NG Bailey

MAN-MET SCIENCE AND ENGINEERING

TM54 OPERATIONAL ENERGY REPORT

SEPTEMBER 2025

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Notes

Notice this document and its contents have been prepared and are intended solely as information for Man-Met Science and Engineering

NG Bailey assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

This document has 20 pages including the cover.

Version

Rev	Prepared by	Checked by	Date
A	Luke Dollan	Garry Leedham	11.09.25
B			
C			
D			

Rev B update reason:

EXECUTIVE SUMMARY

Analysis has been carried out in order to estimate the operational energy consumption (regulated and un-regulated) for the Man-Met Science and engineering building.

The analysis has been carried out in line with the methodology set out in CIBSE Technical Memorandum 54 “Evaluating Operational Energy Performance of Buildings at the Design Stage”

Based on the operating inputs detailed within this report the analysis has determined estimated annual energy consumption for the following fuel categories.

Occupancy profiles and utilisation factors are based on a maximum building occupancy of 2,786 persons, as defined in the fire strategy. These profiles, derived from the national university calculation methodology, were used to calculate heating, cooling, ventilation, and the overall energy profile. In the absence of client or end-user input, TM54 profiles have been assumed and aligned with MMU’s published academic calendar. NG Bailey accepts no responsibility for discrepancies or outcomes arising from these assumptions, which rely solely on available documentation and public information

Simulation Annual Profile for the university academic year

Term 1 **19th Jan to 28th March**
Term 2 **19th April to 22nd May**
Term 3 **22nd September to 12th December**

High - The assessment is based on assumed occupancy levels and operational profiles, which were derived from publicly available information (including university term times and typical operational hours). Actual usage patterns may vary.
A diversity factor of 100% has been applied across all equipment. This represents a conservative assumption and may not fully reflect realistic operating conditions, where actual simultaneity of use is often lower.
The results should therefore be interpreted as indicative rather than definitive. They are intended to provide a high-level understanding of energy use relative to PV generation, not an exact representation of actual building performance.
Future validation with metered building data is recommended to refine these assumptions and improve accuracy.
The catering energy has been calculated on 2000 servings using TM50.

Medium Base model – The assessment has been prepared using assumed occupancy patterns and generic user profiles in the absence of direct consultation with the client or end users.
Operational hours have been assumed to align with a standard Monday–Friday schedule during the academic year. These assumptions are based on reasonable planning parameters but may not capture all variations in practice (e.g., evening use, weekend activities, or off-term operations).
The findings should be considered indicative and subject to refinement. Actual building use may differ from the modelled scenario, which could affect energy demand and PV utilisation outcomes.
To improve accuracy and ensure alignment with the intended operation of the facility, validation against measured operational data or confirmation from the client is recommended.
The catering energy has been calculated on 1500 servings using TM50.

Low – This assessment is based on the same assumed occupancy profiles as used in the Medium Base Model.
No direct validation with the client or end users has been undertaken, and actual operational patterns may differ.
A reduced diversity factor has been applied to equipment loads. This assumption increases the likelihood of concurrent usage and therefore represents a more conservative estimate of demand. Actual simultaneity of equipment operation may be lower in practice.

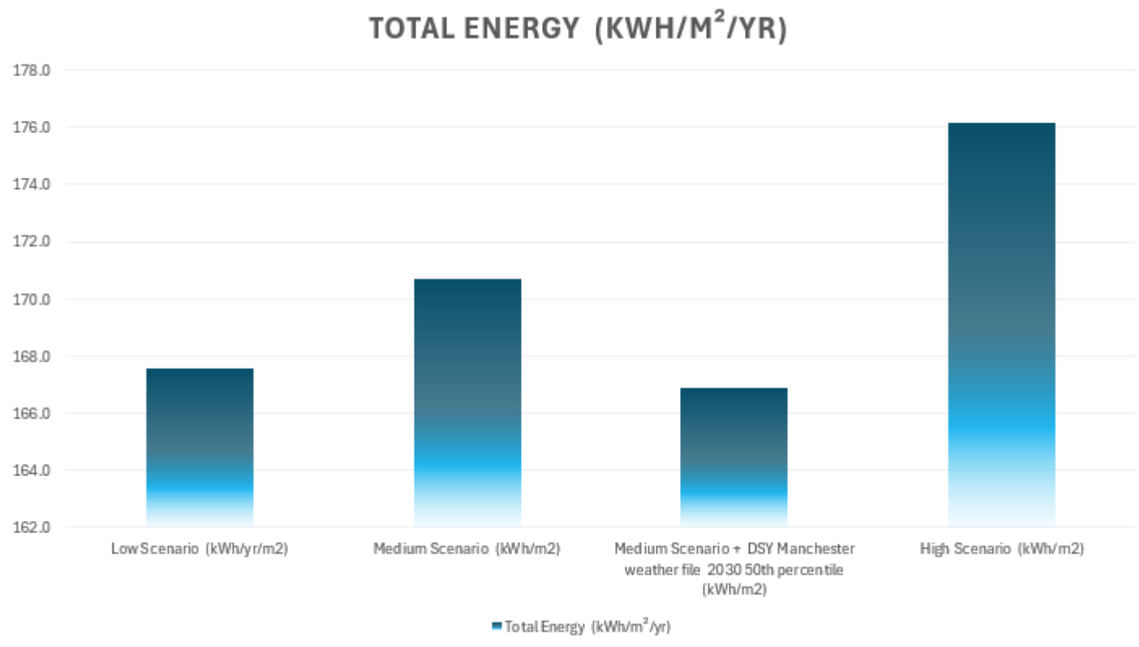
The catering energy has been calculated on 1000 servings using TM50.

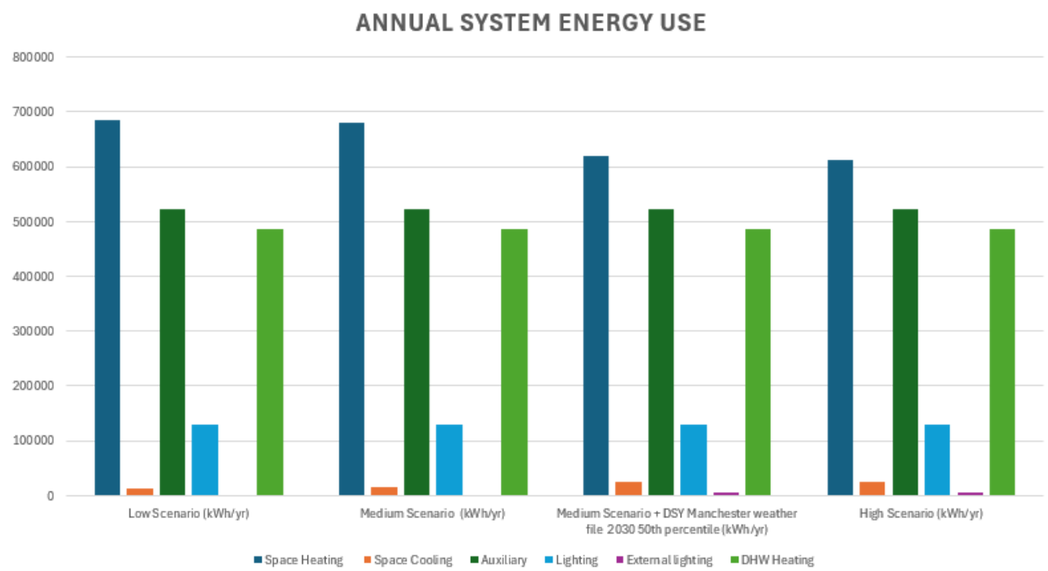
The PV array size has been increased within the model to explore potential impacts. This does not reflect a confirmed design specification and should be treated as a scenario analysis rather than a final proposal.
The results are indicative and intended for comparative purposes only. Validation against measured building data or client confirmation is required to verify alignment with the intended operational conditions and system design.

Based on occupancy profiles as in the medium base run, with a further reduced diversity factor applied to the equipment and increased PV array.

The total building demand is as shown below, which is offset by the PV array and CHP energy production

Scenario		Building Demand	LZC Generated energy	Demand - LZC
High	Annual Electricity Consumption (kWh)	2257067.0	205,974	2051093.00
Medium	Annual Electricity Consumption (kWh)	2299086.0	205,974	2093112.00
Medium + 2030 weather file	Annual Electricity Consumption (kWh)	2253849.0	205,974	2047875.00
Low	Annual Electricity Consumption (kWh)	2379245.0	278,372	2100873.00





1. INTRODUTION

It is recognised that when estimating energy use in buildings there is a large difference between the annual energy consumption loads within the Part L model and the actual energy use. The main reasons for the difference are:
Part L models are not intended to be used as predictions of energy consumption.
Part L use standard profiles and inputs which may not represent how the building will be used.
Part L models only evaluate the regulated energy consumption and do not consider the unregulated energy consumption.

CIBSE TM54: Evaluating operational energy performance of buildings at the design stage provides a methodology to predict the energy use in operation. Calculating the operation energy use can help to provide an indication of energy use, carbon emissions and running costs for the building. Additionally, it can provide an understanding of where and how the energy is used, and what measures have the greatest impact on energy use, ensuring that occupiers do not have unrealistic expectations on the performance of the building.

This report presents the outputs from the TM54 assessment

The treated floor area has been based on the areas extracted from the IES model. Treated floor area includes the areas of the building services by plant and equipment and excludes areas of the building that are not directly heated or cooled such as risers or plant rooms. The treated floor area used in the assessment is 13470m2.

This report also provides a detailed review of the targets/industry standard benchmarks set within the science and engineering building assessing their feasibility, alignment with objectives, and potential challenges. Understanding the effectiveness of these targets/industry standard benchmarks is essential to ensuring optimal performance, efficiency, and sustainability.

The review focuses on key performance indicators, benchmarking data, and projected outcomes. It also examines whether the targets are realistic, achievable, and aligned with industry best practices and regulatory requirements.

Furthermore, potential risks and mitigation strategies are explored to enhance the likelihood of success.

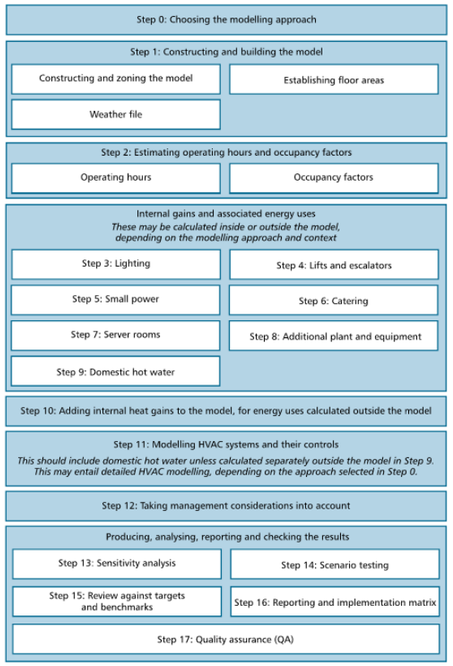
By analysing these aspects, this report aims to provide clear recommendations for refining targets to maximize project efficiency and effectiveness.

Methodology

The CIBSE TM54 methodology has been used to calculate the predicted energy use for the science and engineering building.
The assessment includes scenarios outlined in the medium baseline assessment.
The input data used in the TM54 assessment have been collected a number of ways:

- GA Drawings
- Manufactures data
- As design MEP
- CIBSE guide A
- Room data sheet
- Furniture layouts

The diagram below (recreated from the CIBSE TM54 methodology document) sets out the process that has been used.



Modelling Approach

As stated, the Operational Energy assessment within this report has been carried out using a combination of DSM software and manual calculations. IES-VE (version 2024) software
was used to assess end-use categories, as defined by CIBSE TM54 methodology, including the modelling of heating, cooling, ventilation, lighting equipment, server room equipment and lifts and other auxiliary gains. Manual calculations were used to assess domestic hot water (DHW) use.

2. MODEL INPUTS

Weather Data & building orientation

A local weather file must be selected for the model to represent the building location. For this project the weather file used for the analysis is the CIBSE Test Reference Year (TRY) Manchester (this being the closest and most applicable file for the Science and Engineering building.

The orientation of the model has been set to the actual orientation on the site.

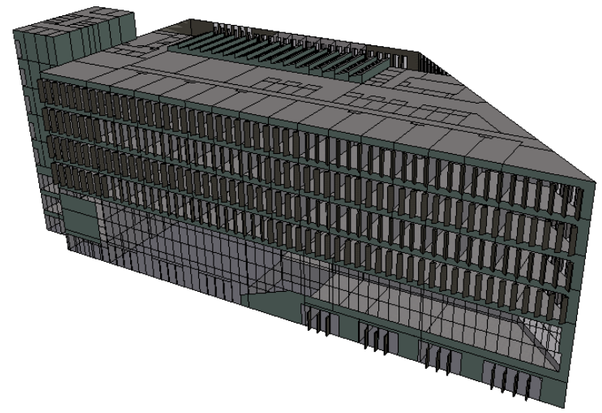


Image 1 – Science and Engineering building

Building operation and treated area

The occupancy has been assumed. details of these operating profiles (Occupants, lighting, and equipment) for each room type can be found in Appendix A.

From these profiles the building is occupied for a maximum of 11 hrs per weekday and 0 hrs per weekend day, during the academic year.

The treated area is based on the entire building less, risers, and plant areas – 13470m2

Building Fabric and constructions

The building fabric thermal properties have been based on the U-values stated within the as-built BRUKL document. As this document was produced by a third party, NG Bailey is unable to independently verify the accuracy of these figures and therefore cannot accept responsibility for their validity.

Type	U-value (W/m².K)
External Wall	0.35
External Basement Wall	N/A
Solid Ground Floor	0.25
Exposed roof	0.25
Personnel Door	1.1
Vehicle Door	N/A
Roof Smoke Vents	N/A

Description	U-Value (Inc Frame) (W/m²K)	g-Value
External Glazing	2.2	0.40
Roof Lights	2.2	0.35

Heating and cooling set points

The following table details the heating & cooling set point used in the heating & cooling energy estimate.

Room type	Heating Set Point (°C)	Cooling Set Point (°C)
Circulation/stairs	20	Uncontrolled
Office	21	26
Seminar Rooms	21	24
WC	19	Uncontrolled
Changing areas	20	Uncontrolled
Showers	20	Uncontrolled
Plant spaces	5	Uncontrolled
Comms rooms	22	23
Stores/ cupboards	12	Uncontrolled
Reception	22	26
Event Stairs	22	26
Labs	21	24
Kitchen/servery	16	27

Heating & Cooling operation

Each space is provided with heating or cooling in accordance with the heating & cooling design.

The analysis considers the plant to operate during the following periods.

Plant Item	Operation Profile
Heating plant	The heating operation it set to control to each room set point. The heating plant is set to activate three hours prior to the building occupation this is to allow for pre heat and management factors. The above is set to activate five days a week with a nighttime set back of 15°C to maintain the background during weekends and out of hours.
Cooling plant	Hours 8am to 7pm
Ventilation plant	8am to 7pm. In spaces where ventilation is supplying warm air these spaces have been set to activate if any setback temperature is activated in any room.

Main Plant Efficiencies

2.1.1 Heating

System Name	Heating Fuel	Seasonal Eff.	Delivery Eff.	SCoP kW/kW
Split System (Comms)	Electricity: Heating elec	4	0.9808	3.9234
Underfloor AHU1	Electricity: Heating elec	4.6	0.9393	4.3206
Underfloor AHU4	Electricity: Heating elec	4.6	0.9393	4.3206
Underfloor Nat vent	Electricity: Heating elec	4.6	0.9393	4.3206
Central Air Distribution (Kitchen) AHU2	Natural Gas: Heating gas	0.95	1.0669	1.0136
Displacement AHU3	Natural Gas: Heating gas	0.95	0.9069	0.8616
Displacement AHU4	Natural Gas: Heating gas	0.95	0.9008	0.8558
Greenhouse heaters	Natural Gas: Heating gas	0.95	1.0669	1.0136
HB AHU3	Natural Gas: Heating gas	0.95	0.8147	0.774
HB AHU4	Natural Gas: Heating gas	0.95	0.8117	0.7711
HB AHU5	Natural Gas: Heating gas	0.95	0.8143	0.7736
HB AHU5 VAV	Natural Gas: Heating gas	0.95	0.8147	0.774
HB AHU6	Natural Gas: Heating gas	0.95	0.8103	0.7698
HB AHU6 VAV	Natural Gas: Heating gas	0.95	0.8103	0.7698
Radiant Panel AHU1	Natural Gas: Heating gas	0.95	0.8923	0.8477
Radiant Panel AHU3	Natural Gas: Heating gas	0.95	0.8923	0.8477
Radiant Panel AHU4	Natural Gas: Heating gas	0.95	0.8923	0.8477
Radiant Panel Nat vent	Natural Gas: Heating gas	0.95	0.8923	0.8477
Rads AHU1	Natural Gas: Heating gas	0.95	0.9393	0.8923
Rads AHU4	Natural Gas: Heating gas	0.95	0.9393	0.8923
Rads Nat Vent	Natural Gas: Heating gas	0.95	0.9393	0.8923
VAV (Ground and First) AHU1	Natural Gas: Heating gas	0.95	0.7627	0.7246
VAV (Ground and First) AHU3	Natural Gas: Heating gas	0.95	0.7627	0.7246
AHU1	Natural Gas: Heating gas	0.95	0.9871	0.9377
AHU2	Natural Gas: Heating gas	0.95	0.8874	0.843
AHU2 VAV	Natural Gas: Heating gas	0.95	0.8874	0.843
AHU3	Natural Gas: Heating gas	0.95	0.9799	0.9309
AHU4	Natural Gas: Heating gas	0.95	0.9739	0.9252
AHU5	Natural Gas: Heating gas	0.95	0.9835	0.9343
AHU6	Natural Gas: Heating gas	0.95	0.9695	0.921
Radiant Panel AHU2	Natural Gas: Heating gas	0.95	0.8923	0.8477

System Name	Heating Fuel	Seasonal Eff.	Delivery Eff.	SCoP kW/kW
VAV (Ground and First) AHU2	Natural Gas: Heating gas	0.95	0.7492	0.7117
VAV (Ground and First) AHU4	Natural Gas: Heating gas	0.95	0.7609	0.7229
VAV (Labs)	Natural Gas: Heating gas	0.95	0.7638	0.7256

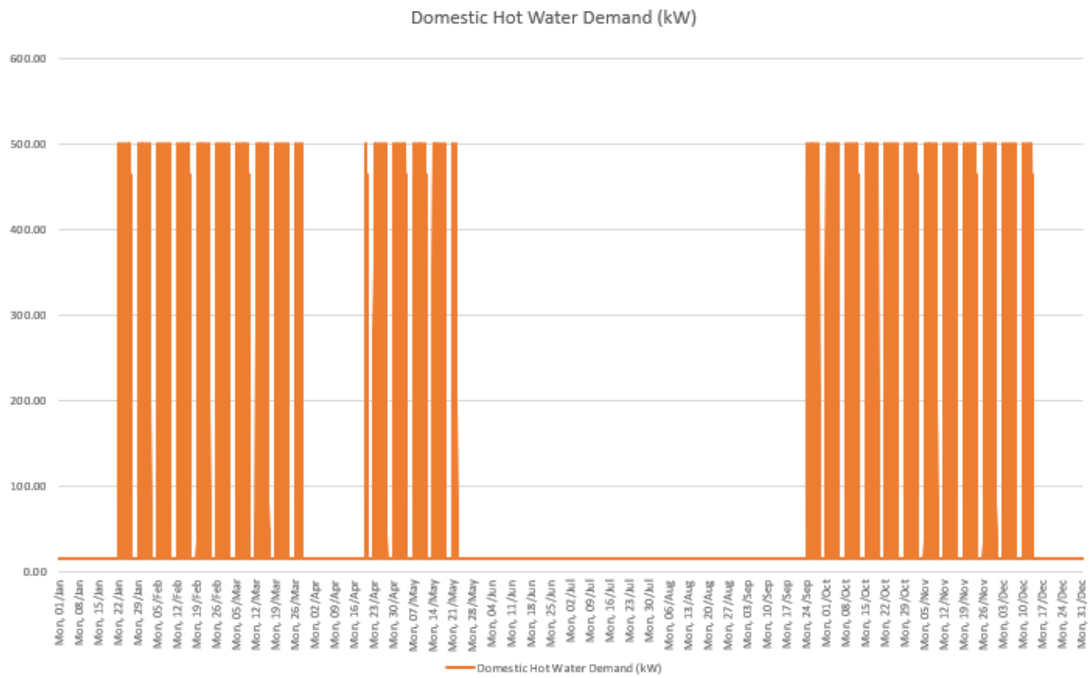
2.1.2 Cooling

System Name	Seasonal EER (kW/kW)	SSEER (kW/kW)	Vent Heat Recovery Eff.	System Specific Fan Power (SFP) W/(l/s)
Displacement AHU3	6.75	6.2159	0.76	2
VAV (Ground and First) AHU1	6.25	3.9381	0.75	1.3
Split System (Comms)	5.8	4.3347	0	0
VAV (Ground and First) AHU3	6.25	3.7856	0.76	2
VAV (Ground and First) AHU4	6.25	3.7856	0.75	2
HB AHU3	6.25	4.2827	0.76	2
HB AHU4	6.25	4.2827	0.75	2
HB AHU5	6.25	4.2827	0.75	2
HB AHU6	6.25	4.2827	0.74	2
Displacement AHU4	6.75	6.1806	0.75	2
HB AHU5 VAV	6.25	4.2827	0.75	2
HB AHU6 VAV	6.25	4.2827	0.74	2
AHU2	2	0.8886	0.75	2
AHU1	2	1.0028	0.75	1.3
VAV (Ground and First) AHU2	6.25	3.7856	0.75	2
AHU2 VAV	2	1.0224	0.75	2
AHU4	6.25	3.1778	0.75	2
AHU6	6.25	3.1778	0.74	2
AHU5	6.25	3.1778	0.75	2
AHU3	6.25	3.1778	0.76	2

2.1.3 Domestic Hot Water

Domestic Hot Water:

- Has been calculated in a spreadsheet using the following methodology: The heating efficiency for the domestic hot water is based on a SCOP of 0.95
    - Total estimated Daily Hot Water demand as calculated for the hot water system sizing, based on building occupants and CIBSE guidance.
    - The total demand is then profiled across a typical day to give usage per hour (Graph 1). The profile comes from BS EN 12831-3 2017.
    - Separately, from the TM54 model the hourly building occupants across the year are scheduled out (Table 1). And the maximum occupancy is noted. From this a figure can be calculated for % of occupants present in any given hour
    - Graph 1 is a daily profile based on occupancy from the medium base model which incorporates occupancy diversity. The values in Table 1 provide us an hourly occupancy usage % based on assumed occupancy profiles. These 2 datasets are used in conjunction to provide an estimated, hourly hot water demand across 1 year.
- In addition to the estimated annual hot water demand the pipework standing losses based on the installed meterage of insulated pipe are also taken into account, to provide a figure for the standing losses of the system to be included in the total.



Graph 1 – Domestic Hot Water usage

Lighting Energy

2.1.4 Internal

Item	Value
Lighting Power / Heat Gain	
Lighting Efficiency (lm/W)	Based on NGB as designed lighting schedule
Input Method	W/m² calculated in TM54 model from design calculations and profiles
Annual Lighting Consumption Method	Thermal model lighting power
Controls	
Control Types	As NGB lighting drawings
Constant Illuminance Factor (Fc)	1 (to areas with daylight dimming)
Occupancy Factor (Fo)	0.9 (to areas with PIR control)
Daylight Dimming (Fd)	1 (to areas with daylight dimming)

Ventilation Energy

Item	Value
Air Handling Unit Energy	
AHU Annual Flowrate	Based on TM54 thermal model
AHU SFP (Constant Volume)	Based on as designed AHU manufacturers data
Extract Fan Energy	
Annual Flowrate	Based on design flowrate & assumed operation period
SFP (Constant Volume)	Based on confirmed manufacturers data
Fan Coil Units & Fan assisted Trench Fan Energy	
Annual Flowrate	Based on design flowrate & operation period plus 2-hour pre heat in winter
SFP	Based on confirmed manufacturers data

Lift Energy

Lift energy consumption has been estimated based on a 7-storey building in operation for 34 weeks per year, five days per week. The calculation assumes an average of 0.03 kWh per trip, with an additional standby consumption of 2.4 kWh per day across all six lifts.

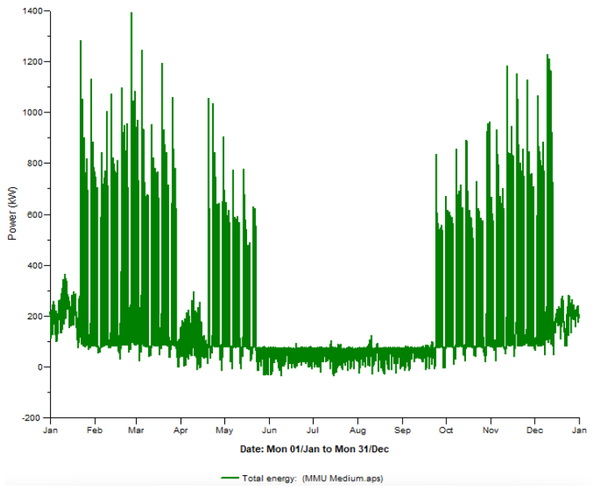
Scenario	Trips/day (per lift)	Motion energy (kWh/day)	Standby energy (kWh/day)	Total (kWh/day, per lift)	Total (kWh/day, 6 lifts)
Medium	350	10.5	2.4	12.9	77.4

Photovoltaic Panels

Renewable / LZC Technologies
PV Cells are predicted to have a yield of 110,915kWh as per the calculation within VE IES

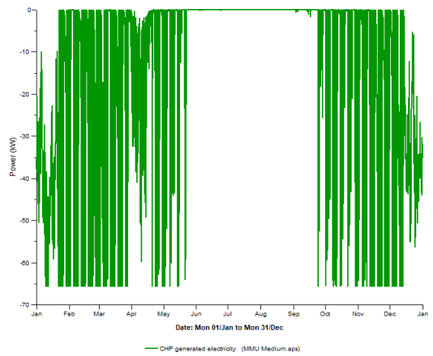
Due to the building's consistent energy demand, particularly from certain equipment that operates continuously, all energy generated by the photovoltaic (PV) system is effectively utilized. At no point is the PV output in excess of the building's requirements, meaning no generated energy is wasted or lost.

The graph below illustrates this relationship clearly, showing that the building's energy consumption never falls into a negative state. In other words, the demand remains greater than or equal to the PV generation at all times.



Combined Heating and Power (CHP)

Renewable / CHP Technologies
CHP predicted to have a yield of 110,384kWh as per the calculation within VE IES



3. SUMMARY OF RESULTS

The following table summarises the building predicted annual electricity & thermal energy consumption and the predicted energy produced by the PV array and CHP.
The energy use of ‘poorly managed’ buildings can be significantly higher, even double or triple that of ‘well managed’
buildings, depending on numerous factors including the complexity of the building and its systems and the level of engagement of its occupiers.
The below results scenarios also consider an increase in energy use due by applying a management factor, as detailed in each scenario.
In absence of any defined targets the Medium (Baseline) results should be used to gauge the building performance”

scenarios:-

High - Based on occupancy and profiles assumed based on the operational hours sourced from the internet and university term time. Diversity factor for all equipment applied to 100%.

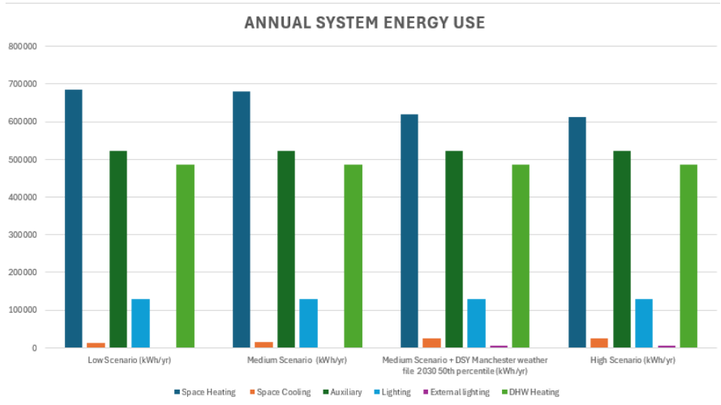
Medium Base model – The assessment has been prepared using assumed occupancy patterns and generic user profiles in the absence of direct consultation with the client or end users.
Operational hours have been assumed to align with a standard Monday–Friday schedule during the academic year. These assumptions are based on reasonable planning parameters but may not capture all variations in practice (e.g., evening use, weekend activities, or off-term operations).
The findings should be considered indicative and subject to refinement. Actual building use may differ from the modelled scenario, which could affect energy demand and PV utilisation outcomes.
To improve accuracy and ensure alignment with the intended operation of the facility, validation against measured operational data or confirmation from the client is recommended.

Medium (Baseline with DSY Leeds 2030 50th percentile weather file) – Based on the above medium base run.

Low – This assessment is based on the same assumed occupancy profiles as used in the Medium Base Model. No direct validation with the client or end users has been undertaken, and actual operational patterns may differ. A reduced diversity factor has been applied to equipment loads. This assumption increases the likelihood of concurrent usage and therefore represents a more conservative estimate of demand. Actual simultaneity of equipment operation may be lower in practice.
The PV array size has been increased within the model to explore potential impacts. This does not reflect a confirmed design specification and should be treated as a scenario analysis rather than a final proposal.
The results are indicative and intended for comparative purposes only. Validation against measured building data or client confirmation is required to verify alignment with the intended operational conditions and system design.

Regulated Energy								
End use Category	Low Scenario (kWh/yr)	Low Scenario (kWh/yr/m2)	Medium Scenario (kWh/yr)	Medium Scenario (kWh/m2)	Medium Scenario + DSY Manchester weather file 2030 50th percentile (kWh/yr)	Medium Scenario + DSY Manchester weather file 2030 50th percentile (kWh/m2)	High Scenario (kWh/yr)	High Scenario (kWh/m2)
Space Heating	684584	50.82	680055	50.49	618942	45.95	612870	45.50
Space Cooling	13468	1.00	15539	1.15	25816	1.92	24337	1.81
Auxiliary	522246	38.77	522246	38.77	522246	38.77	522246	38.77
Lighting	129028	9.58	129028	9.58	129028	9.58	129028	9.58
External lighting	0	0.00	0	0.00	5599	0.00	6108	0.00
DHW Heating	485781	36.06	485781	36.06	485781	36.06	485781	36.06
Total Regulated Energy (kWh/yr)	1835107		1832649		1787412		1780370	
Total Regulated Energy (kWh/m²/yr)		136.2		136.1		132.3		131.7
Unregulated Energy								
Small Power Equipment	260185	19.32	263862	19.59	263862	19.59	355500	26.39
Servers	67017	4.98	67017	4.98	67017	4.98	67017	4.98
Catering	81600	6.06	122400	9.09	122400	9.09	163200	12.12
Lifts	13158	0.98	13158	0.98	13158	0.98	13158	0.98
Total Unregulated Energy (kWh/yr)	421960		466437		466437		598875	
Total Unregulated Energy (kWh/m²/yr)		31.3		34.6		34.6		44.5
Total Energy (kWh/m²/yr)		167.6		170.7		166.9		176.2

"The results below are consistent with the established metering and sub-metering strategy, enabling the client to conduct a direct, like-for-like comparison between actual system performance and the predicted outcomes. This alignment supports transparent performance evaluation and facilitates data-driven decision-making moving forward."



Scenario, Management and sensitivity results Comparison

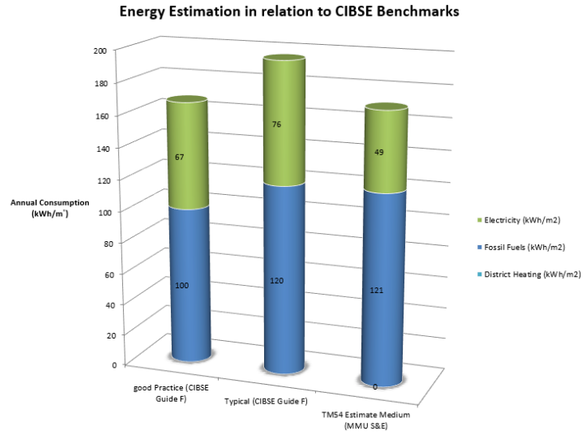
The below table show the energy consumption for each end use items for the three different scenarios detailed in this report.

Most Sensitive Areas:

- Small power consumption and heating demand
- This means these areas are more responsive to changes in input assumptions, decisions, or external variables.

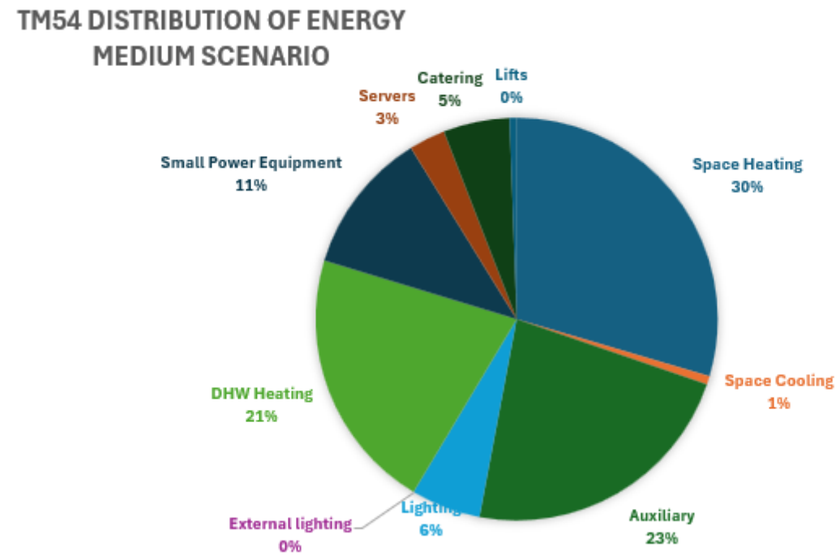
Comparison against Benchmark

The below imagine shows the estimated energy results for the MMU Science and Engineering building against industry standard benchmarks.
The first been CIBSE guide F, teaching science energy Benchmark for existing building of a similar size and use.
The results show that the proposed building is falls below the comparison CIBSE guide F (typical) benchmarks and the TM46 benchmarks and only just exceed the CIBSE guide F (Good practice) benchmark.



Building Energy Consumption Distribution

The below distribution chart apportions the energy in percentage values to better understand where they energy consumption is distributed across the building.



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Results analyse

The analysis of the TM54 assessment results provides insights into the performance of the projected energy use and its alignment with the original targets. The data has been reviewed against industry benchmarks, design expectations, and operational considerations to identify any discrepancies or areas for improvement.
Key findings include:

- **Comparison with Predicted Performance**: The results indicate whether the energy consumption estimates align with initial expectations and highlight any significant deviations.
- **Efficiency of Systems**: A breakdown of energy use across key building systems (e.g., HVAC, lighting, and plug loads) identifies areas of efficiency and potential excess consumption.
- **Seasonal and Operational Variability**: Consideration of how performance varies under different conditions helps determine the resilience and adaptability of the design.
- **Potential Optimisations**: The client should review the report on areas they feel could be optimised.

4. APPENDIX A – BUILDING OPERATING PROFILES

The following occupancy profiles have been derived from the national calculation methodology for universities; it has been assumed that the building will only operate Monday to Friday during the academic year.

The associated lighting profile has been based on the being on 100% during the occupied period.

The associated equipment gains / load has been based on the occupancy periods; it was discussed with the client that all equipment will be switched off out of hours. As part of the energy management process.
Bar the drying room cabs and the IT equipment which will run 24/7.

The following profiles detail the occupancy operating times for each room type for the following day types:

Seminar Room

Image 2- Weekday

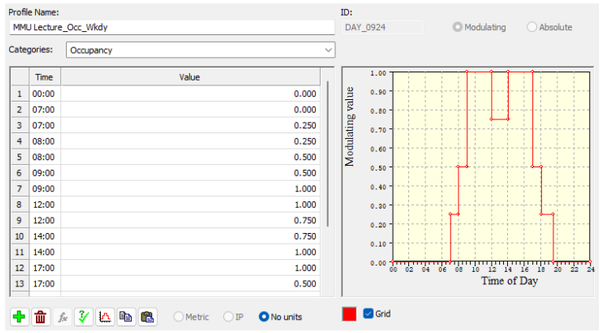
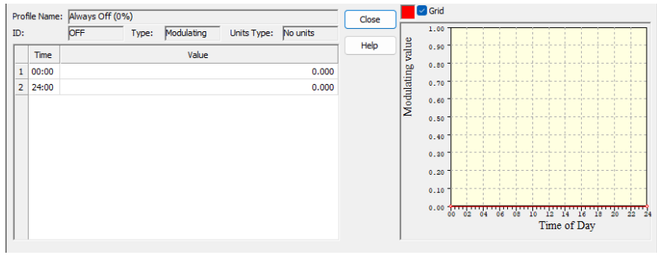


Image 3- Weekend



Single person office

Image 4 - Weekday

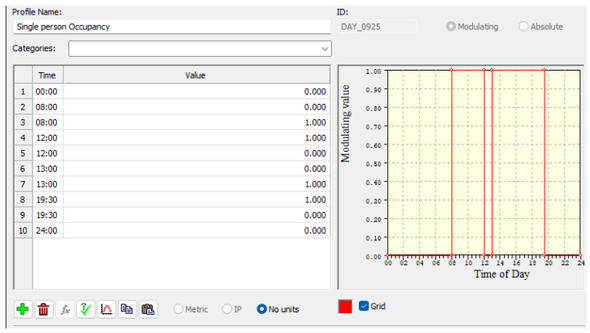
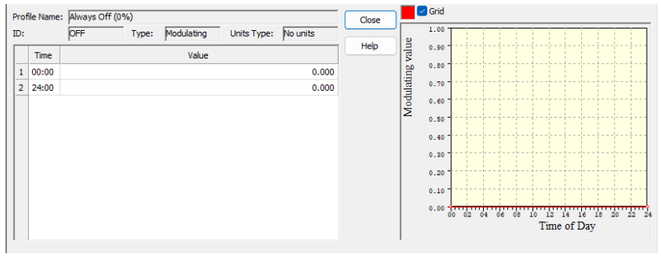


Image 5 - Weekend



Multi occupancy Office/Meeting/other

Image 6 – Weekday

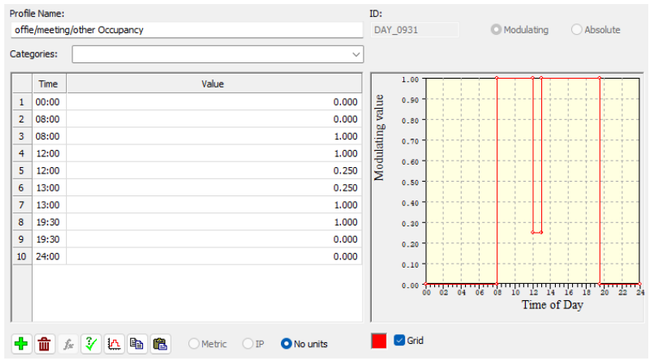
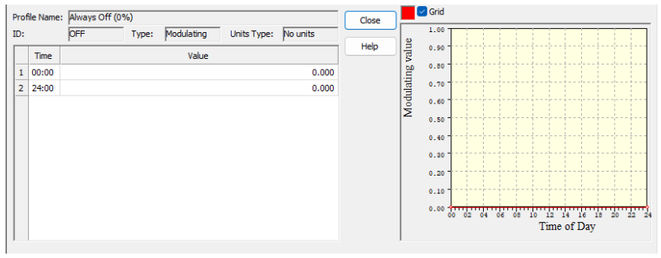


Image 7 - Weekend



Kitchen and Servery

Image 8 – Weekday

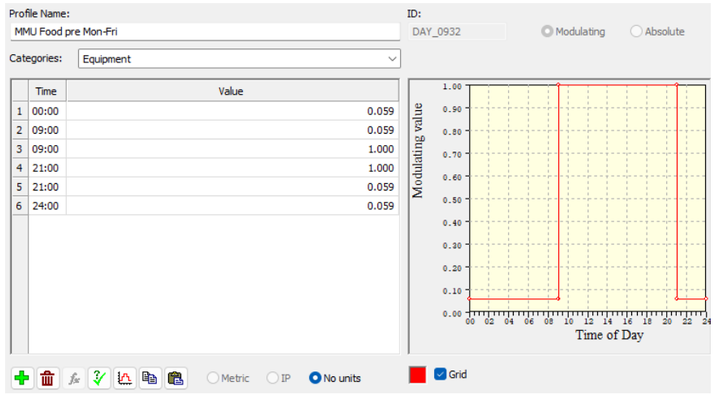
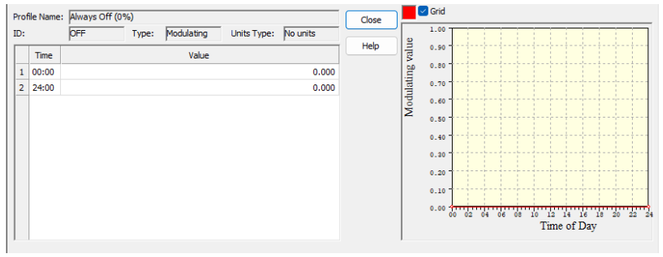


Image 9 - Weekend



5. APPENDIX B – OCCUPANCY, HEAT GAINS AND SMALL POWER CONSUMPTION

Internal Gains and Small power

Room by room heat gain loads have been included in the analysis based on the loads and occupancy levels developed from the MEP design.

Occupant heat gain sensible and latent per person are based on the original Hoare Lea MEP specification.

The below table represents the input data for the medium assessment.

Room Name	People	People Diversity	Lighting (W)	Computer Equipment gains (W)	Computer Electrical Consumption (W)	Small power Equipment gains (W)	Smal Power Electrical Consumption (W)
G.07 Servery	4	0.75	1266.19	0.0	0.0	5979.0	5979.0
G.08 Preparation	2	1	425.191	0.0	0.0	0.0	0.0
G.11 Store	0	1	247.389	0.0	0.0	0.0	0.0
G.12 Hospitality	0	1	0	0.0	0.0	0.0	0.0
G.13 Store	0	1	52.952	0.0	0.0	0.0	0.0
G.14 Office	2	1	70.648	374.0	374.0	0.0	0.0
G.16 Pot Wash	1	1	138.332	0.0	0.0	7796.0	7796.0
G.17 Dirty Wash	1	1	185.059	0.0	0.0	0.0	0.0
G.19 Study / Break-out	46	0.8	1397.262	1746.6	1746.6	0.0	0.0
G.23 Event Stair	34	0.8	698.076	1224.0	1224.0	0.0	0.0
G.04 Baby Feed	0	1	53.928	0.0	0.0	0.0	0.0
G.05 Shower Lobby	0	1	132.332	0.0	0.0	0.0	0.0
G.05b Shower	0	1	38.238	0.0	0.0	0.0	0.0
G.05c Shower	0	1	38.517	0.0	0.0	0.0	0.0
G.05d Shower	0	1	39.086	0.0	0.0	0.0	0.0
G.05e Shower	0	1	42.47	0.0	0.0	0.0	0.0
G.05f Shower	0	1	42.473	0.0	0.0	0.0	0.0
G.05g Shower	0	1	41.552	0	0	0.0	0.0
G.06 Changing Places	0	1	112.771	0	0	0.0	0.0
G.18 Social / Break-out	194	0.8	4538.823	5673.528	5673.528	0.0	0.0
G.5a Lockers	0	1	102.751	0	0	0.0	0.0
1.04 Seminar Room 5	48	0.8	755.278	1728	1728	300.0	300.0
1.05 Seminar Room 6	54	0.8	828.108	1944	1944	300.0	300.0
1.06 Seminar Room 7	54	0.8	845.26	1944	1944	300.0	300.0
1.07 Seminar Room 8	54	0.8	843.724	1944	1944	300.0	300.0
1.08 Seminar Room 9	54	0.8	829.644	1944	1944	300.0	300.0
1.AWC.02 Acc WC	0	1	42.793	0	0	1500.0	1500.0
1.WC.02 All gender WC	0	1	33.672	0	0	1500.0	1500.0
2.AWC.02 Acc WC	0	1	42.152	0	0	1500.0	1500.0
2.WC.02 All gender WC	0	1	33.168	0	0	1500.0	1500.0

Room Name	People	People Diversity	Lighting (W)	Computer Equipment gains (W)	Computer Electrical Consumption (W)	Small power Equipment gains (W)	Smal Power Electrical Consumption (W)
3.07 Collaboration Area	11	0.8	210.267	396	396	0.0	0.0
3.08 Collaboration Area	2	1	229.592	72	72	0.0	0.0
3.09 Exec PA	2	1	119.208	374	374	0.0	0.0
3.10 FPVC Meeting Room	12	0.8	212.452	432	432	300.0	300.0
3.11 Director of FP&O	1	1	58.951	187	187	0.0	0.0
3.12 Faculty PVC (Dean)	1	1	58.946	187	187	0.0	0.0
3.13 AD/Director of PR&P	1	1	58.967	187	187	0.0	0.0
3.14 Group Booth	4	0.75	27.612	144	144	0.0	0.0
3.15 Group Booth	4	0.75	28.129	144	144	0.0	0.0
3.16 Kitchenette	0	1	173.21	0	0	6194.0	6194.0
3.17 Exec Meeting Room	2	1	47.34	72	72	0.0	0.0
3.18 Meeting Room	2	1	48.885	72	72	0.0	0.0
3.19 RKE Manager	1	1	58.181	145.452	145.452	0.0	0.0
3.21 ISDS Manager	1	1	57.11	187	187	0.0	0.0
3.22 Meeting Room	4	0.75	26.678	144	144	0.0	0.0
3.23 Meeting Room	4	0.75	26.668	144	144	0.0	0.0
3.24 Meeting Room	4	0.75	26.671	144	144	0.0	0.0
3.AWC.02 Acc WC	0	1	41.64	0	0	1500.0	1500.0
3.WC.02 All gender WC	0	1	32.765	0	0	1500.0	1500.0
4.06 Collaboration Area	28	0.8	960.329	1200.411	1200.411	0.0	0.0
4.06a Meeting Room	4	0.75	27.905	144	144	0.0	0.0
4.06b Meeting Room	4	0.75	27.903	144	144	0.0	0.0
4.06c Meeting Room	4	0.75	27.913	144	144	0.0	0.0
4.06f Collaboration Area	3	1	28.129	144	144	0.0	0.0
4.06h Meeting Room	4	0.75	27.589	144	144	0.0	0.0
4.06j Group Booth	4	0.75	30.204	144	144	0.0	0.0
4.07 Kitchenette	3	1	132.956	0	0	0.0	0.0
4.08 Office (1P)	1	1	66.021	187	187	0.0	0.0
4.09 Office (1P)	1	1	59.969	187	187	0.0	0.0
4.10 Office (1P)	1	1	60.643	187	187	0.0	0.0

Room Name	People	People Diversity	Lighting (W)	Computer Equipment gains (W)	Computer Electrical Consumption (W)	Small power Equipment gains (W)	Smal Power Electrical Consumption (W)
4.11 Faculty Accountant	1	1	61.485	187	187	0.0	0.0
4.12 Office (1P) HoS	1	1	60.353	187	187	0.0	0.0
4.13 Office (1P) HoS	1	1	61.011	187	187	0.0	0.0
4.14 Office (1P) HoS	1	1	60.99	187	187	0.0	0.0
4.15 Office (1P) HoS	1	1	60.995	187	187	0.0	0.0
4.32 Office (1P)	1	1	62.409	187	187	0.0	0.0
4.33 Office (1P)	1	1	61.169	187	187	0.0	0.0
4.34 Office (1P)	1	1	62.899	187	187	0.0	0.0
4.35 Office (1P)	1	1	61.473	187	187	0.0	0.0
4.36 Collaboration Area	30	0.8	1095.503	1369.379	1369.379	0.0	0.0
4.36a Group Booth	4	0.75	28.486	144	144	0.0	0.0
4.36c Group Booth	4	0.75	28.171	144	144	0.0	0.0
4.36e Group Booth	3	1	28.058	108	108	0.0	0.0
4.37 Department of Life Sciences Studio Space	51	0.8	639.483	5195.797	5195.797	0.0	0.0
4.37a Group Booth	3	1	28.463	108	108	0.0	0.0
4.37b Group Booth	3	1	28.497	108	108	0.0	0.0
4.37c Group Booth	3	1	27.963	108	108	0.0	0.0
4.37d Group Booth	3	1	27.262	108	108	0.0	0.0
4.38 Office (1P)	1	1	62.667	187	187	0.0	0.0
4.39 Office (1P)	1	1	62.744	187	187	0.0	0.0
4.40 Office (1P)	1	1	61.568	187	187	0.0	0.0
4.41 Office (1P)	1	1	60.024	187	187	0.0	0.0
4.AWC.02 Acc Wc	0	1	41.64	0	0	1500.0	1500.0
4.WC.02 All gender WC	0	1	32.765	0	0	1500.0	1500.0
5.01 Collaboration Area	34	0.8	960.29	1224	1224	0.0	0.0
5.01a Group Booth	4	0.75	27.905	114	114	0.0	0.0
5.01b Group Booth	4	0.75	27.903	114	114	0.0	0.0
5.01c Group Booth	4	0.75	27.913	114	114	0.0	0.0
5.01f Collaboration Area	4	0.75	28.129	114	114	0.0	0.0
5.01h Group Booth	4	0.75	27.628	114	114	0.0	0.0

Room Name	People	People Diversity	Lighting (W)	Computer Equipment gains (W)	Computer Electrical Consumption (W)	Small power Equipment gains (W)	Smal Power Electrical Consumption (W)
5.01j Group Booth	4	0.75	30.204	114	114	0.0	0.0
5.02 Kitchenette	0	1	132.956	0	0	6194.0	6194.0
5.03 Office (1P)	1	1	66.021	187	187	0.0	0.0
5.04 Office (1P)	1	1	59.969	187	187	0.0	0.0
5.05 Office (1P)	1	1	60.643	187	187	0.0	0.0
5.06 Office (1P)	1	1	61.485	187	187	0.0	0.0
5.07 Office (1P)	1	1	60.353	187	187	0.0	0.0
5.08 Office (1P)	1	1	61.011	187	187	0.0	0.0
5.09 Office (1P)	1	1	60.99	187	187	0.0	0.0
5.10 Office (1P)	1	1	60.995	187	187	0.0	0.0
5.27 Collaboration Area	13	0.8	759.625	576	576	0.0	0.0
5.27a Group Booth	2	1	28.486	72	72	0.0	0.0
5.27b Group Booth	4	0.75	27.92	144	144	0.0	0.0
5.28 Dept of Natural Sciences Studio Space	70	0.8	662.327	2520	2520	0.0	0.0
5.28a Group Booth	3	1	28.709	108	108	0.0	0.0
5.28b Group Booth	3	1	28.058	108	108	0.0	0.0
5.28c Group Booth	3	1	27.959	108	108	0.0	0.0
5.28d Group Booth	3	1	27.921	108	108	0.0	0.0
5.29 Office (1P)	1	1	62.409	187	187	0.0	0.0
5.30 Office (1P)	1	1	61.169	187	187	0.0	0.0
5.31 Office (1P)	1	1	62.899	187	187	0.0	0.0
5.32 Office (1P)	1	1	61.473	187	187	0.0	0.0
5.33 Office (1P)	1	1	61.317	187	187	0.0	0.0
5.34 Office (1P)	1	1	61.355	187	187	0.0	0.0
5.AWC.02 Acc WC	0	1	41.64	0	0	1500.0	1500.0
5.WC.02 All gender WC	0	1	32.765	0	0	1500.0	1500.0
6.01 Collaboration Area	34	0.8	960.29	1224	1224	0.0	0.0
6.01a Group Booth	4	0.75	27.905	144	144	0.0	0.0
6.01b Group Booth	4	0.75	27.903	144	144	0.0	0.0
6.01c Group Booth	4	0.75	27.913	144	144	0.0	0.0

Room Name	People	People Diversity	Lighting (W)	Computer Equipment gains (W)	Computer Electrical Consumption (W)	Small power Equipment gains (W)	Smal Power Electrical Consumption (W)
6.01f Collaboration Area	4	0.75	28.129	144	144	0.0	0.0
6.01h Group Booth	4	0.75	27.628	144	144	0.0	0.0
6.01j Group Booth	4	0.75	30.204	144	144	0.0	0.0
6.02 Kitchenette	0	1	132.956	0	0	6194.0	6194.0
6.03 Office (1P)	1	1	66.021	187	187	0.0	0.0
6.04 Office (1P)	1	1	59.969	187	187	0.0	0.0
6.05 Office (1P)	1	1	60.643	187	187	0.0	0.0
6.06 Office (1P)	1	1	61.485	187	187	0.0	0.0
6.07 Office (1P)	1	1	60.353	187	187	0.0	0.0
6.07a Group Booth	2	1	28.486	187	187	0.0	0.0
6.08 Office (1P)	1	1	61.011	187	187	0.0	0.0
6.09 Office (1P)	1	1	60.99	187	187	0.0	0.0
6.10 Office (1P)	1	1	60.995	187	187	0.0	0.0
6.27 Collaboration Area	46	0.8	966.634	162	162	0.0	0.0
6.27c Group Booth	4	0.75	28.171	144	144	0.0	0.0
6.27e Group Booth	4	0.75	28.058	144	144	0.0	0.0
6.28 Office (1P)	1	1	62.409	187	187	0.0	0.0
6.29 Office (1P)	1	1	61.169	187	187	0.0	0.0
6.30 Office (1P)	1	1	62.899	187	187	0.0	0.0
6.31 Office (1P)	1	1	61.473	187	187	0.0	0.0
6.AWC.02 Acc WC	0	1	41.64	0	0	1500.0	1500.0
6.WC.02 All gender WC	0	1	32.765	0	0	1500.0	1500.0
G.DWC.01 Acc WC	0	1	50.806	0	0	1500.0	1500.0
G.AWC.02 Acc WC	0	1	52.484	0	0	1500.0	1500.0
G.AWC.03 Acc Wc	0	1	41.642	0	0	1500.0	1500.0
G.WC.02 Lobby	0	1	160.57	0	0	0.0	0.0
G.WC.02a Religious Wash (M)	0	1	30.962	0	0	1500.0	1500.0
G.WC.02b Religious Wash (F)	0	1	30.794	0	0	1500.0	1500.0
G.WC.02c All gender WC	0	1	30.589	0	0	1500.0	1500.0
G.WC.02d All gender WC	0	1	31.031	0	0	1500.0	1500.0

Room Name	People	People Diversity	Lighting (W)	Computer Equipment gains (W)	Computer Electrical Consumption (W)	Small power Equipment gains (W)	Smal Power Electrical Consumption (W)
G.WC.02e All gender WC	0	1	28.504	0	0	1500.0	1500.0
G.WC.02f All gender WC	0	1	29.443	0	0	1500.0	1500.0
G.WC.02g All gender WC	0	1	32.053	0	0	1500.0	1500.0
G.WC.02h All gender WC	0	1	31.598	0	0	1500.0	1500.0
G.WC.02i All gender WC	0	1	31.81	0	0	1500.0	1500.0
G.WC.02j All gender WC	0	1	31.984	0	0	1500.0	1500.0
G.WC.03 All gender WC	0	1	32.765	0	0	1500.0	1500.0
1.09 Study / Break-out	111	0.8	1661.498	3996	3996	0.0	0.0
1.11 Social / Break-out	40	0.8	971.184	1440	1440	0.0	0.0
1.12 Study / Break-out	83	0.8	1076.309	2988	2988	0.0	0.0
2.09 Seminar Room 12	56	0.8	795.837	2016	2016	300.0	300.0
3.05 Study / Break-out	10	0.8	292.825	360	360	0.0	0.0
3.06 Collaboration Area	8	0.8	133.579	288	288	0.0	0.0
1.10 Seminar Room 10	56	0.8	795.837	2016	2016	300.0	300.0
4.16 Meeting Room	12	0.8	367.719	432	432	200.0	200.0
5.11 Meeting Room	12	0.8	367.719	432	432	300.0	300.0
6.11 Meeting Room	12	0.8	367.719	432	432	300.0	300.0
G.20 Seminar Room 1	72	0.8	1076.309	1345.387	1345.387	300.0	300.0
G.21 Seminar Room 2	56	0.8	831.175	2016	2016	300.0	300.0
G.22 Seminar Room 3	56	0.8	788.51	2016	2016	300.0	300.0
6.14 Office (6P)	6	0.8	262.821	1122	1122	0.0	0.0
1.WC.01 WC Lobby	0	1	95.735	0	0	0.0	0.0
1.WC.01a All gender WC	0	1	33.254	0	0	1500.0	1500.0
1.WC.01b All gender WC	0	1	33.346	0	0	1500.0	1500.0
1.WC.01c All gender WC	0	1	28.237	0	0	1500.0	1500.0
1.WC.01d All gender WC	0	1	27.962	0	0	1500.0	1500.0
1.WC.01e Religious Wash	0	1	35.561	0	0	1500.0	1500.0
2.06 Study / Break-out	40	0.8	924.077	1440	1440	0.0	0.0
2.10 Study / Break-out	8	0.8	374.986	288	288	0.0	0.0
2.CLN.01 Cleaners Store	0	1	25.096	0	0	0.0	0.0

Room Name	People	People Diversity	Lighting (W)	Computer Equipment gains (W)	Computer Electrical Consumption (W)	Small power Equipment gains (W)	Smal Power Electrical Consumption (W)
2.WC.01 WC Lobby	0	1	0	0	0	0.0	0.0
2.WC.01a All gender WC	0	1	33.254	0	0	1500.0	1500.0
2.WC.01b All gender WC	0	1	33.346	0	0	1500.0	1500.0
2.WC.01c All gender WC	0	1	33.849	0	0	1500.0	1500.0
2.WC.01d All gender WC	0	1	27.873	0	0	1500.0	1500.0
2.WC.01e All gender WC	0	1	27.962	0	0	1500.0	1500.0
2.WC.01f All gender WC	0	1	35.453	0	0	1500.0	1500.0
3.20 Office (44P)	44	0.8	1521.347	8228	8228	0.0	0.0
3.20a Collaboration Area	16	0.8	228.717	476	476	0.0	0.0
3.25 Office (44P)	8	0.8	263.826	1496	1496	0.0	0.0
3.26 Meeting Room	12	0.8	262.197	432	432	300.0	300.0
3.27 Office (8P)	8	0.8	264.57	1496	1496	0.0	0.0
3.28 Office (6P)	6	0.8	262.691	1122	1122	0.0	0.0
3.29 Office (6P)	6	0.8	264.156	1122	1122	0.0	0.0
3.30 Office (6P)	6	0.8	262.423	1122	1122	0.0	0.0
3.31 Office (6P)	6	0.8	263.463	1122	1122	0.0	0.0
3.32 Office (8P)	8	0.8	264.337	1496	1496	0.0	0.0
3.33 Office (6P)	6	0.8	262.317	1122	1122	0.0	0.0
3.34 Office (6P)	6	0.8	264.097	1122	1122	0.0	0.0
3.35 RKE Business Lounge	28	0.8	497.569	1008	1008	0.0	0.0
3.36 Office (1P)	1	1	61.712	187	187	0.0	0.0
3.37 Office (1P)	1	1	62.572	187	187	0.0	0.0
3.38 C&E Interview Room	2	1	57.998	72.497	72.497	0.0	0.0
3.AWC.01 Acc WC	0	1	62.047	0	0	1500.0	1500.0
3.CLN.01 Cleaners Store	0	1	24.884	0	0	0.0	0.0
3.WC.01 WC Lobby	0	1	124.049	0	0	0.0	0.0
3.WC.01a All gender WC	0	1	33.254	0	0	1500.0	1500.0
3.WC.01b All gender WC	0	1	33.346	0	0	1500.0	1500.0
3.WC.01c All gender WC	0	1	34.06	0	0	1500.0	1500.0
3.WC.01d All gender WC	0	1	27.873	0	0	1500.0	1500.0

Room Name	People	People Diversity	Lighting (W)	Computer Equipment gains (W)	Computer Electrical Consumption (W)	Small power Equipment gains (W)	Smal Power Electrical Consumption (W)
3.WC.01e All gender WC	0	1	27.962	0	0	1500.0	1500.0
3.WC.01f All gender WC	0	1	35.75	0	0	1500.0	1500.0
4.17 Office (8P)	8	0.8	262.622	1496	1496	0.0	0.0
4.18 Office (6P)	6	0.8	262.71	1122	1122	0.0	0.0
4.19 Office (6P)	6	0.8	262.821	1122	1122	0.0	0.0
4.20 Office (6P)	6	0.8	262.363	1122	1122	0.0	0.0
4.21 Office (6P)	6	0.8	263.826	1122	1122	0.0	0.0
4.22 Office (6P)	6	0.8	264.57	1122	1122	0.0	0.0
4.23 Collaboration Area	14	0.8	266.803	504	504	0.0	0.0
4.24 Office (6P)	6	0.8	267.297	1122	1122	0.0	0.0
4.25 Office (6P)	6	0.8	263.554	1122	1122	0.0	0.0
4.26 Office (6P)	6	0.8	263.025	1122	1122	0.0	0.0
4.27 Office (6P)	6	0.8	263.463	1122	1122	0.0	0.0
4.28 Office (6P)	6	0.8	264.337	1122	1122	0.0	0.0
4.29 Office (6P)	6	0.8	262.317	1122	1122	0.0	0.0
4.30 Office (6P)	6	0.8	264.097	1122	1122	0.0	0.0
4.31 HG Project Lab	24	0.8	497.569	4042.75	4042.75	300.0	300.0
4.42 Office (1P)	1	1	61.712	187	187	0.0	0.0
4.43 Office (1P)	1	1	62.572	187	187	0.0	0.0
4.44 HG Interview Space	3	1	57.998	108	108	0.0	0.0
4.AWC.01 Acc WC	0	1	62.047	0	0	1500.0	1500.0
4.CLN.01 Cleaners Store	0	1	24.884	0	0	0.0	0.0
4.CORR.08 Circulation	0	1	1183.728	1479.66	1479.66	0.0	0.0
4.WC.01 WC Lobby	0	1	123.896	0	0	0.0	0.0
4.WC.01a All gender WC	0	1	33.254	0	0	1500.0	1500.0
4.WC.01b All gender WC	0	1	33.346	0	0	1500.0	1500.0
4.WC.01c All gender WC	0	1	34.06	0	0	1500.0	1500.0
4.WC.01d All gender WC	0	1	27.798	0	0	1500.0	1500.0
4.WC.01e All gender WC	0	1	28.037	0	0	1500.0	1500.0
4.WC.01f Religious Wash	0	1	35.561	0	0	1500.0	1500.0

Room Name	People	People Diversity	Lighting (W)	Computer Equipment gains (W)	Computer Electrical Consumption (W)	Small power Equipment gains (W)	Smal Power Electrical Consumption (W)
5.12 Office (8P)	8	0.8	262.622	1496	1496	0.0	0.0
5.13 Office (6P)	6	0.8	262.543	1122	1122	0.0	0.0
5.14 Office (6P)	6	0.8	262.987	1122	1122	0.0	0.0
5.15 Office (6P)	6	0.8	262.363	1122	1122	0.0	0.0
5.16 Office (6P)	6	0.8	263.826	1122	1122	0.0	0.0
5.17 Office (6P)	6	0.8	264.57	1122	1122	0.0	0.0
5.18 Collaboration Area	12	0.8	266.803	432	432	0.0	0.0
5.19 Office (6P)	6	0.8	267.297	1122	1122	0.0	0.0
5.20 Office (6P)	6	0.8	264.156	1122	1122	0.0	0.0
5.21 Office (8P)	8	0.8	262.423	1496	1496	0.0	0.0
5.22 Office (6P)	6	0.8	263.463	1122	1122	0.0	0.0
5.23 Office (8P)	8	0.8	264.337	1496	1496	0.0	0.0
5.24 Office (8P)	8	0.8	262.317	1496	1496	0.0	0.0
5.25 Office (6P)	6	0.8	264.097	1122	1122	0.0	0.0
5.26 Seminar Room 15	24	0.8	497.569	764	764	300.0	300.0
5.35 Office (1P)	1	1	61.712	187	187	0.0	0.0
5.36 Office (1P)	1	1	62.572	187	187	0.0	0.0
5.37 HG Interview Space	3	1	57.998	72.497	72.497	0.0	0.0
5.AWC.01 Acc WC	0	1	62.047	0	0	1500.0	1500.0
5.CLN.01 Cleaners Store	0	1	24.884	0	0	0.0	0.0
5.WC.01 WC Lobby	0	1	123.896	0	0	0.0	0.0
5.WC.01a All gender WC	0	1	33.254	0	0	1500.0	1500.0
5.WC.01b All gender WC	0	1	33.346	0	0	1500.0	1500.0
5.WC.01c All gender WC	0	1	34.06	0	0	1500.0	1500.0
5.WC.01d All gender WC	0	1	27.798	0	0	1500.0	1500.0
5.WC.01e All gender WC	0	1	28.037	0	0	1500.0	1500.0
5.WC.01f Religious Wash	0	1	35.561	0	0	1500.0	1500.0
6.12 Office (8P)	8	0.8	262.622	1122	1122	0.0	0.0
6.13 Office (6P)	6	0.8	262.71	1122	1122	0.0	0.0
6.15 Office (6P)	6	0.8	262.363	1122	1122	0.0	0.0

Room Name	People	People Diversity	Lighting (W)	Computer Equipment gains (W)	Computer Electrical Consumption (W)	Small power Equipment gains (W)	Smal Power Electrical Consumption (W)
6.16 Office (6P)	6	0.8	263.826	1122	1122	0.0	0.0
6.17 Office (6P)	6	0.8	264.57	1122	1122	0.0	0.0
6.18 Collaboration Area	14	0.8	266.803	504	504	0.0	0.0
6.19 Office (6P)	6	0.8	267.297	1122	1122	0.0	0.0
6.20 Office (6P)	6	0.8	264.156	1122	1122	0.0	0.0
6.21 Office (6P)	6	0.8	262.423	1122	1122	0.0	0.0
6.22 Office (6P)	6	0.8	263.463	1122	1122	0.0	0.0
6.23 Office (6P)	6	0.8	264.337	1122	1122	0.0	0.0
6.24 Office (6P)	6	0.8	262.317	1122	1122	0.0	0.0
6.25 Office (6P)	6	0.8	264.097	1122	1122	0.0	0.0
6.26 Seminar Room 14	24	0.8	497.569	864	864	300.0	300.0
6.32 Office (1P)	1	1	61.712	187	187	0.0	0.0
6.33 Office (1P)	1	1	62.572	187	187	0.0	0.0
6.34 Meeting Room	3	1	57.998	72.497	72.497	0.0	0.0
6.AWC.01 Acc WC	0	1	62.047	0	0	1500.0	1500.0
6.CLN.01 Cleaners Store	0	1	24.967	0	0	0.0	0.0
6.WC.01 WC Lobby	0	1	123.896	0	0	0.0	0.0
6.WC.01a All gender WC	0	1	33.977	0	0	1500.0	1500.0
6.WC.01a All gender WC	0	1	33.254	0	0	1500.0	1500.0
6.WC.01b All gender WC	0	1	33.346	0	0	1500.0	1500.0
6.WC.01d All gender WC	0	1	28.17	0	0	1500.0	1500.0
6.WC.01e All gender WC	0	1	27.665	0	0	1500.0	1500.0
6.WC.01f Religious Wash	0	1	35.561	0	0	1500.0	1500.0
7.AWC.01 Acc WC	0	1	62.047	0	0	1500.0	1500.0
7.CLN.01 Cleaners Store	0	1	24.967	0	0	0.0	0.0
7.WC.01 WC Lobby	0	1	123.896	0	0	0.0	0.0
7.WC.01a All gender WC	0	1	33.254	0	0	1500.0	1500.0
7.WC.01b All gender WC	0	1	33.346	0	0	1500.0	1500.0
7.WC.01c All gender WC	0	1	33.977	0	0	1500.0	1500.0
7.WC.01d All gender WC	0	1	28.17	0	0	1500.0	1500.0

Room Name	People	People Diversity	Lighting (W)	Computer Equipment gains (W)	Computer Electrical Consumption (W)	Small power Equipment gains (W)	Smal Power Electrical Consumption (W)
7.WC.01e All gender WC	0	1	27.665	0	0	1500.0	1500.0
7.WC.01f Religious Wash	4	0.75	35.561	0	0	1500.0	1500.0
G.01 Information / Reception	2	1	139.231	374	374	110.0	110.0
G.02 Post Room	0	1	116.996	219.367	219.367	0.0	0.0
G.03 Deliveries Office	1	1	69.161	187	187	0.0	0.0
G.AWC.01 Acc WC	0	1	52.691	0	0	1500.0	1500.0
G.WC.01 All gender WC	0	1	29.971	0	0	1500.0	1500.0
2.01 Seminar Room 11	24	0.8	487.648	864	864	300.0	300.0
2.02 Meeting Room	6	0.8	101.664	216	216	300.0	300.0
3.04 Study / Break-out	99	0.8	1336.11	4114	4114	0.0	0.0
7.01 Office (1P)	1	1	61.712	187	187	0.0	0.0
7.02 Office (1P)	1	1	62.572	187	187	0.0	0.0
7.03 Meeting Room	3	1	57.998	108	108	0.0	0.0
1.01 Seminar Room 4	24	0.8	484.016	972	972	300.0	300.0
1.02 Meeting Room	6	0.8	105.111	216	216	300.0	300.0
1.03 Meeting Room	6	0.8	120.569	216	216	300.0	300.0
2.03 Meeting Room	6	0.8	119.837	216	216	300.0	300.0
2.08 Super Lab	199	0.8	5752.168	17975.527	17975.527	0.0	0.0
3.03 Smart Infrastructure Lab	25	0.8	1723.508	2431	2431	0.0	0.0
4.05 Environment and Ecology lab	16	0.8	1282.905	10423.605	10423.605	0.0	0.0
2.04 Super-Lab Prep Holding Room	0	1	755.278	2360.243	2360.243	0.0	0.0
3.01 Core Genomics and Transcriptomics	17	0.8	1035.648	8414.642	8414.642	0.0	0.0
3.01a Pre-PCR	7	0.8	364.348	2960.328	2960.328	0.0	0.0
3.02 GIS IT Lab	30	0.8	657.372	2054.287	2054.287	0.0	0.0
4.01 Inorganic/ Organic Prep Area	9	0.8	508.398	4130.737	4130.737	0.0	0.0
4.02 -80oC Freezers	0	1	357.943	1118.571	1118.571	500.0	500.0
4.04 Growth Chambers	0	1	518.2	1619.376	1619.376	500.0	500.0
1.AWC.01 Acc WC	0	1	61.682	0	0	1500.0	1500.0

Room Name	People	People Diversity	Lighting (W)	Computer Equipment gains (W)	Computer Electrical Consumption (W)	Small power Equipment gains (W)	Smal Power Electrical Consumption (W)
1.CLN.01 Cleaners Store	0	1	10.58	0	0	0.0	0.0
1.CLN.02 Cleaners Store	0	1	34.585	0	0	0.0	0.0
1.COMMS.01 Comms	0	1	139.892	0	0	0.0	10.0
1.CORR.01 Circulation	0	1	471.207	0	0	0.0	0.0
1.CORR.02 Central Corridor	0	1	172.076	0	0	0.0	0.0
1.CORR.03 Lobby	0	1	145.692	0	0	0.0	0.0
1.CORR.04 Lobby	0	1	228.225	0	0	0.0	0.0
1.CORR.05 Circulation	0	1	294.08	0	0	0.0	0.0
1.CORR.06 Circulation	0	1	1369.579	0	0	0.0	0.0
1.CORR.07 Circulation	0	1	328.209	0	0	0.0	0.0
1.CORR.08 Corridor	0	1	136.453	0	0	0.0	0.0
1.CORR.09 Lobby	0	1	195.455	0	0	0.0	0.0
1.ENG.16 Domestic and Kitchen AHU Plant	0	1	407.29	0	0	0.0	0.0
1.STAIR.01 Stair	0	1	272.951	0	0	0.0	0.0
1.STAIR.02 Stair	0	1	281.497	0	0	0.0	0.0
2.AWC.01 Acc WC	0	1	62.047	0	0	1500.0	1500.0
2.CLN.02 Cleaners Store	0	1	34.585	0	0	0.0	0.0
2.COMMS.01 Comms	0	1	139.892	0	0	0.0	10.0
2.CORR.01 Central Corridor	0	1	473.93	0	0	0.0	0.0
2.CORR.02 Central Corridor	0	1	172.641	0	0	0.0	0.0
2.CORR.03 Circulation	0	1	294.08	0	0	0.0	0.0
2.CORR.04 Lobby	0	1	145.692	0	0	0.0	0.0
2.CORR.05 Goods Lift Lobby	0	1	0	0	0	0.0	0.0
2.CORR.06 Circulation	0	1	739.56	0	0	0.0	0.0
2.CORR.07 Circulation	0	1	136.453	0	0	0.0	0.0
2.CORR.08 Lobby	0	1	195.455	0	0	0.0	0.0
2.STAIR.01 Stair	0	1	295.27	0	0	0.0	0.0
2.STAIR.02 Stair	0	1	281.523	0	0	0.0	0.0

Room Name	People	People Diversity	Lighting (W)	Computer Equipment gains (W)	Computer Electrical Consumption (W)	Small power Equipment gains (W)	Smal Power Electrical Consumption (W)
3.09a FPVC Waiting Area	4	0.75	376.344	0	0	0.0	0.0
3.CLN.02 Cleaners Store	0	1	34.585	0	0	0.0	0.0
3.COMMS.01 Comms	0	1	127.434	0	0	0.0	10.0
3.COMMS.02 Comms	0	1	11.515	0	0	0.0	10.0
3.CORR.01 Central Corridor	0	1	481.825	0	0	0.0	0.0
3.CORR.02 Central Corridor	0	1	171.552	0	0	0.0	0.0
3.CORR.03 Circulation	0	1	294.08	0	0	0.0	0.0
3.CORR.04 Lobby	0	1	145.692	0	0	0.0	0.0
3.CORR.05 Goods Lift Lobby	0	1	0	0	0	0.0	0.0
3.CORR.06 Central Corridor	0	1	1248.377	0	0	0.0	0.0
3.CORR.06a Lockers	0	1	11.938	0	0	0.0	0.0
3.CORR.06b Lockers	0	1	11.869	0	0	0.0	0.0
3.CORR.06c Lockers	0	1	11.68	0	0	0.0	0.0
3.CORR.07 Lobby	0	1	195.455	0	0	0.0	0.0
3.CORR.08 Corridor	0	1	85.489	0	0	0.0	0.0
3.CORR.09 Central Corridor	0	1	568.072	0	0	0.0	0.0
3.CORR.09a Break-Out Pod	2	1	9.276	72	72	0.0	0.0
3.CORR.09b Break-Out Pod	2	1	9.213	72	72	0.0	0.0
3.CORR.09c Break-Out Pod	2	1	9.295	72	72	0.0	0.0
3.CORR.09d Break-Out Pod	2	1	9.253	72	72	0.0	0.0
3.CORR.09e Break-Out Pod	2	1	0	72	72	0.0	0.0
3.LIFT.04 Goods Lift	0	1	98.578	0	0	0.0	0.0
3.STAIR.01 Stair	0	1	296.089	0	0	0.0	0.0
3.STAIR.02 Stair	0	1	281.523	0	0	0.0	0.0
3.STAIR.03 Stair	0	1	136.087	0	0	0.0	0.0
4.01a Clean Sample Prep	0	1	180.924	0	0	0.0	0.0

Room Name	People	People Diversity	Lighting (W)	Computer Equipment gains (W)	Computer Electrical Consumption (W)	Small power Equipment gains (W)	Smal Power Electrical Consumption (W)
4.03 Glacier Cold Room	0	1	174.247	0	0	500.0	500.0
4.CLN.02 Cleaners Store	0	1	35.124	0	0	0.0	0.0
4.COMMS.01 Comms	0	1	127.434	0	0	0.0	10.0
4.CORR.01 Circulation	0	1	478.32	0	0	0.0	0.0
4.CORR.02 Central Corridor	0	1	172.076	0	0	0.0	0.0
4.CORR.03 Circulation	0	1	294.08	0	0	0.0	0.0
4.CORR.04 Lobby	0	1	145.692	0	0	0.0	0.0
4.CORR.05 Goods Lift Lobby	0	1	0	0	0	0.0	0.0
4.CORR.05a Lockers	0	1	11.736	0	0	0.0	0.0
4.CORR.05b Lockers	0	1	11.751	0	0	0.0	0.0
4.CORR.05c Lockers	0	1	11.742	0	0	0.0	0.0
4.CORR.06 Circulation	0	1	754.337	0	0	0.0	0.0
4.CORR.07 Lobby	0	1	196.929	0	0	0.0	0.0
4.CORR.08a Break-Out Pod	2	1	9.256	72	72	0.0	0.0
4.CORR.08b Break-Out Pod	2	1	9.262	72	72	100.0	100.0
4.CORR.08c Break-Out Pod	2	1	9.276	72	72	0.0	0.0
4.CORR.08d Break-Out Pod	2	1	9.295	72	72	0.0	0.0
4.CORR.08e Break-Out Pod	2	1	9.253	72	72	100.0	100.0
4.CORR.08f Break-Out Pod	2	1	9.21	72	72	0.0	0.0
4.STAIR.01 Stair	0	1	296.089	0	0	0.0	0.0
4.STAIR.02 Stair	0	1	281.523	0	0	0.0	0.0
4.STAIR.03b Stair	0	1	255.529	0	0	0.0	0.0
5.COMMS.01 Comms	0	1	127.434	0	0	0.0	10.0
5.CORR.01 Circulation	0	1	478.32	0	0	0.0	0.0
5.CORR.02 Central Corridor	0	1	172.076	0	0	0.0	0.0
5.CORR.03 Circulation	0	1	294.08	0	0	0.0	0.0
5.CORR.04 Lobby	0	1	0	0	0	0.0	0.0

Room Name	People	People Diversity	Lighting (W)	Computer Equipment gains (W)	Computer Electrical Consumption (W)	Small power Equipment gains (W)	Smal Power Electrical Consumption (W)
5.CORR.05 Goods Lift Lobby	0	1	0	0	0	0.0	0.0
5.CORR.06 Lobby	0	1	196.929	0	0	0.0	0.0
5.CORR.07 Circulation	0	1	850.929	0	0	0.0	0.0
5.CORR.07a Break-Out Pod	2	1	9.256	72	72	0.0	0.0
5.CORR.07b Break-Out Pod	2	1	9.262	72	72	110.0	110.0
5.CORR.07c Break-Out Pod	2	1	9.276	72	72	0.0	0.0
5.CORR.07d Break-Out Pod	2	1	9.295	72	72	0.0	0.0
5.CORR.07e Break-Out Pod	2	1	9.253	72	72	110.0	110.0
5.CORR.07f Break-Out Pod	2	1	9.21	72	72	0.0	0.0
5.ENG.14 Plant	0	1	3812.185	0	0	0.0	0.0
5.STAIR.01 Stair	0	1	296.089	0	0	0.0	0.0
5.STAIR.02 Stair	0	1	281.523	0	0	0.0	0.0
5.STAIR.03 Stair	0	1	169.664	0	0	0.0	0.0
5.STAIR.03a Stair	0	1	255.529	0	0	0.0	0.0
6.35 Greenhouse 5	0	1	151.004	283.133	283.133	0.0	0.0
6.36 Greenhouse 4	0	1	151.01	283.143	283.143	0.0	0.0
6.37 Greenhouse 3	0	1	151.01	283.143	283.143	0.0	0.0
6.38 Greenhouse 2	0	1	151.01	283.143	283.143	0.0	0.0
6.39 Greenhouse 1	0	1	151.004	283.133	283.133	0.0	0.0
6.40 Potting Shed	0	1	151.01	283.143	283.143	0.0	0.0
6.COMMS.01 Comms	0	1	127.434	0	0	0.0	10.0
6.CORR.01 Circulation	0	1	478.32	0	0	0.0	0.0
6.CORR.02 Central Corridor	0	1	172.076	0	0	0.0	0.0
6.CORR.03 Lobby	0	1	294.08	0	0	0.0	0.0
6.CORR.04 Lobby	0	1	145.692	0	0	0.0	0.0
6.CORR.05 Goods Lift Lobby	0	1	0	0	0	0.0	0.0
6.CORR.06 Lobby	0	1	196.929	0	0	0.0	0.0

Room Name	People	People Diversity	Lighting (W)	Computer Equipment gains (W)	Computer Electrical Consumption (W)	Small power Equipment gains (W)	Smal Power Electrical Consumption (W)
6.CORR.07 Circulation	0	1	850.929	0	0	0.0	0.0
6.CORR.07a Break-Out Pod	2	1	9.256	72	72	0.0	0.0
6.CORR.07b Break-Out Pod	2	1	9.262	72	72	110.0	110.0
6.CORR.07c Break-Out Pod	2	1	9.276	72	72	0.0	0.0
6.CORR.07d Break-Out Pod	2	1	9.295	72	72	0.0	0.0
6.CORR.07e Break-Out Pod	2	1	9.253	72	72	110.0	110.0
6.CORR.07f Break-Out Pod	2	1	9.21	72	72	0.0	0.0
6.STAIR.01 Stair	0	1	295.454	0	0	0.0	0.0
6.STAIR.02 Stair	0	1	281.523	0	0	0.0	0.0
6.STAIR.03 Stair	0	1	425.193	0	0	0.0	0.0
7.CORR.01 Central Corridor	0	1	172.076	0	0	0.0	0.0
7.CORR.02 Goods Lift Lobby	0	1	0	0	0	0.0	0.0
Central Atrium	0	1	2896.791	3620.989	3620.989	0.0	0.0
G.09 Cold Room	0	1	100.341	0	0	0.0	0.0
G.10 Freezer	0	1	88.893	277.791	277.791	0.0	0.0
G.15 COSHH	0	1	45.339	0	0	0.0	0.0
G.CLN.01 Cleaners Store	0	1	37.809	0	0	0.0	0.0
G.COMMS.01 Comms	0	1	135.362	0	0	0.0	10.0
G.CORR.01 Entrance Lobby	0	1	249.365	0	0	0.0	0.0
G.CORR.02 Entrance Lobby	0	1	441.13	0	0	0.0	0.0
G.CORR.03 Lift Lobby	0	1	240.152	0	0	0.0	0.0
G.CORR.03 Lift Lobby	0	1	264.728	0	0	0.0	0.0
G.CORR.04 Lobby	0	1	99.697	0	0	0.0	0.0
G.CORR.05 Lobby	0	1	145.692	0	0	0.0	0.0
G.CORR.06 Central Corridor	0	1	162.247	0	0	0.0	0.0

Room Name	People	People Diversity	Lighting (W)	Computer Equipment gains (W)	Computer Electrical Consumption (W)	Small power Equipment gains (W)	Smal Power Electrical Consumption (W)
G.CORR.07 Escape Corridor	0	1	240.28	0	0	0.0	0.0
G.CORR.08 Lobby	0	1	156.453	0	0	0.0	0.0
G.CORR.09 Lobby	0	1	184.007	0	0	0.0	0.0
G.CORR.10 Refectory Kitchen	4	0.75	361.455	0	0	40292.0	40292.0
G.END.02 Mechanical Plant Room	0	1	1170.788	0	0	0.0	0.0
G.ENG.01 LTHW Boiler and Aquifer	0	1	516.529	0	0	0.0	0.0
G.ENG.03 LV Switch	0	1	152.62	0	0	0.0	0.0
G.ENG.05 Deliveries Loading Bay	0	1	406.671	762.509	0	0.0	0.0
G.STAIR.01 Stair	0	1	324.809	0	0	0.0	0.0
G.STAIR.02 Stair	0	1	287.993	0	0	0.0	0.0
T0.CORR.01 Stair 1 Lobby	0	1	0	0	0	0.0	0.0
T0.STAIR.01 Stair	0	1	0	0	0	0.0	0.0

6 TM54 MATRIX

TM54 Implementation Matrix					
TM54 Steps	Recommendation	Modelling Approach	Probable range	Confidence level (L/M/H)	QA check
Simplifications and assumptions (see section 5.2)	They should be used appropriately and judiciously, and detailed in the report	See MMU Science and Engineering TM54 report	n/a	n/a	Yes
Use of benchmarks and targets (see section 6.2)	Benchmarks should not replace a dedicated calculation of energy use. Targets that can be verified in use are recommended to be set for the project from the early stages, and should be reported alongside the modelling results. The aim of the modelling will be to test whether the targets are achievable, and inform the design proposals to meet the target	In absence of any defined targets the Medium (Baseline) results should be used to gauge the building performance"	n/a	n/a	Yes
Step 0: Choosing the right level of modelling	The project team should establish early in the project, in discussion with the client, the right level of modelling for the project. This should consider multiple factors including the complexity of the building and its systems, the resources available for the modelling, and the level of accuracy and certainty needed from the results. The discussions should also determine whether some steps in this methodology should be carried out within or outside the model, e.g. Step 3 (Lighting), Step 9 (Domestic hot water)	The building is a university building with significant mechanical ventilation using centralised AHUs. The is control by a BMS system. A dynamic thermal modelling approach has been chosen as this enables the model to be used for additional tasks such as thermal comfort analysis and building regulations compliance. HVAC will be modelled from templates and tuned to more accurately reflect the design proposals. Energy use associated with hot water will be calculated outside the DSM The energy associated with lighting has been calculated outside the DSM and input into the DSM and profiled based on the occupancy.	n/a	n/a	Yes
Step 1: Constructing and building the mode	Constructing and zoning: Consider the level of detail needed for the model to be accurate and robust. Always check the North arrow. Check the modelled envelope properties against information provided by design team members (engineer, façade consultant, architect etc). Carryout simple checks at the end of this stage, with default settings, to ensure the model operates as expected	The model used information provided by the design team including architect, building services engineer and façade consultant as per design reports. all thermal bridges (repeating and non-repeating) has not been included. The North arrow was checked online. Adjacent building has been modelled as best possible to account for local shading	±60%	L	Yes
	Establishing floor areas: Identify or estimate NIA, GIA, or TFA for the building, as required for the calculations and in line with the floor area used in targets and benchmarks for the project, and include this in the report	The total treated floor area within the model is 14108m2.	±5%	H	Yes

TM54 Implementation Matrix					
TM54 Steps	Recommendation	Modelling Approach	Probable range	Confidence level (L/M/H)	QA check
	The weather data used for the model should be clearly stated in the report, and appropriate for the purpose of the modelling. Where the site location is not close to any of the CIBSE weather file locations, the best match should be used based on the local climate.	The weather file used was the CIBSE Manchester 2016 TRY.	n/a	n/a	
Step 2: Estimating operating hours and occupancy factors	Request anticipated operational profiles from the client, for example through structured interview.	The assessment has been prepared using assumed occupancy patterns and generic user profiles in the absence of direct consultation with the client or end users.	±80%	L	No
Step 3: Evaluating lighting energy use	Assess the energy use for each element, as per guidance provided in each step. Where steps are omitted, state and justify (e.g. Step 4 omitted if the building has no lifts). Make a note of instances where benchmarks or assumptions have been used, rather than project specific and confirmed information. Identify likely variability and uncertainty, to take account of it in the scenario testing and sensitivity analysis.	Model uses lighting efficacies calculated by electrical engineer based on luminaire schedule and controls assumed to include daylight linking and dimming (with backspace sensor) and target illuminance levels as listed in modelling report.	±40%	L	Yes
Step 4: Evaluating energy use for lifts and escalators		Building is only 7 story's and will have stairs throughout, with right lift available purely for staff access and deliveries. Estimate based on TM54 formula based on high lift duty	±75%	L	Yes
Step 5: Evaluating energy use for small power		Based on the Room data sheet and furniture layout in the offices. The values of different pieces of equipment are based on BCO and CIBSE guide A guidance	±30%	M	no
Step 6: Evaluating energy use for catering		There is catering equipment, domestic kitchen appliances, these have been accounted for in based on a w/m2 values stated in the Hoare Lea specifications	±60%	L	no

TM54 Implementation Matrix					
TM54 Steps	Recommendation	Modelling Approach	Probable range	Confidence level (L/M/H)	QA check
Step 7: Evaluating energy use for server rooms		The server information has been assumed and applied as a W/m2 bases	±20%	L	No
Step 8: Evaluating energy use of additional plant and equipment		Non has been accounted for as there has been no engagement with the client	±10%	L	
Step 9: Evaluating energy use of domestic hot water	Assess the energy use for each element, as per guidance provided in each step. Where steps are omitted, state and justify (e.g. Step 4 omitted if the building has no lifts). Make a note of instances where benchmarks or assumptions have been used, rather than project specific and confirmed information. Identify likely variability and uncertainty, to take account of it in the scenario testing and sensitivity analysis.	Prediction of DHW usage based on PHPP for all units. DHW currently expected to be met via individual Boiler SCOP 95%.	±50%	M	Yes
Step 10: Evaluating internal heat gain		See TM 54 modelling report internal occupancy gain are based on the room data sheets and the use of CIBSE guide A, BCO and RIBA guidance. The equipment gains have a diversity applies as detailed above, The occupancy profiles have been assumed as there hasn't been any engagement with the client	±20%	L	Yes
Step 11: Modelling HVAC systems and their control	Assess the energy use with the appropriate modelling method, as determined in Step 0. Report separately for heating, hot water, cooling, and fans and pumps. Model controls carefully and use this to inform the control strategy and design.	Dynamic thermal modelling in VE including HVAC templates model (.tpd) based on full mechanical vent with 75% HR, cooling based on a chiller…see modelling report for all HVAC assumptions. The controls are modelled as per design principles, including general temperature set points and Constant volume ventilation.	±40%	M	Yes
	Evaluating energy use for humidification and dehumidification: Active (de)humidification systems should be modelled using detailed HVAC simulation.	Humidification energy has not been taken into account			
Step 12: Taking management considerations into account	Review management considerations, ideally through structured interview/information request with future occupants. This should determine variability in the inputs due to management considerations. Blanket management factors should not be used	No further analysis of the energy consumption of the MMU building has been undertaken beyond the scope of this report. The findings and conclusions presented herein are based solely on the information, data, and assumptions available at the time of preparation. This report does not constitute ongoing monitoring or performance verification, and no warranty, guarantee, or legal liability is accepted for energy consumption outcomes beyond the date of issue. Any subsequent changes in building operation, occupancy, equipment usage, or system performance may materially affect actual results and are outside the responsibility of the authors.	±10%	L	no

TM54 Implementation Matrix					
TM54 Steps	Recommendation	Modelling Approach	Probable range	Confidence level (L/M/H)	QA check
		For reliance on the findings in this report, it is recommended that the client obtain independent validation through measured operational data or further specialist assessment.			
Step 13: Sensitivity analyse	At the minimum, run basic sensitivity tests on the impact of individual inputs, to identify the most influential and inform scenario testing. The range of factors to include in the sensitivity tests will vary for different building types, but typically would include: • weather and climate • heat gain scenarios, including occupancy density and hours (and associated loads) • management and occupant behaviour. Discuss with the client whether a proper sensitivity analysis (beyond these basic tests) is required, and record the justification and decision	Sensitivity scenarios have been run and are detailed within the TM54 report. These were assumed. No conversation with the maintenance team have been had to discusses other factor that may affect the building yet. Management and maintenance factor have been assumed to address the different management practices and lower maintenance standards.	±10%	L	No
Step 14: Scenario testing	Produce mid-range, low-end and high-end scenarios. As an additional option, run a 'worst case' scenario, with caveats as noted in section 7.15. This should take account of variability in inputs established in each of the previous steps. Scenarios will vary per project, but typically would include variations in the following inputs: • controls • hours of operation of plant and equipment • heat gain scenarios, including occupancy density and hours (and associated loads) • design efficiencies of key plant and equipment items • weather scenarios, including future climate change • management considerations, as examined in Step 13 • occupant behaviour.	additional scenarios have been run with different diversity factors and plant efficiencies	n/a	n/a	yes

TM54 Implementation Matrix					
TM54 Steps	Recommendation	Modelling Approach	Probable range	Confidence level (L/M/H)	QA check
Step 15: Reviewing the results against benchmarks and targets	Compare results with the project targets and, if relevant, benchmarks. If using benchmarks, provide context on their relevance to the project. Use the comparison to check whether the design proposals are on track to achieve the target, and inform any change required. If the comparison and iterative review of design options and modelling concludes that the initial target is not achievable, this should be carefully recorded and justified, along with a recommendation for alternative target and design proposals to achieve it. If the range for the low-mid-high scenarios for the project is higher than acceptable levels for a project, then the project team should seek to refine the variability of the input factors, including further discussions with the client on likely operation of the building; design measures may also need to be implemented, if variability is expected to remain, and safeguards should be put in place to keep them in check through construction and into operation.	The results show that the proposed building is falls below the comparison CIBSE guide F (typical) benchmarks and the TM46 benchmarks and only just exceed the CIBSE guide F (Good practice) benchmark. The analysis of the TM54 assessment results provides insights into the performance of the projected energy use and its alignment with the original targets. The data has been reviewed against industry benchmarks, design expectations, and operational considerations to identify any discrepancies or areas for improvement. Key findings include: • Comparison with Predicted Performance: The results indicate whether the energy consumption estimates align with initial expectations and highlight any significant deviations. • Efficiency of Systems: A breakdown of energy use across key building systems (e.g., HVAC, lighting, and plug loads) identifies areas of efficiency and potential excess consumption. • Seasonal and Operational Variability: Consideration of how performance varies under different conditions helps determine the resilience and adaptability of the design. Potential Optimisations: The client should review the building and report to enable any improvements.			NO

TM54 Implementation Matrix					
TM54 Steps	Recommendation	Modelling Approach	Probable range	Confidence level (L/M/H)	QA check
Step 18: QA	QA should be carried out by an experienced modeller, at least at each stage before the results and report are issued to external parties. It should be recorded, with clear recommendations to be acted upon before issue, or for the next stage. It should encompass the model, the report, and their consistency with each other and with the project information. Intermediate QAs may also be carried out, e.g. at the end of Step 1, rather than waiting for the whole model and report to be available	Carried out by the NGB Modeller in retrospect. This included the model, the modelling report, and relevant design information. Brief comments are made against each step in this matrix, and more details are recorded in in the report.	n/a	n/a	n/a

6. APPDENDIX 1

Suitable qualified building energy modeller Credentials

CIBSE Certification Limited

This Certificate is to certify that

Luke Dollan

has complied with the requirements of the following

LCC Building Design

to comply with the Building Regulations and the EPBR in England, Wales & Northern Ireland

and is authorised to use the CIBSE Certification Mark

Date of Issue: 03/10/2024 **Certification number:** LCC 186989

Date of Expiry: 31/08/2025

Date of First Issue: 28/04/2017

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CIBSE Certification Limited

This Certificate is to certify that

Luke Dollan

has complied with the requirements of the following

LCC Simulation

to comply with the Building Regulations and the EPBR in the United Kingdom

and is authorised to use the CIBSE Certification Mark

Date of Issue: 03/10/2024 **Certification number:** LCC 186989

Date of Expiry: 31/08/2025

Date of First Issue: 21/01/2019

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This Certificate is to certify that

Luke Dollan

has complied with the requirements of the following

LCEA for the production of EPCs Level 5
LCC Building Design and LCC Simulation

to comply with the Building Regulations and the EPBR in England, Wales & Northern Ireland

and is authorised to use the CIBSE Certification Mark

Date of Issue: 03/10/2024 **Certification number:** LCEA186989

Date of Expiry: 31/08/2025

Date of First Issue: 21/01/2019

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