectiveness and thermal resilience.
- **Key drivers of compliance:** Compliance is primarily driven by the natural ventilation strategy, controlled solar gains, and appropriate internal heat gain assumptions consistent with BB101 occupancy profiles.

Table 4-1 - TM52 and BB101 result summary for current weather scenarios.

Room Name	Occupied hours	Criteria 1	Criteria 2	Criteria 3	Result
GF_6th Office-0.19	763	0	0	0	Pass
GF_Classroom 1 / Green Room-0.16	654	10	5	3	Pass
GF_Tea-0.20	763	0	0	0	Pass
GF_6th Form Study 0.01	763	0	2	0	Pass
GF_Foyer / 6th Form Social-0.02	763	0	1	0	Pass
FF_Classroom 3-1.36	654	15	5	3	Pass
FF_Social Space / Informal Study 1.06	763	0	0	0	Pass
FF_Staff / Meeting Room-1.29	763	0	2	0	Pass
FF_Classroom 4-1.01	654	11	3	2	Pass
FF_Classroom 2-1.05	654	10	3	2	Pass
GF_Main Hall-0.03	763	1	3	1	Pass
GF_6th Office-0.19	763	0	0	0	Pass

5 CONCLUSION

The thermal modelling assessment undertaken for the Abbeyfield School Extension Phase 01 demonstrates that the proposed design meets all key performance requirements related to energy efficiency, thermal comfort, and overheating risk.

The updated BRUKL confirms that the proposed Abbeyfield School Extension Phase 01 complies with UK Building Regulations Part L 2021, with both the Building Emission Rate (BER) and Building Primary Energy Rate (BPER) remaining below their respective target values. The proposed design achieves a BER of 2.08 kgCO₂/m²·yr against a TER of 3.72 kgCO₂/m²·yr, and a BPER of 20.7 kWhPE/m²·yr against a TPER of 39.81 kWhPE/m²·yr. This compliance is supported by the proposed all-electric services strategy and the contribution of the roof-mounted photovoltaic (PV) system within the compliance model.

Highest contributors to regulated energy demand:

- **Domestic Hot Water (DHW)** –DHW is the largest energy demand due to the use of electric point-of-use heaters, which have no contribution from low-carbon heat recovery or heat pumps. Although demand is intermittent, electric resistance heating results in relatively high annual energy intensity.
- **Lighting** –Lighting demand remains significant due to long occupied hours and school operational profiles. While efficient luminaires and controls are provided, lighting energy remains a dominant regulated load in education buildings.
- **Heating** –Space heating demand is comparatively low due to the use of an air source heat pump and underfloor heating operating at low flow temperatures, combined with a well-performing building fabric.

The overheating assessment, undertaken in accordance with BB101 using the CIBSE DSY1 2020 High 50th percentile weather file, demonstrates that all evaluated occupied spaces satisfy the BB101 adaptive thermal comfort criteria, which adopt the TM52 three-criterion methodology for free-running buildings.

All modelled teaching, office, social, and hall spaces operate within acceptable comfort limits across Criteria 1, 2, and 3.

Next Steps & recommendation

To ensure that the demonstrated Part L 2021 compliance and BB101 overheating performance are achieved in operation, the following should be implemented during detailed design and construction:

- Maintain the adopted building fabric specification and air permeability target to achieve the modelled thermal performance.
- Install and commission MVHR and windcatcher ventilation systems in accordance with the modelled design intent.
- Confirm specified SFP values during final equipment selection.
- Implement BMS-controlled boost and night-time purge ventilation via motorised louvres.
- Commission ventilation flow rates and control strategies in line with BB101 requirements.
- Install and commission the proposed photovoltaic (PV) array to achieve the modelled on-site renewable contribution.

Subject to delivery of the above measures, the proposed Abbeyfield School Extension Phase 01 is expected to achieve compliance with Part L 2021 and satisfy the stated BB101 overheating risk assessment criteria in operation.

APPENDIX A: BRUKL

BRUKL Output Document

Compliance with England Building Regulations Part L 2021



Project name

Abbeyfield School Extension Phase 01 As designed

Date: Tue Mar 31 11:55:14 2026

Administrative information

Building Details

Address: Stanley Ln, Chippenham, SN15 3XB

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.30

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.30

BRUKL compliance module version: v6.1.e.1

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Foundation area [m²]: 642.23

The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	3.72
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	2.08
Target primary energy rate (TPER), kWh _{eq} /m ² .annum	39.81
Building primary energy rate (BPER), kWh _{eq} /m ² .annum	20.7
Do the building's emission and primary energy rates exceed the targets?	BER <= TER BPER <= TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _a -Limit	U _a -Calc	U _i -Calc	First surface with maximum value
Walls*	0.26	0.15	0.15	WC000001:Surf[3]
Floors	0.18	0.11	0.11	WC000001:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.11	0.11	CL000000:Surf[8]
Windows** and roof windows	1.6	1.4	1.4	WC000001:Surf[1]
Rooflights***	2.2	1.42	1.42	ST000013:Surf[4]
Personnel doors ^Δ	1.6	1.3	1.3	ST000001:Surf[3]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)] * Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. ** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position. ^Δ For fire doors, limiting U-value is 1.8 W/m ² K. NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				
Air permeability	Limiting standard	This building		
m ³ /(h.m ²) at 50 Pa	8	3		

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Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- MVHR/UFH

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.24	-	0.2	-	0.8
Standard value	2.5*	N/A	N/A	N/A	N/A

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

2- Nat Vent/UFH

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.24	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

3- Windcatcher/UFH

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.24	-	0.2	-	0.5
Standard value	2.5*	N/A	N/A	N/A	N/A

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

4- DX Unit

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	4.5	0	-	-
Standard value	2.5*	5	N/A	N/A	N/A

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

1- DHW Instant

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

2- DHW Storage

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

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Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I		
Standard value		0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
GF_6th Office-0.19		-	-	-	0.9	-	-	-	-	-	-	N/A
GF_Classroom 1 / Green Room-0.16		-	-	-	0.5	-	-	-	-	-	-	N/A
GF_Ch - lob-0.15		-	-	-	0.9	-	-	-	-	-	-	N/A
GF_Tea-0.20		-	-	-	0.9	-	-	-	-	-	-	N/A
GF_Changing-0.12		-	-	-	0.9	-	-	-	-	-	-	N/A
GF_Ch - lob-0.14		-	-	-	0.9	-	-	-	-	-	-	N/A
GF_Changing-0.13		-	-	-	0.9	-	-	-	-	-	-	N/A
GF_Circulation-0.21		-	-	-	0.9	-	-	-	-	-	-	N/A
GF_6th Form Study-0.01		-	-	-	0.5	-	-	-	-	-	-	N/A
GF_Main Hall-0.03		-	-	-	0.5	-	-	-	-	-	-	N/A
GF_Foyer / 6th Form Social-0.02		-	-	-	0.5	-	-	-	-	-	-	N/A
FF_Classroom 3-1.36		-	-	-	0.5	-	-	-	-	-	-	N/A
FF_Corridor-1.35		-	-	-	0.9	-	-	-	-	-	-	N/A
FF_Tea - Staff-1.28		-	-	-	0.9	-	-	-	-	-	-	N/A
FF_Social Space / Informal Study-1.06		-	-	-	0.5	-	-	-	-	-	-	N/A
FF_WC circ-1.12		-	-	-	0.9	-	-	-	-	-	-	N/A
FF_Staff / Meeting Room-1.29		-	-	-	0.9	-	-	-	-	-	-	N/A
FF_Corridor-1.34		-	-	-	0.9	-	-	-	-	-	-	N/A
FF_Classroom 4-1.01		-	-	-	0.5	-	-	-	-	-	-	N/A
FF_Classroom 2-1.05		-	-	-	0.5	-	-	-	-	-	-	N/A
GF_Entrance Foyer-0.06		-	-	-	0.9	-	-	-	-	-	-	N/A
FF_Circ-1.27		-	-	-	0.9	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire		Display light source	
Zone name		Efficacy [lm/W]		Efficacy [lm/W]	Power density [W/m²]
Standard value		95		80	0.3
GF_WC circ-0.22		104		-	-
GF_Acc WC-0.32		100		-	-
GF_WC-0.28		100		-	-

General lighting and display lighting		General luminaire		Display light source	
Zone name		Efficacy [lm/W]		Efficacy [lm/W]	Power density [W/m²]
Standard value		95		80	0.3
GF_WC-0.29		100		-	-
GF_WC-0.24		100		-	-
GF_WC-0.25		100		-	-
GF_WC-0.30		100		-	-
GF_WC-0.31		100		-	-
GF_WC-0.26		100		-	-
GF_Acc WC-0.27		100		-	-
GF_WC-0.23		100		-	-
GF_6th Office-0.19		118		-	-
GF_Classroom 1 / Green Room-0.16		119		-	-
GF_Store-0.17		104		-	-
GF_Ch - lob-0.15		98		-	-
GF_Stair-0.05		98		-	-
GF_Hall Store-0.04		104		-	-
GF_Tea-0.20		104		-	-
GF_Clnr-0.18		104		-	-
GF_Changing-0.12		104		-	-
GF_Ch - lob-0.14		98		-	-
GF_Hygiene-0.11		112		-	-
GF_Changing-0.13		104		-	-
GF_Circulation-0.21		98		-	-
GF_6th Form Study-0.01		119		-	-
GF_Main Hall-0.03		170		-	-
GF_Foyer / 6th Form Social-0.02		120		-	-
FF_Store-1.30		180		-	-
FF_Store-1.09		180		-	-
FF_Store-1.32		180		-	-
FF_WC-1.14		100		-	-
FF_WC-1.15		100		-	-
FF_WC-1.16		100		-	-
FF_WC-1.18		100		-	-
FF_WC-1.19		100		-	-
FF_WC-1.20		100		-	-
FF_Classroom 3-1.36		119		-	-
FF_Corridor-1.35		98		-	-
FF_St WC-1.24		100		-	-
FF_Tea - Staff-1.28		98		-	-
FF_WC-1.13		100		-	-
FF_Acc WC-1.21		100		-	-
FF_Acc WC-1.21		100		-	-
FF_WC-1.17		100		-	-
FF_Mech Plant-1.10		157		-	-
FF_Social Space / Informal Study-1.06		98		-	-

General lighting and display lighting		General luminaire		Display light source	
Zone name	Standard value	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]	
FF_St WC-1.25		100	-	-	
FF_St WC-1.26		100	-	-	
FF_WC circ-1.12		98	-	-	
FF_Repro-1.31		98	-	-	
FF_Staff / Meeting Room-1.29		98	-	-	
FF_Clnr-1.33		104	-	-	
FF_Server-1.04		104	-	-	
FF_Store-1.03		180	-	-	
FF_Store-1.02		180	-	-	
FF_Corridor-1.34		98	-	-	
FF_Classroom 4-1.01		119	-	-	
FF_Stair-1.07		98	-	-	
FF_Classroom 2-1.05		119	-	-	
GF_WC-0.07		100	-	-	
GF_Switch Room-0.09		157	-	-	
GF_Entrance Foyer-0.06		98	-	-	
FF_Circ-1.27		98	-	-	

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF_6th Office-0.19	NO (-81.5%)	NO
GF_Classroom 1 / Green Room-0.16	NO (-54%)	NO
GF_Tea-0.20	N/A	N/A
GF_6th Form Study-0.01	NO (-28.3%)	NO
GF_Main Hall-0.03	NO (-99.9%)	NO
GF_Foyer / 6th Form Social-0.02	NO (-30.2%)	NO
FF_Classroom 3-1.36	NO (-54.5%)	NO
FF_Tea - Staff-1.28	NO (-43.7%)	NO
FF_Social Space / Informal Study-1.06	N/A	N/A
FF_Repro-1.31	N/A	N/A
FF_Staff / Meeting Room-1.29	NO (-57.6%)	NO
FF_Server-1.04	N/A	N/A
FF_Classroom 4-1.01	NO (-43.3%)	NO
FF_Classroom 2-1.05	NO (-55.7%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters			Building Use	
	Actual	Notional	% Area	Building Type
Floor area [m²]	1284.5	1284.5		Retail/Financial and Professional Services
External area [m²]	2276.9	2267.4		Restaurants and Cafes/Drinking Establishments/Takeaways
Weather	SWI	SWI		Offices and Workshop Businesses
Infiltration [m³/hm²@ 50Pa]	3	3		General Industrial and Special Industrial Groups
Average conductance [W/K]	468.19	588.34		Storage or Distribution
Average U-value [W/m²K]	0.21	0.26		Hotels
Alpha value* [%]	25.04	10		Residential Institutions: Hospitals and Care Homes
* Percentage of the building's average heat transfer coefficient which is due to thermal bridging				
				Residential Institutions: Residential Schools
				Residential Institutions: Universities and Colleges
				Secure Residential Institutions
				Residential Spaces
				Non-residential Institutions: Community/Day Centre
				Non-residential Institutions: Libraries, Museums, and Galleries
			99	Non-residential Institutions: Education
				Non-residential Institutions: Primary Health Care Building
				Non-residential Institutions: Crown and County Courts
				General Assembly and Leisure, Night Clubs, and Theatres
				Others: Passenger Terminals
				Others: Emergency Services
			1	Others: Miscellaneous 24hr Activities
				Others: Car Parks 24 hrs
				Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	4.87	4.32
Cooling	0.38	0.37
Auxiliary	4.48	3.74
Lighting	6.04	7.21
Hot water	11.97	11.08
Equipment*	18.19	18.19
TOTAL**	27.73	26.73

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	14.76	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	14.76	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	56.59	49.39
Primary energy [kWh _{eq} /m²]	20.7	39.81
Total emissions [kg/m²]	2.08	3.72

HVAC Systems Performance									
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	7.7	751.4	0.8	51.5	0	2.7	4.05	3	4.5
Notional	4	848.7	0.4	50.8	0	2.78	4.63	----	----
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	42.4	0	4	0	4.6	2.92	0	3.24	0
Notional	38.7	0	3.9	0	4.1	2.78	0	----	----
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	40.2	0	3.8	0	2.5	2.92	0	3.24	0
Notional	59	0	5.9	0	1.2	2.78	0	----	----
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	89.5	0	8.5	0	4.8	2.92	0	3.24	0
Notional	57.5	0	5.7	0	3.2	2.78	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

APPENDIX B: BB101 RESULTS

Room Name	Occupied hours	Criteria 1	Criteria 2	Criteria 3	Result
GF_6th Office-0.19	763	0	0	0	Pass
GF_Classroom 1 / Green Room-0.16	654	10	5	3	Pass
GF_Tea-0.20	763	0	0	0	Pass
GF_6th Form Study 0.01	763	0	2	0	Pass
GF_Foyer / 6th Form Social-0.02	763	0	1	0	Pass
FF_Classroom 3-1.36	654	15	5	3	Pass
FF_Social Space / Informal Study 1.06	763	0	0	0	Pass
FF_Staff / Meeting Room-1.29	763	0	2	0	Pass
FF_Classroom 4-1.01	654	11	3	2	Pass
FF_Classroom 2-1.05	654	10	3	2	Pass
GF_Main Hall-0.03	763	1	3	1	Pass
GF_6th Office-0.19	763	0	0	0	Pass



APPENDIX C: MECHANICAL VENTILATION FLOW RATES

Room Ref	Level	Description	Air Flow (l/s)	Operation	HR Eff
Level 00					
6th Form Study-0.01	L00	Classroom	240	0630-1900	80
6th Office-0.19	L00	Office	40	0630-1900	80
Acc WC-0.27	L00	WC	6	0630-1900	80
Acc WC-0.32	L00	WC	6	0630-1900	80
Ch - lob-0.14	L00	Circulation	67	0630-1900	80
Ch - lob-0.15	L00	Circulation	67	0630-1900	80
Changing-0.12	L00	Changing	68	0630-1900	80
Changing-0.13	L00	Changing	68	0630-1900	80
Circulation-0.21	L00	Circulation	43	0630-1900	0
Classroom 1 / Green Room-0.16	L00	Classroom	248	0630-1900	80
Clnr-0.18	L00	Store	1	0630-1900	80
Entrance Foyer-0.06	L00	Circulation	87	0630-1900	0
Foyer / 6th Form Social-0.02	L00	Social	240	0630-1900	80
Hall Store-0.04	L00	Lockers	7	0630-1900	0
Hygiene-0.11	L00	WC	12	0630-1900	80
Lift-0.08	L00	Lift	0	NA	NA
Main Hall-0.03	L00	Main Hall	1920	0630-1900	30

Riser-0.10	L00	Lift	0	NA	NA
Stair-0.05	L00	Circulation	36	0630-1900	0
Store-0.17	L00	Store	2	0630-1900	0
Switch Room-0.09	L00	Plant	2	0630-1900	0
Tea-0.20	L00	Tea	15	0630-1900	80
WC circ-0.22	L00	Riser	0	0630-1900	80
WC-0.07	L00	WC	6	0630-1900	80
WC-0.23	L00	WC	6	0630-1900	80
WC-0.24	L00	WC	6	0630-1900	80
WC-0.25	L00	WC	6	0630-1900	80
WC-0.26	L00	WC	6	0630-1900	80
WC-0.28	L00	WC	6	0630-1900	80
WC-0.29	L00	WC	6	0630-1900	80
WC-0.30	L00	WC	6	0630-1900	80
WC-0.31	L00	WC	6	0630-1900	80
Level 01					
Acc WC	L01	WC	6	0630-1900	0
Acc WC	L01	WC	6	0630-1900	0
Circ	L01	Circulation	1.2l/s/m2	0630-1900	0
Classroom 2	L01	Classroom	248	0630-1900	80
Classroom 3	L01	Classroom	248	0630-1900	80



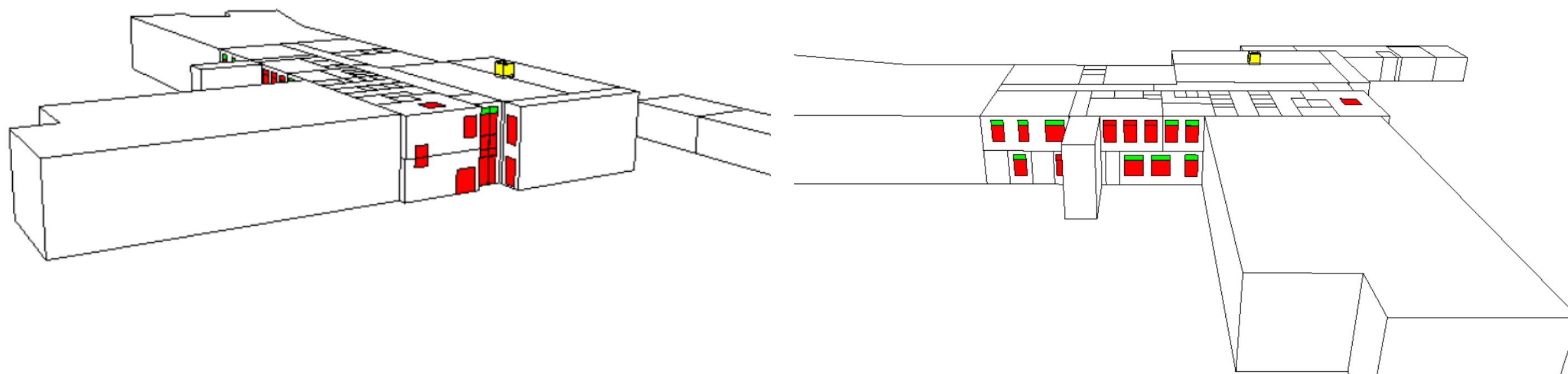
Classroom 4	L01	Classroom	248	0630-1900	80
Clnr	L01	Store	03 l/s/m2	0630-1900	0
Corridor 1.34	L01	Circulation	36	0630-1900	0
Corridor	L01	Circulation	1.2l/s/m2	0630-1900	0
Lift	L01	Lift	0	NA	NA
Mech Plant	L01	Plant	2	0630-1900	90
Repro	L01	Repro	20	0630-1900	0
Server	L01	Comms	0	0630-1900	0
Social Space / Informal Study	L01	Classroom	96	0630-1900	80
St WC	L01	WC	6	0630-1900	80
St WC	L01	WC	6	0630-1900	80
St WC	L01	WC	6	0630-1900	80
Staff / Meeting Room	L01	Office	120	0630-1900	80
Staff WC circ	L01	WC	16	0630-1900	80
Stair	L01	Stair	36	0630-1900	0
Store 1.02	L01	Store	2	0630-1900	0
Store 1.03	L01	Store	2	0630-1900	0
Store	L01	Store	2	0630-1900	0
Store	L01	Store	2	0630-1900	0
Store	L01	Store	2	0630-1900	0
Tea	L01	Tea	15	0630-1900	80

WC circ	L01	Circulation	9	0630-1900	80
WC	L01	WC	6	0630-1900	80
WC	L01	WC	6	0630-1900	80
WC	L01	WC	6	0630-1900	80
WC	L01	WC	6	0630-1900	80
WC	L01	WC	6	0630-1900	80
WC	L01	WC	6	0630-1900	80
WC	L01	WC	6	0630-1900	80

APPENDIX D: OPENABLE WINDOW LOCATION FOR OVERHEATING ASSESSMENT

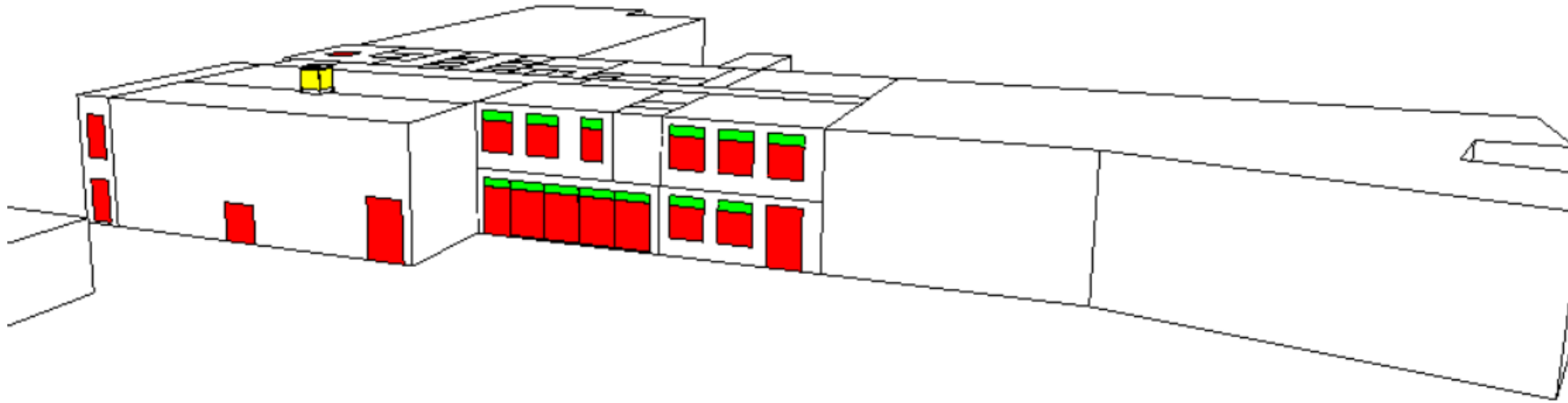
Opening Type

- XTRN0000 (External window opening closed)
- XTRN0001 (External Louver opening 40%)
- XTRN0004 (Monodraught Quantum Damper)
- XTRN0034 (Abbeyfield WINDCATCHER X-Air 200)



Opening Type

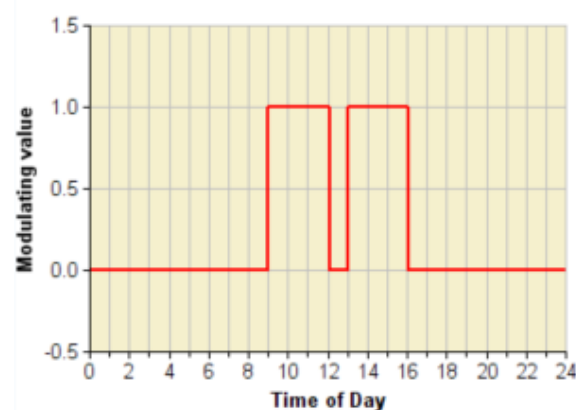
- XTRN0000 (External window opening closed)
- XTRN0001 (External Louver opening 40%)
- XTRN0004 (Monodraught Quantum Damper)
- XTRN0034 (Abbeyfield WINDCATCHER X-Air 200)



APPENDIX E: ROOMS INPUT FOR OVERHEATING ASSESMENT

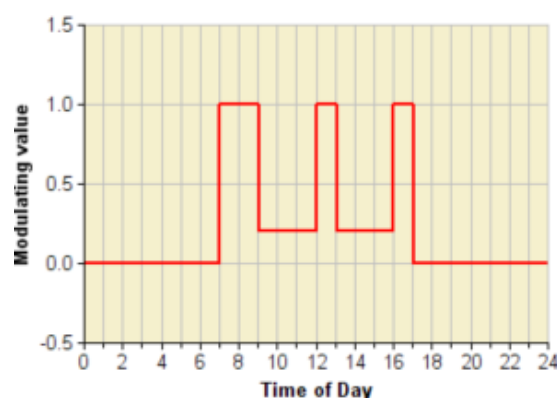
classroom

People gain	30-31	p
Sensible heat gain	70 W	Per person
latent heat gain	55 W	Per person
Lighting gain	7.2	W/ m ²
Equipment gains	10	W/ m ²



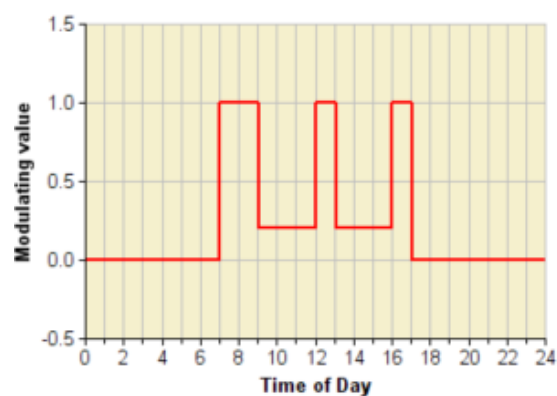
Office / staff / meeting spaces

People gain	4-12	p
Sensible heat gain	70 W	Per person
latent heat gain	55 W	Per person
Lighting gain	7.2	W/ m ²
Equipment gains	10	W/ m ²



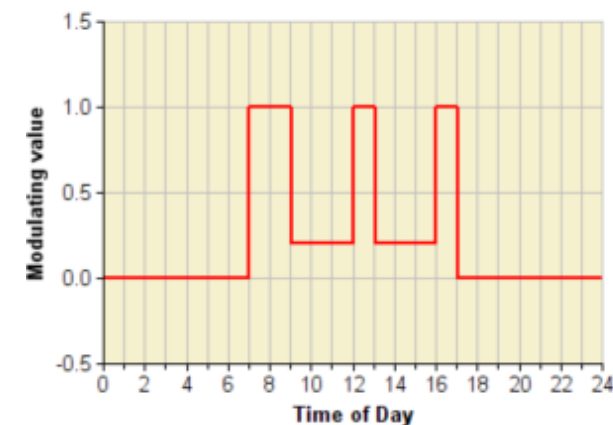
Social spaces

People gain	12-30	p
Lighting gain	7.2	W/ m ²
Sensible heat gain	70 W	Per person
latent heat gain	55 W	Per person
Equipment gains	10	W/ m ²



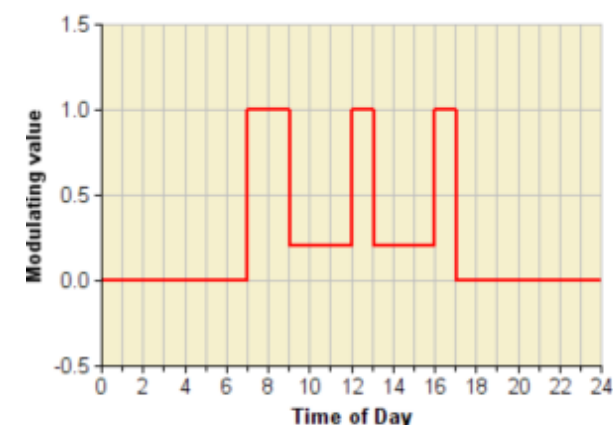
Tea points

People gain	2-3	p
Sensible heat gain	70 W	Per person
latent heat gain	55 W	Per person
Lighting gain	7.2	W/ m ²
Equipment gains	10	W/ m ²



Main Hall

People gain	240	p
Sensible heat gain	70 W	Per person
latent heat gain	55 W	Per person
Lighting gain	7.2	W/ m ²
Equipment gains	10	W/ m ²





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