

NHS Property Services Whitefield Medical Centre

Energy Statement
Places for Everyone (JP-S2)

January 2026
Rev P01

**SILCOCK
LEEDHAM**

Consulting Engineers

Upperbank House,
Stoneythorpe,
Leeds,
LS18 4BN

United Kingdom
W: silcockleedham.co.uk
T: +44 (0)113 393 3310



Low
Carbon
Consultant



an **RSK** company

Revision	Description	Date	Approved
P01	Stage 4 Issue	30/01/2026	DM

Contents

0. Executive Summary.....	3
0.1 Project Overview.....	3
0.2 Energy & Carbon Proforma.....	3
1.0 Building fabric and ventilation.....	3
1.1 Building form, and heat loss envelope.....	3
1.2 Elevation design and window proportions.....	3
1.3 Heated and unheated spaces.....	4
1.4 Building fabric specifications and airtightness.....	4
1.5 Ventilation system.....	4
1.6 Space heating demand.....	5
2.0 Maximise energy efficiency.....	5
2.1 Energy use intensity.....	5
2.2 Efforts to reduce energy use of equipment.....	5
3.0 Renewable energy generation.....	5
3.1 Proposed renewable energy generation system.....	5
3.2 Renewable energy balance.....	6
4.0 Low carbon heating.....	6
4.1 Fossil fuel free.....	6
4.2 Proposed system for heating and hot water.....	6
4.3 Proposed system for cooling.....	6
5.0 Overheating risk.....	6
5.1 Natural ventilation.....	6
5.2 Overheating risk assessment.....	6
6.0 Materials.....	6
6.1 Efforts made to minimise embodied carbon.....	6
7.0 - Appendices.....	7
7.1 Appendix A – Non-Residential Minor Energy and Carbon Proforma.....	7
7.2 Appendix B – Thermal Envelope Plan & Sections.....	8
7.3 Appendix C – Passive Design Report.....	9
7.4 Appendix D – TM54 Assessment Report.....	10
7.5 Appendix E – Solar PV Layout.....	11
7.6 Appendix F – LZC Report.....	12
7.7 Appendix G – Thermal Comfort Report.....	13
7.8 Appendix H – Embodied Carbon Assessment.....	14

0. Executive Summary

0.1 Project Overview

The project is the Whitefield Primary Care Health Centre, located at Pinfold Lane, Whitefield, Manchester. It comprises a single-storey primary healthcare facility with a Gross Internal Area (GIA) of approximately 586 m² (Minor Development). The facility includes consulting/examination rooms, administration offices, welfare areas, and patient waiting areas.

PfE Policy JP-S2 requires developments to support Greater Manchester's goal of becoming carbon neutral by 2038, through minimising energy demand, maximising efficiency, using renewable and low carbon energy, and reducing whole life cycle emissions.

This report sets out the requirements of JP-S2 and demonstrates how the Whitefield Primary Care Health Centre complies with each element of the policy.

0.2 Energy & Carbon Proforma

A completed Non-Residential Minor Energy and Carbon Proforma has been prepared to accompany this submission. This document provides a summary of the predicted operational energy performance, carbon emissions, and compliance with the PfE JP-S2 policy. A copy of the completed proforma is included in Appendix A.

1.0 Building fabric and ventilation

1.1 Building form, and heat loss envelope

The building form is simple in rectangular shape, with a simple flat roof, simple facades and single storey.

PfE JP-S2 requires developments to minimise energy demand through efficient building form and reduced heat loss surfaces.

For a Non-Residential Minor Development, this should be less than or equal to 2.

Perimeter: 145m
Elevation: 4m
Envelope Area: 580m²
GIA: 586m²

Form factor: $586 / 580 = \underline{1.01}$

1.2 Elevation design and window proportions

PfE JP-S2 requires that elevation design and glazing proportions balance daylight access and control of solar gains.

Window-to-wall ratios (WWR) have been calculated as below;

North: 4%
East: 10%
South: 6%
West: 6%

1.3 Heated and unheated spaces

All occupied spaces including consultation, treatment, circulation and staff areas are heated/cooled. All areas within the building have been accounted for within the heat loss assessment for the building – Where losses to individual spaces are minimal, the loss has been included in the heating demand of adjacent spaces. I.e. Small WC area losses are provided within the adjacent circulation space.

The only explicitly unheated space within the building is the main plantroom. Due to the plant equipment gains within this space, no heating is proposed.

Refer to Appendix B for thermal envelope plan & sections (Indicated by the dashed red line).

1.4 Building fabric specifications and airtightness

PfE JP-S2 requires developments to minimise energy demand and maximise energy efficiency.

This scheme complies by adopting a fabric-first approach with high-performance envelope design as below. The U-Values have been developed with the architect to specify U-values significantly better than the baseline Building Regulations (Approved Document Part L 2021).

The proposed construction achieves:

- Air Tightness: **8 m³/h·m² @ 50 Pa**
- Floors: **0.18 W/m²K** (improved from 0.25 W/m²K)
- Walls: **0.14 W/m²K** (improved from Part L notional 0.30 W/m²K)
- Roof: **0.18 W/m²K** (equal to the limiting U-value from the Building Regulations)
- Windows: **1.60 W/m²K** (equal to the limiting U-value from the Building Regulations)
- Doors: **1.60 W/m²K** (equal to the limiting U-value from the Building Regulations)

It is acknowledged that the Air Permeability target of <1 as set by the Energy & Carbon Proforma for Non-Residential Minor developments is not met. However, it should be noted that the contractor should aim to construct the building with the aim of minimising the air permeability of the building.

A target of **8 m³/h·m² @ 50 Pa** is seen as attainable, and provides a reasonable value to be used within all other MEP services calculations to ensure plant is sized adequately without any risk of over sizing.

For further detail, reference should be made to the Passive Design Assessment report (Appendix C).

1.5 Ventilation system

The building, where suitable shall be naturally ventilated. This is generally to the consult rooms with lower occupancies and with openable windows away from any sources of pollution such as roads.

The free area to the windows has been assessed to provide sufficient levels of fresh air ventilation to the spaces.

Mechanical ventilation with heat recovery (MVHR) is provided to higher occupancy and specialist areas such as treatment rooms. Systems are designed for low Specific Fan Power and specified with high efficiency heat recovery.

1.6 Space heating demand

Based on TM54 “central” results, predicted annual space heating demand is approximately 3.9 MWh/yr (~6.6 kWh/m²/yr) and cooling demand approximately 2.1 MWh/yr (~3.5 kWh/m²/yr).

2.0 Maximise energy efficiency

2.1 Energy use intensity

Predictive energy modelling undertaken using CIBSE TM54 methodology gives a predicted Energy Use Intensity (EUI) of 79.4 kWh/m²/yr, equivalent to 46.5 MWh/yr total.

For further detail, reference should be made to the TM54 Assessment Report (Appendix D).

2.2 Efforts to reduce energy use of equipment

Unregulated loads, primarily small power and IT equipment, have been derived from benchmark data and design team input, with conservative allowances applied where information was unavailable. Management factors such as hours of operation, control strategies, and commissioning have been agreed with the design team to reflect the intended facilities management approach.

This has been assessed to provide an approximate Unregulated load of ~20 W/m² with 5% overnight setback. The building operator shall be responsible for ensuring that profile settings and equipment procurement are carried out with energy efficiency as a primary consideration.

3.0 Renewable energy generation

3.1 Proposed renewable energy generation system

Solar photovoltaic (PV) panels are proposed, generating approximately 30,273 kWh annually (51.66kWh/m²).

Refer to Appendix E for PV footprint layout.

The below table summarises the proposed system:

Description	Solar PV
Orientation	West 271°
Tilt	10° (Horizontal)
Peak output (kWp)	34.32kWp
Panel (maximum output, type of inverters)	440 W panels, string inverters
PV area as a percentage of ground floor area	26.60%
Expected annual renewable energy generation	30,273 kWh/yr
Annual renewable energy generation per m ² GIA	51.66 kWh/yr/m ²
Annual renewable energy generation per m ² building footprint	51.66 kWh/yr/m ²
Balance between total energy use and renewable energy generation	65.10%
Shading constraints?	1.0% Yield Reduction
Data source	Meteonorm 8.2(i)

3.2 Renewable energy balance

Predicted annual demand (TM54 central case): 46,500 kWh
PV output: 30,273 kWh/yr
Balance: ~65% of total demand met by PV.

4.0 Low carbon heating

4.1 Fossil fuel free

The building is fossil-fuel free with no reliance on natural gas.

4.2 Proposed system for heating and hot water

Heating and hot water will be provided by high efficiency heat pump VRF system.

Other LZC technologies were considered but found unfeasible for this site (Refer to LZC Assessment Report – Appendix F).

District heating was considered to the site, but discounted on the basis of excessive costs associated with a new connection in relation to a relatively small building with low heating demand. The heating systems proposed offers high efficiency and is able to provide an energy efficient method of hot water generation, whilst also providing cooling to areas of the building.

4.3 Proposed system for cooling

Cooling is provided by the VRF system.

5.0 Overheating risk

5.1 Natural ventilation

All windows to the building are openable. The consult rooms are naturally ventilated and the openable area of the windows has been specified to ensure adequate ventilation to the spaces.

Design measures include solar-control glazing, openable windows for purge cooling

5.2 Overheating risk assessment

A Thermal Comfort Assessment has been appended to this report (Appendix G).

6.0 Materials

6.1 Efforts made to minimise embodied carbon

An embodied carbon assessment (BREEAM MAT01) has been produced as appended (Appendix H).

7.0 - Appendices

7.1 Appendix A – Non-Residential Minor Energy and Carbon Proforma

Energy and Carbon Proforma
Non-residential

Minor development (100-999m²)
Version 1.0



Project Name: Whitefield Primary Care Facility
Application ref: -
Date: 29/09/2025

		Ref. name	-					
		Area (m ² GIA)	586					
		Target values	Building 1	Building 2	Building 3	Building 4	Building 5	+
Minimise energy demand	Space heating demand (kWh/m ² GIA/yr)	≤ 15	6.6					
	Space cooling demand (kWh/m ² GIA/yr)	≤ 15	3.5					
	Calculation methodology used to calculate space heating demand and confirmation that this covers all homes/blocks	Predictive energy model	TM54					
	Form factor per building	≤ 2	1.01					
	Average external wall U-value (W/m ² K)	≤ 0.15	0.14					
	Average window U-value (W/m ² K)	≤ 1 (triple)	1.6					
	Air permeability rate (m ³ /h/m ² @ 50 Pa)	≤ 1	8					
Maximise energy efficiency	BREEAM Ene 01 rating	Excellent	Excellent					
	Energy use intensity (kWh/m ² GIA/yr)	-	79.4					
	Calculation methodology used to calculate energy use intensity and confirmation that this covers all homes/blocks	Predictive energy model	TM54					
Use renewable energy	PV footprint area (% of ground floor space)	-	26.6					
	Annual renewable energy generation (kWh/m ² building footprint/yr)	-	51.66					
	Renewable energy balance (%)	-	65.1					
	Total energy used (kWh/yr)	-	46500					
	Total energy generated on-site (kWh/yr)	-	30273					
Use low carbon energy	Fossil fuel free (yes/no)	Yes	Yes					
	Heat source - Where the system for generating space heating and hot water is a heat pump and it achieves a SCOP of 3.5 or higher (then a Low Carbon Heat Appraisal not required)	Electric	Electric / Heat Pump					
Reduce overheating risk	Has CIBSE TM52 been used to calculate overheating and does the building pass?	Yes	Yes					
	What percentage of spaces are cooled? (% of GIA)	-	55					
Minimise embodied carbon	Confirmation that a summary of the efforts made to design a lean, low carbon structure and building design has been submitted?	Yes	Yes					

7.2 Appendix B – Thermal Envelope Plan & Sections

THIS DRAWING (OR ANY PART THEREOF) MAY NOT BE COPIED, TRANSMITTED OR DISCLOSED TO ANY THIRD PARTY OR UNAUTHORISED PERSON WITHOUT THE PRIOR WRITTEN PERMISSION OF GILLING DOD.

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS PREPARED BY CONSULTANTS AND SUB-CONTRACTORS.

REPORT ANY DISCREPANCIES TO THE ARCHITECT OR REPRESENTATIVES THEREOF.

© ALL RIGHTS RESERVED. NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS WITHOUT THE WRITTEN PERMISSIONS OF THE COPYRIGHT HOLDER

ONCE PRINTED AND DISTRIBUTED THIS DOCUMENT IS ASSUMED UNCONTROLLED

THIS DRAWING IS INTENDED TO BE PRINTED AT THE PAPER SIZE INDICATED IN THE INFORMATION BELOW

DO NOT SCALE FROM THIS DRAWING. WORK ONLY TO PRINTED DIMENSIONS.

NOTES

Drawing to be read in conjunction with Stage 4 drawing pack & details.

All relevant Mechanical, Electrical and Structural Engineer's details to be referred to where relevant.

All details are to be referred to for Stage 4/tender purposes only and should at no point be considered as construction information.

Room Schedule		
Number	Name	Area
V1.00.001	Lobby	6 m²
V1.00.002	Circulation	19 m²
V1.00.003	Circulation	34 m²
V1.00.004	Office	7 m²
V1.00.005	Reception	17 m²
V1.00.006	Circulation	29 m²
V1.00.007	Waiting Room	48 m²
V1.00.008	IWWC	6 m²
V1.00.009	Quiet Room	3 m²
V1.00.010	WC	4 m²
V1.00.011	Interview Room	6 m²
V1.00.012	Consult / Exam	13 m²
V1.00.013	Consult / Exam	12 m²
V1.00.014	Consult / Exam	16 m²
V1.00.015	Consult / Exam	16 m²
V1.00.016	Consult / Exam	15 m²
V1.00.017	Circulation	22 m²
V1.00.018	Consult / Exam	14 m²
V1.00.019	Consult / Exam	14 m²
V1.00.020	Clean Store	7 m²
V1.00.021	Store	5 m²
V1.00.022	Comms	5 m²
V1.00.023	Admin	33 m²
V1.00.024	Admin	7 m²
V1.00.025	Staff WC	4 m²
V1.00.026	Staff WC	4 m²
V1.00.027	Staff Room	15 m²
V1.00.028	Meeting Room	23 m²
V1.00.029	Cleaners	7 m²
V1.00.030	Dirty Utility	6 m²
V1.00.031	Plant Room	14 m²
V1.00.032	Treatment Room	18 m²
V1.00.033	Treatment Room	17 m²
V1.00.034	Consult / Exam	15 m²
V1.00.035	Consult / Exam	14 m²
V1.00.036	Circulation	15 m²
V1.00.037	External disposal Hold	12 m²
V1.00.038	External Plant Enclosure	20 m²
V1.00.039	Admin	7 m²

GIFA: 531sqm*

GIA: 583sqm*

Note: *Figures do not include uncovered Plant Compound & External Refuse Store

Department Legend

- Circulation
- Clinical Spaces (Consult/Exam & Treatment)
- Clinical Support (Stores/Utility Rooms)
- Patient Waiting/WCs
- Plant Room
- Shared Spaces (Meeting/Interview Room)
- Staff Areas (Reception/Admin/Rest)

P09	MB	Updated ramp and plant enclosure	16/01/2026
P08	MB	Stage 4 Issue	19/12/2025
P07	MB	Draft Stage 4 issue	06/11/2025
P06	MB	Stage 3 Issue	16/06/2025
P05	MB	Updated with GIA and GIFA	20/05/2025
P04	MB	Draft Stage 3 Issue	15/05/2025
P03	MB	Updated following comments recieved	19/02/2025
		14/02/25	
P02	MB	Updated following comments recieved	12/02/2025
		10/02/25	
P01	CR	First Issue.	22/01/2025
Rev	By	Description	Date



The Cruck Barn, Duxbury Park, Chorley, Lancashire, PR7 4AT
+44 1257 260070 | contact@gillingdod.com | gillingdod.com

Client Name:
NHS Property Services

Site Name:
Whitefield Library, Pinfold Lane,
Whitefield, M45 7NY

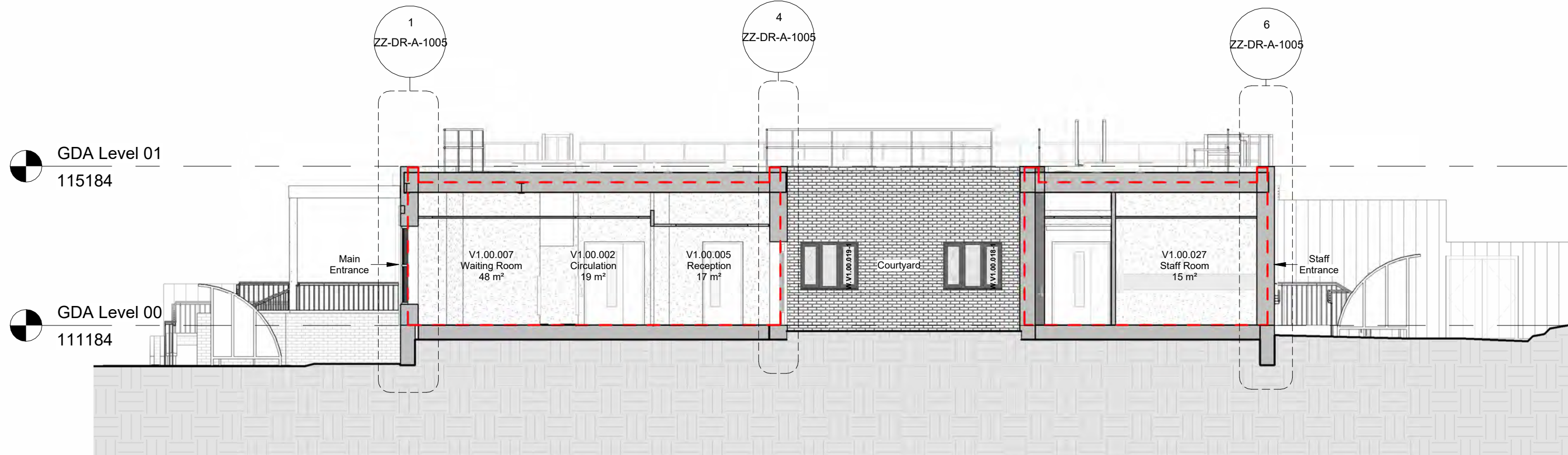
Project Name:
Primary Care GP Surgery

Drawing Title:
**Proposed Ground Floor
GA Plan**

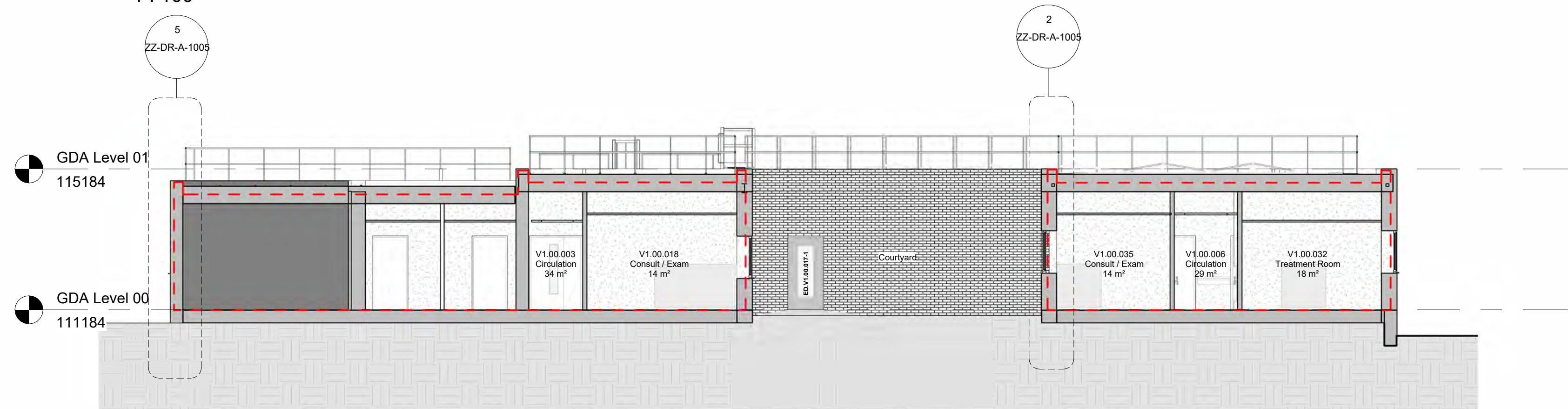
Project No: 9113-001	Sheet Size: A2	Scale: 1 : 100	
Drawn by: MB	Checked by: CLS	Approved by: CLS	Revision: P09

Drawing Number:
Project Code / Originator / Volume / Level / Type / Discipline / System-Number
WFLREF-GDA-V1-00-DR-A-1001

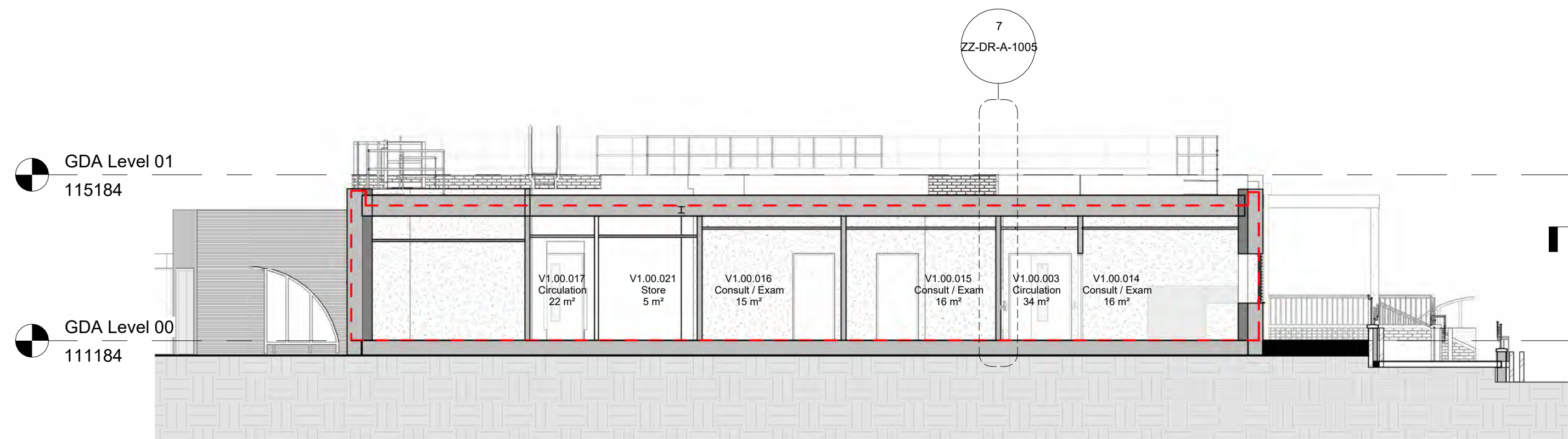




1 ZZ-DR-A-1004-Section 1 - Proposed
1 : 100

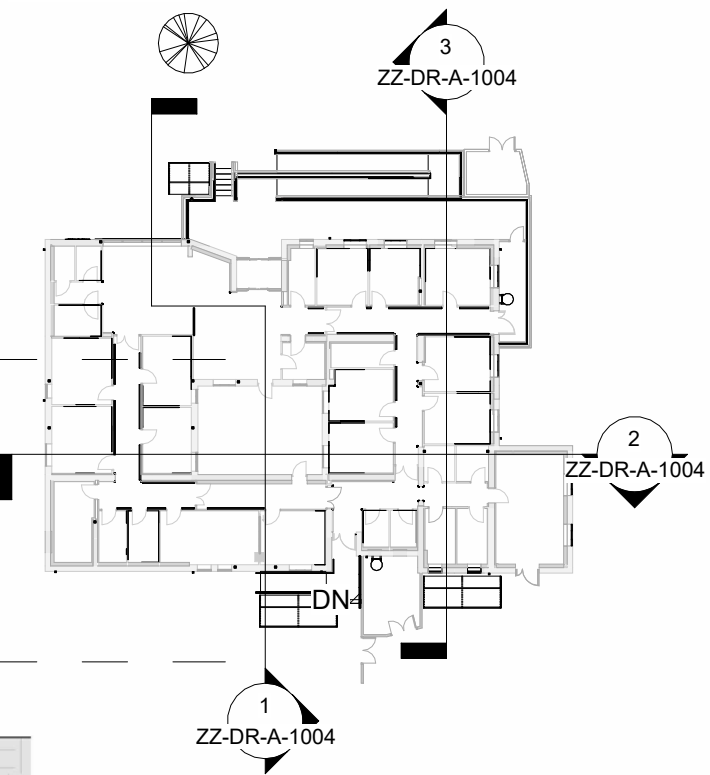


2 ZZ-DR-A-1004-Section 2 - Proposed
1 : 100



3 ZZ-DR-A-1004-Section 3 - Proposed
1 : 100

SECTION KEY



THIS DRAWING (OR ANY PART THEREOF) MAY NOT BE COPIED, TRANSMITTED OR DISCLOSED TO ANY THIRD PARTY OR UNAUTHORISED PERSON WITHOUT THE PRIOR WRITTEN PERMISSION OF GILLING DOD.

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS PREPARED BY CONSULTANTS AND SUB-CONTRACTORS.

REPORT ANY DISCREPANCIES TO THE ARCHITECT OR REPRESENTATIVES THEREOF.

© ALL RIGHTS RESERVED. NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS WITHOUT THE WRITTEN PERMISSIONS OF THE COPYRIGHT HOLDER

ONCE PRINTED AND DISTRIBUTED THIS DOCUMENT IS ASSUMED UNCONTROLLED

THIS DRAWING IS INTENDED TO BE PRINTED AT THE PAPER SIZE INDICATED IN THE INFORMATION BELOW

DO NOT SCALE FROM THIS DRAWING. WORK ONLY TO PRINTED DIMENSIONS.

NOTES

Drawing to be read in conjunction with Stage 4 drawing pack & details.

Levels based on Topographical Survey Ref 72968MCLS-01 Dated 25/04/25 by Survey Solutions.

All relevant Mechanical, Electrical and Structural Engineer's details to be referred to where relevant.

All details are to be referred to for Stage 4/tender purposes only and should at no point be considered as construction information.

--- Line of Air Tightness

P05	MB	Stage 4 Issue	19/12/2025
P04	SM	WIP - Issued comment & coordination	09/09/2025
P03	MB	Stage 3 Issue	16/06/2025
P02	MB	Draft Stage 3 Issue	15/05/2025
P01	CR	First Issue.	22/01/2025
Rev	By	Description	Date


The Cruck Barn, Duxbury Park, Chorley, Lancashire, PR7 4AT
+44 1257 260070 | contact@gillingdod.com | gillingdod.com

Client Name:
NHS Property Services

Site Name:
Whitefield Library, Pinfold Lane,
Whitefield, M45 7NY

Project Name:
Primary Care GP Surgery

Drawing Title:
Proposed GA Sections

Project No: 9113-001	Sheet Size: A2	Scale: As indicated	
Drawn by: MB	Checked by: CLS	Approved by: CLS	Revision: P05

Drawing Number:
Project Code / Originator / Volume / Level / Type / Discipline / System-Number
WFLREF-GDA-V1-ZZ-DR-A-1004

7.3 Appendix C – Passive Design Report



Whitefield Primary Care Health Centre

Ene04: Passive Design Analysis

August 2025

Project Ref: 3280460

We are **daylighting** experts

We are **thermal comfort** experts

We are **life cycle analysis** experts

We are **sustainability** experts

We are **building physics** experts

We are **zero carbon** experts

We are **zed.**



zero carbon
building physics
sustainability

zed.
an RSK company

contents

4

abbreviations

5

executive summary

7

introduction

10

microclimate

12

layout & orientation

14

materials & design

17

results

19

conclusion

21

drawing register

23

Appendix
BRUKL Standard Building

26

Appendix
BRUKL Proposed Building

prepared by:	Miquel Garcia – Senior Building Physics Engineer	date: 06 08 25	sig: 
checked by:	Jordan Turner – Senior Building Physics & Sustainability Engineer	date: 06 08 25	sig: 
revision:	00 - initial issue	date: 06 08 25	sig: 

abbreviations

AHU	-	Air Handling Unit
APR	-	Air Permeability Rate
ASHP	-	Air Source Heat Pump
BREEAM	-	Building Research Establishment Environmental Assessment Method
BRUKL	-	Building Regulations UK, Part L
CHP	-	Combined Heat & Power
COP	-	Coefficient Of Performance
DHW	-	Domestic Hot Water
EER	-	Energy Efficiency Ratio
LED	-	Light Emitting Diode
LZC	-	Low and Zero Carbon
NCM	-	National Calculation Methodology
PV	-	Photo Voltaic (panels)
SCOP	-	Seasonal Coefficient of Performance
SEER	-	Seasonal Energy Efficiency Ratio
SFP	-	Specific Fan Power
TRY	-	Test Reference Year
VRF	-	Variable Refrigerant Flow

executive summary



executive summary

This assessment shows that passive design measures result in a reduction in predicted energy consumption and associated CO₂ emissions.

zed. has compiled the following report on behalf of Silcock Leedham Consulting Engineers in support of the BREEAM credit ‘Ene04 - Passive Design Analysis’ for the proposed Whitefield Primary Care Health Centre, Manchester.

The assessment was undertaken at the concept design stage using information provided prior to the end of RIBA Stage 2.

Works have been undertaken by Miquel Garcia, a Senior Building Physics Engineer and CIBSE registered Energy Assessor and Low Carbon Consultant (LCEA206041). **zed.** Thermal modelling has been carried out using Government approved IES - VE dynamic simulation software in accordance with CIBSE AM11. Calculated energy and CO₂ savings are expressed against baseline ‘Standard’ building performance as defined within the BREEAM UK ‘Refurbishment and Fit-out 2014’ technical guide. For the purpose of this assessment, current regulatory CO₂ factors are used.

A full thermal comfort assessment is currently being undertaken in accordance with BREEAM credit issue Hea04. However, all occupied areas are to be fully mechanically conditioned and initial plant sizing has been based upon achieving the recommended operative temperatures set out within CIBSE Guide A Table 1.5, therefore achieving thermal comfort by default.

Building	Regulated Energy (MWh/yr)	Regulated CO ₂ (tonnes.CO ₂ /yr)
Standard	25.23	3.69
Actual ‘Proposed’	21.03 (-16.68%)	3.06 (-17.14%)

Table 1. Result summary

introduction



introduction

Passive energy savings have been calculated using dynamic thermal modelling using IES - VE software.

This report sets out the approach and results of the Passive Design Analysis undertaken for the proposed Whitefield Primary Care Health Centre. Each consideration listed within BREEAM technical guidance for credit issue Ene04 is addressed in turn.

A computational model has been constructed from the architectural drawings and design specification using the latest IES - VE software by a CIBSE accredited Low Carbon Consultant and Energy Assessor. Building servicing is based on the current design strategy and initial performance data available at this stage. The building comprises a high - performance sealed envelope and with full (primarily air source heat pumps) mechanical conditioning.

Passive savings are measured against a 'Standard' baseline building as defined within BREEAM guidance:

Measure	'Standard Building'	'Proposed Building'
External shading devices	As Designed	As Designed
Fabric performance	Building Regulations *	As Designed
Fabric proportions	As Designed	As Designed
Measure	'Standard Building'	'Proposed Building'
Thermal mass	Building Regulations *	As Designed
Daylighting	As Designed	As Designed
Ventilation	As Designed	As Designed

Table 2. Basis of modelling for BREEAM 'Standard' and 'Proposed' buildings

* For fabric elements that have been improved as part of the refurbishment works, the Building Regulations' minimum performance value for existing buildings have been used for the standard building specifications.

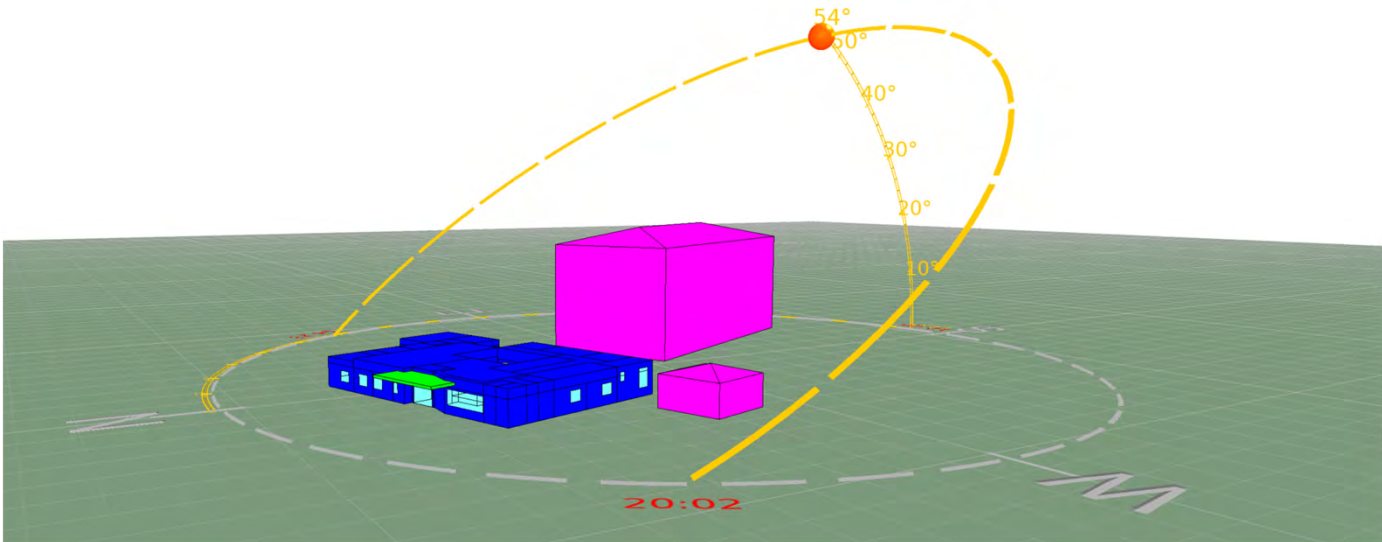


Figure 1. IES - VE thermal model

introduction

The development is located at Whitefield, north Manchester.

The development comprises the refurbishment of an existing single-story building to accommodate a new primary health centre in Whitefield, Manchester. The facility consists of several consultant/examination and treatment rooms, admin offices and welfare facilities.

A fabric-first approach to design has been taken, comprising of low thermal U-values to reduce heat loss in winter and solar-control glazing to reduce heat gain in summer. High efficiency LED luminaires and low Specific Fan Powers (SFPs) on the ventilation systems will minimise the energy consumption associated with the fixed building services.

The feasibility for incorporating recognised LZC technologies has been undertaken in two stages. An initial high level desktop appraisal has been carried out to establish if a technology is technically viable considering the site opportunities and constraints in context with the building use.



Figure 2. Site Location

microclimate



microclimate

Annual air temperature taken from the current regional CIBSE TRY (Test Reference Year).

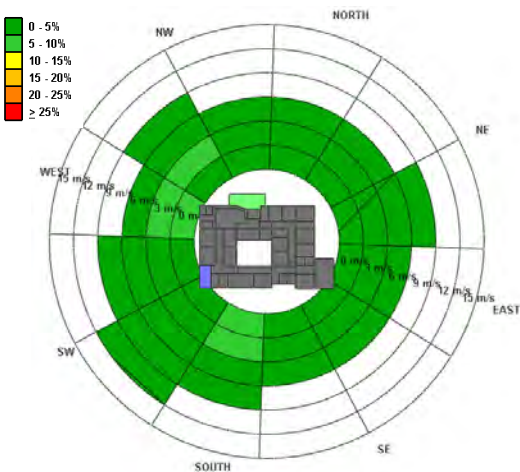


Figure 3. Manchester TRY weather data – wind rose (May to September)

The development site is located south of Whitefield town centre, in the former Whitefield Library & Adult Learning Centre building. The chart below shows the annual air temperature of the current CIBSE Test Reference Year weather file for the nearest location.

The minimum, maximum and average air temperatures are -6.9°C , 28.2°C and 9.82°C respectively. Heat recovery will be included on the ventilation systems to reduce the load during the coldest periods. Conversely, relatively low ambient temperatures in mid - season months will enable free - cooling potential in offsetting high internal heat gains.

Prevailing wind during the summer months should only be partially sheltered by adjacent buildings to the south and west of the site boundary.

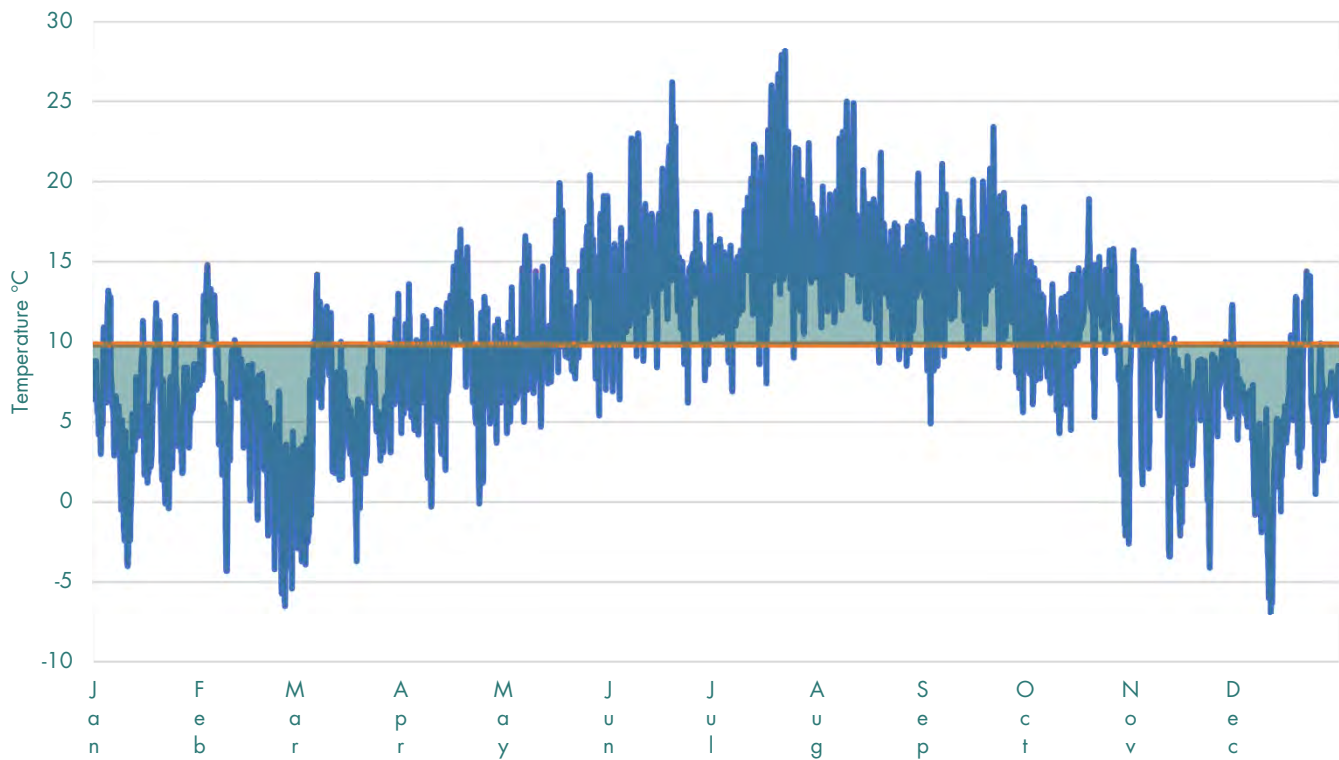


Figure 4. Manchester TRY weather data - external air temperature

layout & orientation



layout & orientation

The development comprises the change of use of an existing single-story building.

The building orientation is dictated by the existing building and driveway of the site.

The development comprises the change of use of the former Whitefield Library & Adult Learning Centre building, located south of Whitefield town centre. The refurbished building will accommodate a new primary health centre, including consultant/examination and treatment rooms, admin offices and welfare facilities.

Due to the refurbishment nature of the project, there is no scope to alter the orientation of the existing building. However, the internal layout has been carefully coordinated to ensure efficient workflows between waiting areas, consultation rooms, welfare facilities, and administrative offices. Consultation and meeting rooms are positioned along the external façades and the internal courtyard to benefit from natural light and potential natural ventilation. The number and size of external windows have also been optimised to minimise solar gains and reduce cooling loads.



Figure 5. Ground floor arrangement

materials & design



materials & design

A high performance thermal envelope is specified at this stage to maximise thermal comfort and minimise conditioning loads.

Element	U - value (W/m².K)	
	'Standard' Benchmark	Proposed
Ground/exposed floor	0.25	≤ 0.18 (-28%)
External walls	0.30	≤ 0.14 (-53%)
Roof	0.18	≤ 0.18 (0%)
Windows	3.14	≤ 1.60 (-49%)
Rooflights/sunpipes	n/a	n/a
Doors	1.60	≤ 1.60 (0%)
Area	Air Permeability (m³/h.m² @ 50Pa)	
	'Standard'	Proposed
Entire	8.0	≤ 8.0

Table 3. Envelope specification

Form

The Architects have designed the building to fit within the constraints of the existing building and site.

Building fabric & thermal mass

The proposed thermal envelope specification is set out in the table below. The average building U - value of 0.23W/m².K is 34% lower than the comparative Standard building as defined within the 'BREEAM UK Refurbishment and Fit-out 2014' technical guide.

In development of the elevations though the following design stage, the proportion of glazing and glass specification will be developed to balance heat loss, heat gain and natural light.

For the purpose of the assessment, an air permeability of 8 m³/h.m² @ 50Pa has been used for both the Standard and Proposed buildings. It is likely that, with the replacement of the existing roof and the installation of new high-performance external windows, the actual building's airtightness will improve further.

Thermal mass will be utilised where possible to promote thermal stability and resistance the effects of solar gains in summertime.

Building occupancy

For the purpose of the assessment, building occupancy is based upon NCM template data for planning category D1: Primary Health Care Building. This template data aims to represent typical building use and in this case generally comprising 7am to 7pm, 5 day/week occupancy.

materials & design

The building will be sealed and fully mechanically conditioned to maintain internal environmental conditions.

Daylight strategy

As referred earlier in the report, a consideration for natural light has been made throughout the development of the internal layouts, with occupied rooms located on the building perimeter.

High efficacy luminaires with automatic control will be installed to adjust lighting levels with respect to both occupancy and the availability of daylight when possible. This approach helps maintain consistent illuminance whilst at the same time reducing the demand for energy and prolonging the service life of the luminaires.

Ventilation strategy

The primary method of ventilation to the building will be natural ventilation. Areas with high occupancy, or specific mechanical ventilation requirements will be served by high efficiency Heat Recovery Ventilation units (HRU). Toilet and changing areas will be served from various dirty extract systems (some combined, some individual local wall extracts).

The M&E designers have specified the specific supply and extract air rates within each space.

Adaptation to Climate Change

The robustness of material selections will be considered by the Architect together with solar absorption and transmittance in mitigating the risks of summertime overheating and increased use of mechanical cooling. At RIBA Stage 3 a full thermal comfort assessment will be undertaken for both current and future weather data in accordance with BREEAM Hea04. Building load calculations will be undertaken in respect of achieving the recommended operative temperatures set out in CIBSE Guide A Table 1.5.

results



results

Baseline regulated energy consumption and CO₂ emissions are taken from the Standard building as defined within BREEAM UK 'Refurbishment and Fit-out 2014' technical guidance.

Dynamic simulation modelling (DSM) has been undertaken using the regulatory National Calculation Methodology (NCM) to determine the impact of passive design measures.

Energy savings are shown below, comprising the cumulative effects of passive design measures at this stage.

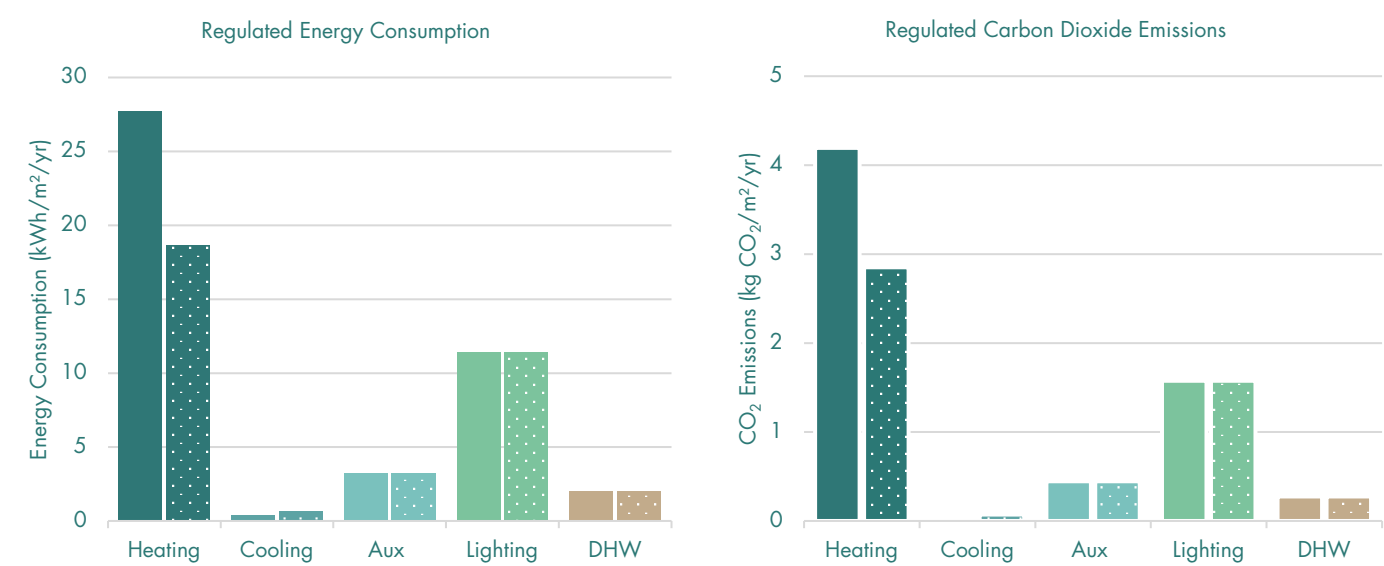


Figure 6. Predicted energy and CO₂ emissions – Standard vs. Actual

Building	Regulated Energy (MWh/yr)	Regulated CO ₂ (tonnes.CO ₂ /yr)
Standard	25.23	3.69
Actual 'Proposed'	21.03 (-16.68%)	3.06 (-17.14%)

Table 4. Result summary

conclusion



conclusion

Results show that passive design measures results in energy and CO₂ savings.

This assessment has been undertaken in accordance with BREEAM UK 'Refurbishment and Fit-out 2014' credit issue Ene04 – 'Passive Design Analysis'. Thermal modelling has been undertaken by a CIBSE registered Energy Assessor in accordance with the NCM using Government approved IES - VE dynamic simulation software.

The building orientation is determined by the existing structure and driveway on the site, therefore, there is no opportunity to alter the orientation of the proposed building.

The building uses passive design measures to reduce the total heating, cooling, mechanical ventilation and lighting loads and energy consumption in line with the findings of the passive design analysis.

Simulation results show that significant savings in both predicted energy and CO₂ emissions are achieved through passive measures.

Predicted regulated energy consumption = 21.03MWh/yr (- 16.7%)

Predicted regulated CO₂ emissions = 3.06 tonnes.CO₂/yr (- 17.1%)

Further to passive savings, a reduction in energy demand and CO₂ emissions will continue to be explored through the efficient use of energy and on - site LZC technologies.

drawing register



drawing register

The thermal model has been constructed using the following drawings.

drawing title	drawing reference	issued by	revision
Proposed Ground Floor GA Plan	WFLREF-GDA-V1-00-DR-A-1001	Gilling Dod Architects	P04
Proposed Site Plan	WFLREF-GDA-V1-S1-DR-A-1002	Gilling Dod Architects	P06
Proposed Elevations	WFLREF-GDA-V1-ZZ-DR-A-1003	Gilling Dod Architects	P01
Proposed GA Sections	WFLREF-GDA-V1-ZZ-DR-A-1004	Gilling Dod Architects	P02
Proposed Roof Plan	WFLREF-GDA-V1-R1-DR-A-2001	Gilling Dod Architects	P01
Ground Floor Reflected Ceiling Plan	WFLREF-GDA-V1-00-DR-A-2101	Gilling Dod Architects	P01
Proposed Window Elevations & Schedule	WFLREF-GDA-V1-00-DR-A-2802	Gilling Dod Architects	P01
Proposed External Door Reference Plan	WFLREF-GDA-V1-00-DR-A-2805	Gilling Dod Architects	P01

Table 5. Drawing Register

Appendix BRUKL Standard Building



Project name

Whitefield Primary Care - STANDARD**As designed****Date:** Tue Aug 05 15:57:39 2025**Administrative information****Building Details****Address:** Pinfold Lane, MANCHESTER, M45 7NY**Certifier details****Name:** Miquel Garcia**Telephone number:** 0113 393 3329**Address:** Zero Energy Design Ltd, Upperbank House,
Stoneythorpe, Horsforth, Leeds, LS18 4bBN**Certification tool****Calculation engine:** Apache**Calculation engine version:** 7.0.29**Interface to calculation engine:** IES Virtual Environment**Interface to calculation engine version:** 7.0.29**BRUKL compliance module version:** v6.1.e.1**Foundation area [m²]:** 528.61**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	3.05
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	2.28
Target primary energy rate (TPER), kWh _{PE} /m ² annum	31.33
Building primary energy rate (BPER), kWh _{PE} /m ² annum	19.03
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	0.3	0.3	00000039:Surf[1]
Floors	0.18	0.25	0.25	00000005:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.18	0.18	00000039:Surf[0]
Windows** and roof windows	1.6	3.21	3.21	00000005:Surf[1]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.6	1.6	V1000007:Surf[0]
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/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

* 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.

^ For fire doors, limiting U-value is 1.8 W/m²K

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	8

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	585.9	585.9
External area [m ²]	1709.6	1709.6
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	8	3
Average conductance [W/K]	606.79	454.19
Average U-value [W/m ² K]	0.35	0.27
Alpha value* [%]	32.53	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

Retail/Financial and Professional Services
 Restaurants and Cafes/Drinking Establishments/Takeaways
 Offices and Workshop Businesses
 General Industrial and Special Industrial Groups
 Storage or Distribution
 Hotels
 Residential Institutions: Hospitals and Care Homes
 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
 Non-residential Institutions: Education

100 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
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	25.79	14.39
Cooling	0.69	0.9
Auxiliary	3.22	0.86
Lighting	11.38	10.13
Hot water	2	0.61
Equipment*	30.18	30.18
TOTAL **	43.07	26.89

* 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	32.6	6.19
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>32.6</i>	<i>6.19</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	237.74	131.23
Primary energy [kWh _{PE} /m ²]	19.03	31.33
Total emissions [kg/m ²]	2.28	3.05

Appendix BRUKL Proposed Building



Project name

Whitefield Primary Care - PROPOSED

As designed

Date: Tue Aug 05 12:55:59 2025

Administrative information

Building Details

Address: Pinfold Lane, MANCHESTER, M45 7NY

Certifier details

Name: Miquel Garcia

Telephone number: 0113 393 3329

Address: Zero Energy Design Ltd, Upperbank House,
Stoneythorpe, Horsforth, Leeds, LS18 4bBN

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.29

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.29

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

Foundation area [m²]: 528.61The 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	2.95
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	1.2
Target primary energy rate (TPER), kWh _{PE} /m ² annum	30.34
Building primary energy rate (BPER), kWh _{PE} /m ² annum	7.85
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	0.14	0.14	00000039:Surf[1]
Floors	0.18	0.18	0.18	00000005:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.18	0.18	00000039:Surf[0]
Windows** and roof windows	1.6	1.6	1.6	00000005:Surf[1]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.6	1.6	V1000007:Surf[0]
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/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

* 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.

^ For fire doors, limiting U-value is 1.8 W/m²K

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	8

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	585.9	585.9
External area [m ²]	1709.6	1709.6
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	8	3
Average conductance [W/K]	390.24	452.48
Average U-value [W/m ² K]	0.23	0.26
Alpha value* [%]	29.34	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

Retail/Financial and Professional Services
 Restaurants and Cafes/Drinking Establishments/Takeaways
 Offices and Workshop Businesses
 General Industrial and Special Industrial Groups
 Storage or Distribution
 Hotels
 Residential Institutions: Hospitals and Care Homes
 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
 Non-residential Institutions: Education

100 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
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	18.67	14.04
Cooling	0.62	0.96
Auxiliary	3.22	0.86
Lighting	11.38	10.13
Hot water	2	0.61
Equipment*	30.18	30.18
TOTAL **	35.89	26.6

* 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	32.6	6.55
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>32.6</i>	<i>6.55</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	170.54	129.56
Primary energy [kWh _{PE} /m ²]	7.85	30.34
Total emissions [kg/m ²]	1.2	2.95

Our Services

We offer a wide range of high-quality building performance advice and evaluation,
Sustainability & Net Zero Carbon Consultancy.

We work across all construction sectors in the UK, Europe and Worldwide.



Building Physics



Carbon



Sustainability



Compliance



Projects



Planning Support

Upperbank House, Stoneythorpe, Leeds LS18 4BN

t: 0113 3933329 e: info@zed-uk.com



7.4 Appendix D – TM54 Assessment Report



Whitefield Primary Care Health Centre

Ene01: TM54 Operational Energy Consumption Report

August 2025

Project Ref: 3280460

We are **daylighting** experts

We are **thermal comfort** experts

We are **life cycle analysis** experts

We are **sustainability** experts

We are **building physics** experts

We are **zero carbon** experts

We are **zed.**



zero carbon
building physics
sustainability

zed.
an RSK company

contents

3

abbreviations

5

executive summary

7

introduction

9

methodology

12

risk assessment

14

model input data

22

scope and scenarios

24

results

27

conclusion

29

drawing register

31

appendix

prepared by:	Miquel Garcia– Senior Building Physics Engineer	date: 28 08 25	sig: 
checked by:	Jordan Turner – Senior Building Physics & Sustainability Engineer	date: 28 08 25	sig: 
revision:	00 – initial issue	date: 28 08 25	sig: 

abbreviations

ACH	- Air Changes per Hour
APR	- Air Permeability Rate
ASHP	- Air Source Heat Pump
BREEAM	- Building Research Establishment Environmental Assessment Method
COP	- Coefficient of Performance
DHW	- Domestic Hot Water
DSM	- Dynamic Simulation Modelling
EUI	- Energy Use Intensity
HVAC	- Heating, Ventilation & Air Conditioning
NCM	- National Calculation Methodology
PV	- Photo Voltaic (panels)
SCOP	- Seasonal Coefficient of Performance
SFP	- Specific Fan Power
TRY	- Test Reference Year
VLT	- Visible Light Transmittance

executive summary



executive summary

This report has been compiled by zed., on behalf of Silcock Leedham Consulting Engineers, to detail the results of a TM54 Energy Assessment for the proposed Whitefield Primary Care Health Centre, Manchester.

This report supports BREEAM 2018 credit issue Ene01: predicted operational energy consumption.

zed. have undertaken an energy audit for the proposed Whitefield Primary Care Health Centre, Manchester.

All inputs into this assessment have been agreed with the project design team.

The assessment has been completed by Miquel Garcia, a Senior Building Physics Engineer and CIBSE registered Energy Assessor and Low Carbon Consultant (LCEA206041). The thermal modelling has been carried out using IES Virtual Environment software version 2025.0.0.0 in accordance with CIBSE AM11 (Building Energy and Performance Modelling) and CIBSE TM54:2022 (Evaluating Operational Energy Use at the Design Stage).

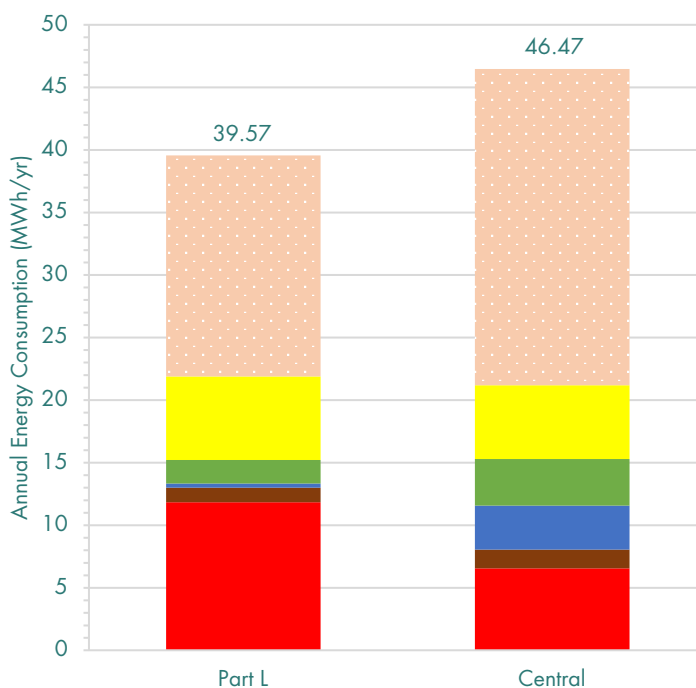
Predicted energy demand is reported for a range of scenarios on a monthly basis and broken down in respect of end use, and the M&E arrangement, to enable direct comparison with sub-meter data.

A summary of the scenarios is given in the scope and scenarios section, with full results for each scenario given in the results section and the appendix. Monthly energy demand for the central and worst cases are given in table 1.

Figure 1. illustrates the extent of the differences between the outputs from Part L and the more detailed Apache calculation methodologies

month	energy consumption (kWh/yr)	
	central case	worst case
Jan	4,101	6,095
Feb	3,819	4,931
Mar	4,287	5,223
Apr	3,771	4,800
May	3,555	4,333
Jun	3,637	4,335
July	3,707	4,321
Aug	3,691	4,404
Sep	3,698	4,385
Oct	3,661	4,672
Nov	4,088	5,091
Dec	4,458	5,889
Total	46,471	58,479

Table 1. predicted monthly energy consumption



■ Heating ■ Hot Water ■ Cooling ■ Aux ■ Lighting ■ Equipment

Figure 1. annual energy consumption, central and Part L scenarios

introduction



introduction

The development is located in Whitefield, Manchester.

The development comprises the refurbishment of an existing single-story building to accommodate a new primary health centre in Whitefield, Manchester. The facility consists of several consultant/examination and treatment rooms, admin offices and welfare facilities.

A fabric-first approach to design has been taken, comprising of low thermal U-values to reduce heat loss in winter and solar-control glazing to reduce heat gain in summer. High efficiency LED luminaires. An efficient VRF system and low Specific Fan Powers (SFPs) on the ventilation systems will minimise the energy consumption associated with the fixed building services.



Figure 2. site location

methodology



methodology

TM54: 2022 (Evaluating operational energy use at the design stage) gives guidance on how to accurately estimate operational energy use for a project, based on design stage information.



Figure 3. TM54: 2022

Building energy estimations made at the design stage are often found to be significantly different from the actual energy use during operation. This is commonly referred to as the performance gap.

TM54: 2022 outlines the best approach to estimating the operational energy use for a proposed development, in order to reduce this gap. Guidance is given on best modelling practice, reporting and quality checks.

Operational energy assessments take a step beyond simple compliance modelling, which should only be used to determine whether the proposed building meets a minimum compliance standard, in a repeatable manner using prescribed templates for operating conditions and by comparison with a notional reference building of the same shape and size.

A more accurate energy estimation is achieved by:

- Establishing a clear dialogue between designers, future occupiers and building owners, with a TM54 interview to establish behaviour of occupants and the building in the future
- Modelling to an appropriate level of detail to reliably estimate energy uses for heating, cooling, fans and pumps, using more realistic profiles and inputs
- Including all anticipated energy uses in buildings, rather than just central plant and equipment
- Breaking down energy use by end-use, allowing comparison to benchmarks to allow in use evaluation to sub metered energy uses

It is important to recognise, however, the limitations of design stage modelling. This includes the basis on how the building will be used and the simplifications that exist within dynamic simulation modelling (DSM) tools. There is a resulting band of uncertainty with any energy prediction, with a mid-range given as a baseline energy prediction.

BREEAM Ene01

“The aim of the Ene01 methodology is to incentivise better understanding of energy modelling techniques and reward more accurate predictions of energy use at early stages to support better design and construction of new buildings.”

This assessment has been carried out at design stage to determine a range for the predicted monthly energy consumption for the proposed Whitefield Primary Care Health Centre, Manchester. The process intends to address the performance gap that exists between Part L Compliance modelling outputs and actual building performance. Although intended as a compliance tool, the Part L methodology is often used to provide insight to anticipated energy consumption. However, due to the need for a standard approach for fair regulatory assessment, assumptions are made against a number of variables which can vastly differ from actual building conditions, including:

- Occupancy and plant operational hours.
- Heating and cooling setpoint temperatures.
- Domestic hot water demand.
- Ventilation rates.
- Weather conditions.
- Plant efficiency, operation and control.

A risk assessment has been undertaken to determine the key factors that could impact the buildings demand for energy. The output of this has been used to inform a process of dynamic simulation modelling.

Energy forecasts are inclusive of both regulated and unregulated demand and are reported on a monthly basis for comparison with in-use data when available.

risk assessment



risk assessment

Energy demand is influenced by a large number of variables including human, environmental and physical building factors.

A risk assessment has been carried out to identify potential causes of increased energy consumption. The outcomes of the below risk assessment has informed the energy modelling process. Severity and Likelihood are measured on a 5-point semantic scale where 1 represents 'very low' and 5 represents 'very high'.

	risk	impact	likelihood	level of risk	control & mitigation	residual risk
Human	Change in operating hours	5	1	5	Building operation is anticipated to be 7am – 7pm Monday – Friday, this is not expected to change.	2
	Change in number of occupants	2	1	2	Current modelling assumes maximum occupancy for the building.	1
	Poor building energy management	3	2	6	Appropriate training and guidance will be given to building operators. Equipment will be sub-metered and connected to a BMS (Building Management System) for centralised monitoring and review.	3
Environmental	Extreme weather, comprising increasing summer temperatures	2	4	8	The potential effects of extreme winter conditions mitigated through low thermal U-values and potential high air recirculation rates. Effects of extreme summer conditions mitigated through solar control glass and constant air volume and recirculation rates.	2
Building	Inefficient building servicing strategy	4	1	4	The building services strategy is designed by Silcock Leedham Consulting Engineers who have considerable experience in the specific requirements of NHS facilities. Plant will be specified to meet the required energy loads and enable suitable control.	1
	Poor plant commissioning and reactive-only maintenance	5	2	10	All plant is commissioned upon installation in accordance with the design specification. A post occupancy evaluation and seasonal commissioning process will be undertaken where required. Inevitably there are long periods where small adjustments can have a high overall impact.	4
	Building services operation efficiency below design	3	2	6	Over complex servicing and control is to be avoided. All equipment will be provided by long-serving and reputable manufacturers with historic in-use performance records available.	2

Table 2. risk assessment

model input data



model input data

Thermal modelling has been undertaken by Miquel Garcia, a Senior Building Physics Engineer and CIBSE registered Energy Assessor and Low Carbon Consultant (LCEA206041). Government approved IES-VE (v2025.0.0.0) dynamic thermal modelling software has been used in accordance with CIBSE AM11 & CIBSE TM54.

Building typology and geometry

A thermal model has been created from the design team drawings provided by Gilling Todd Architecture. The development comprises the refurbishment of an existing single-story building to accommodate a new primary health centre in Whitefield, Manchester. The facility consists of several consultant/examination and treatment rooms, admin offices and welfare facilities.

Building surroundings

Surrounding structures or canopies are included within the model as appropriate.

Climate data

The model has been coordinated for solar access and simulated against the CIBSE Manchester TRY (Test Reference Year) weather file. The weather data used for simulations was sourced from CIBSE (Chartered Institute of Building Services Engineers), an industry recognised organisation.

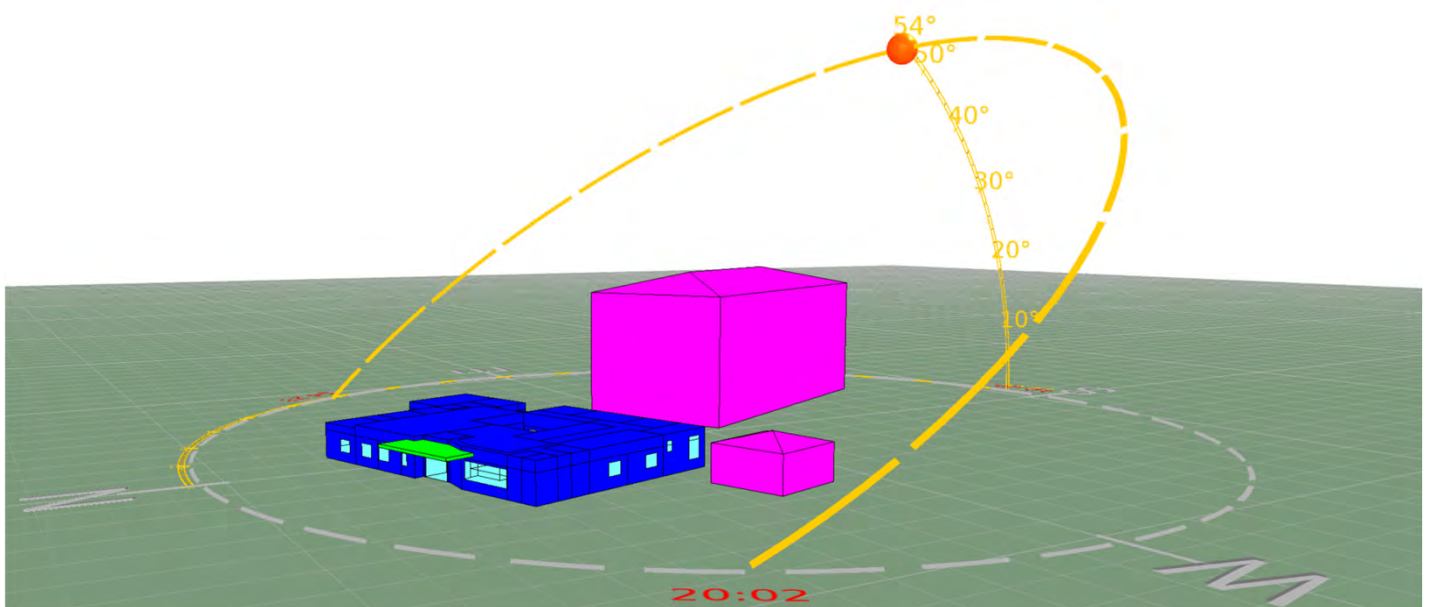


Figure 4. IES thermal model

model input data

The thermal envelope performance has been taken from the information provided by Gilling Todd Architecture.

Any amendments from these inputs will result in changes to the results of the energy assessment.

model data

The input data detailed within this report is a representation of the proposed use of the building, regarding occupancy, equipment, lighting and systems usage. Inputs have been established with the design team and are based on a combination of academic and project specific data. **zed.** are not responsible for ensuring these settings reflect the building in use nor for any differences between proposed simulation data, such as any weather files used.

The total useful internal floor area is taken from the model to be 586m².

fabric & openings	U-value (W/m ² .K)	Notes
Ground floor	0.18	
External walls	0.14 0.14	Type 1 Brickwork Type 2 Vertical rainscreen cladding
Roof	0.18	Replacement of the existing roof, including ceiling void and suspended ceiling
Windows	1.60	PPC aluminium Solar g-value = 0.40, visible light transmittance = 0.71
Curtain Wall	1.60	PPC aluminium Glazed door solar performance same as windows
Doors	1.60	PPC aluminium
air permeability	infiltration (ach ⁻¹)	Notes
Entire building	0.45	Equivalent to the design target APR of 10.0m ³ /(hr.m ²)@50Pa.

Table 3. building envelope specification

design criteria

Temperature set points for each space type are set as per the table below.

room type	heating setpoint (°C) (Occupied/Set back)	cooling setpoint (°C)
Circulation Spaces	19/12	n/a
WCs	21/12	n/a
Offices/Meeting/Admin Spaces	21/12	23
Consultant/Examination Rooms	21/12	23
Treatment Rooms	21/12	23

Table 4. heating and cooling set points

model input data

occupancy

Occupancies are taken from the Gilling Todd Architecture FF&E drawings and internal heat gains associated with each occupancy is taken from the SLCE Design Specification.

room type	max occupancy (people)	heat gain (sensible /latent) (W)	profile	notes
Consultant/Examination/Treatment room	3	90/60	0700-1900 Mon - Fri	Occupancy level varies throughout the day as per NCM template
V1.00.004 Office	1	90/60	0700-1900 Mon - Fri	Occupancy level varies throughout the day as per NCM template
V1.00.023 Admin	8	90/60	0700-1900 Mon - Fri	Occupancy level varies throughout the day as per NCM template
V1.00.024 Admin	3	90/60	0700-1900 Mon - Fri	Occupancy level varies throughout the day as per NCM template
Waiting Area	30	90/60	0700-1900 Mon - Fri	Occupancy level varies throughout the day as per NCM template
Interview Room	3	90/60	0700-1900 Mon - Fri	Occupancy level varies throughout the day as per NCM template
Meeting Room	11	90/60	0700-1900 Mon - Fri	Occupancy level varies throughout the day as per NCM template
Staff Room	8	90/60	0700-1900 Mon - Fri	Occupancy level varies throughout the day as per NCM template

Table 5. occupancy gains and profiles

model input data

equipment gains

The below table summarises the equipment gains assigned within the TM54 model for all room types.

room type	equipment gain (W/m ²)	profile	notes
Consultant/Examination/Treatment room	20.0	0700-1900 Mon - Fri	100% in occupied hours, 5% overnight setback
Interview Room	20.0	0700-1900 Mon - Fri	100% in occupied hours, 5% overnight setback
Isolation Room	20.0	0700-1900 Mon - Fri	100% in occupied hours, 5% overnight setback
Staff Room	20.0	0700-1900 Mon - Fri	100% in occupied hours, 5% overnight setback
Admin Office	20.0	0700-1900 Mon - Fri	100% in occupied hours, 5% overnight setback
Meeting Room	20.0	0700-1900 Mon - Fri	100% in occupied hours, 5% overnight setback
Group Room	20.0	0700-1900 Mon - Fri	100% in occupied hours, 5% overnight setback
Reception	20.0	0700-1900 Mon - Fri	100% in occupied hours, 5% overnight setback
Waiting Area	5.0	0700-1900 Mon - Fri	100% in occupied hours, 5% overnight setback
WCs	2.0	0700-1900 Mon - Fri	100% in occupied hours, 5% overnight setback
Circulation/Stores	2.0	0700-1900 Mon - Fri	100% in occupied hours, 5% overnight setback

Table 6. equipment gains and profiles

model input data

lighting gains

The below table summarises the lighting gains assigned within the TM54 model for all spaces. Sitewide lighting has been proposed as high efficiency LED lighting. Optimal controls have been proposed.

Lighting is profiled as per occupancy hours detailed in table 5.

room type	lighting efficacy (lm/w)	occupancy control	diversity factor	daylight dimming	daylight dimming profile
Consultant/Examination	131.48	Man-On-Auto-Off	0.82	Yes	300 lux ramp
Treatment room	113.00	Man-On-Auto-Off	0.82	Yes	300 lux ramp
V1.00.013 Consult/ Exam	113.40	Man-On-Auto-Off	0.82	Yes	300 lux ramp
V1.00.023 Admin	113.48	Man-On-Auto-Off	0.82	Yes	300 lux ramp
V1.00.024 Admin	131.63	Man-On-Auto-Off	0.82	Yes	300 lux ramp
Meeting Room	113.48	Man-On-Auto-Off	0.82	Yes	300 lux ramp
Interview Room	113.48	Man-On-Auto-Off	0.82	Yes	300 lux ramp
Office/Staff Room	131.63	Man-On-Auto-Off	0.82	Yes	300 lux ramp
Reception	131.48	Man-On-Auto-Off	0.82	Yes	300 lux ramp
Waiting Area	113.80	Auto-On-Auto-Off	0.90	Yes	300 lux ramp
WCs	106.23	Auto-On-Auto-Off	0.90	No	n/a
Circulation	113.80	Auto-On-Auto-Off	0.90	Yes	n/a
Plant/Stores	147.61	Auto-On-Auto-Off	0.90	No	n/a

Table 7. lighting gains, controls and profiles

daylight dimming

Areas in the building with access to daylight diversities have been given installed lighting power to account for daylight control. A dimming profile has been applied to modulate as a function of available daylight, as shown in figure 5 below. The illuminance has been completed using the link to IES Radiance software.

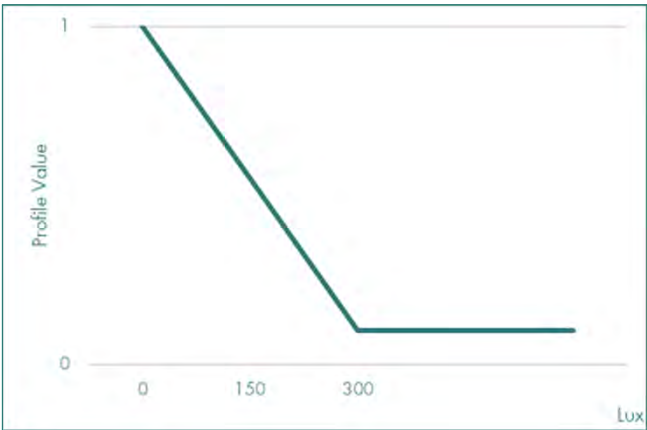


Figure 5. typical dimming profile (for a 300-lux ramp)

model input data

building services

The energy strategy and building services performance has been taken from final design information by SLCE (Silcock Leedham Consulting Engineers) and approved equipment suppliers.

Heating and cooling will be provided via local low carbon technology Variable Refrigerant Flow (VRF) Air Conditioning systems. WCs, and circulation areas will be provided with heating by direct electric panel heaters. The primary method of ventilation to the building will be natural ventilation. Areas with high occupancy or specific mechanical ventilation requirements will be served by high-efficiency heat recovery ventilation units. Toilets, changing areas, cleaners store and dirty utilities will be served from various dirty extract systems.

system reference	efficiencies			ventilation		notes
	heating SCOP (kW/kW)	cooling EER (kW/kW)	cooling SEER (kW/kW)	heat recovery (%)	SFP (W/l/s)	
VRF w/ Nat Vent	4.10	2.50	6.40	n/a	n/a	
VRF w/ MVHR	4.10	2.50	6.40	88.00	1.50	
Elec Rads w/ Nat Vent	1.00	n/a	n/a	n/a	n/a	
Elec Rads w/ Extract	1.00	n/a	n/a	n/a	0.30	
DHW	4.10	n/a	n/a	n/a	n/a	

Table 8. M&E specification – space conditioning

model input data

ventilation

The following room specific ventilation strategies have been used in the TM54 model:

room type	mechanical/natural ventilation	mechanical ventilation rate	natural ventilation notes
Consultant/Examination/Interview	Natural	n/a	Windows set to open based on both temperature and CO ₂ levels
Treatment room	Mechanical	10 ACH	
Interview Room	Mechanical	10 l/s/p	
Staff Room	Mechanical	10 l/s/p	
Admin Office	Mechanical	10 l/s/p	
Meeting Room	Mechanical	10 l/s/p	
Group Room	Mechanical	10 l/s/p	
Reception	Mechanical	10 l/s/p	
Waiting Area	Mechanical	10 l/s/p	
WC	Mechanical	6 ACH (extract only)	
Changing	Mechanical	6 ACH (extract only)	

Table 9. ventilation strategy

scope and scenarios



scope and scenarios

Further to Part L Compliance assessment, several variables have been modelled to determine their impact on energy performance, both individually and cumulatively.

It was established through a risk assessment and during design meetings, that measures are in place to promote good design, comprehensive commissioning and proactive ongoing building management. The following scenarios have been modelled to determine their impact upon predicted energy consumption.

Scenario N°	Scenario Title	Variable changes
1	Central	None, the model is based upon the proposed design and control and the expectation of relatively good management (Factor 1.05)
2	Good Management	Management Factor 1.0.
3	Poor Management	Management Factor 1.15.
4	Extreme Weather	Weather file: Manchester 2016DSY1.
5	Poor commissioning	• 25% increase to SFPs (Specific Fan Powers). • Reduction in lighting control factor for poor PIR time settings. • Reduction in cooling setpoint from 23-24°C to 22°C.
6	Poor Air Permeability	Increased APR from 10 to 25m ³ /(hr.m ²)@50P.
7	Worst case	Cumulative effects of scenarios 3 + 4 + 5 + 6.

Table 10. scenarios assessed

results



results

The predicted energy use intensity for Whitefield Primary Care Health Centre is 79.3 kWh_e/m²/yr.

Results illustrate the extent of the differences between the outputs from Part L and the more detailed Apache calculation methodologies. Total predicted energy consumption using the CIBSE TM54 approach is 30.16% greater than the Part L2: 2021 figures.

The following table and figure demonstrates this difference, with further breakdown of results by scenario and energy end use given in the proceeding pages.

A detailed, month by month, TM54 results table broken down by energy end use for each scenario can be found in the appendix.

Category	Consumption (MWh/yr)	
	Part L	Apache
Heating	11.8	6.6
Hot Water	1.2	1.5
Cooling	0.3	3.5
Aux	1.9	3.7
Lighting	6.7	5.9
Equipment	17.7	25.3
Total	39.6	46.5

Table 11. TM54 energy results compared to Part L

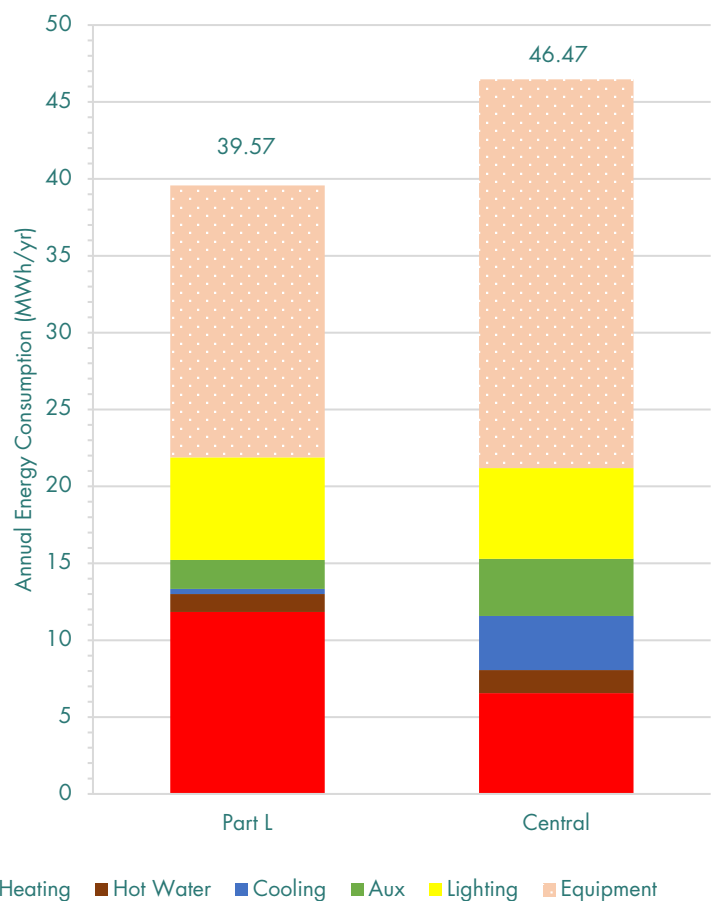


Figure 6. TM54 energy results compared to Part L

results

This page summarises energy performance predictions for the different scenarios considered at Whitefield Primary Care Health Centre.

Category	Consumption (MWh/yr)						
	1) Central	2) Good Management	3) Poor Management	4) Extreme Weather	5) Poor Commissioning	6) Poor Air Permeability	7) Worst Case
Heating	6.6	6.2	7.2	6.1	6.8	13.1	13.5
Hot Water	1.5	1.4	1.6	1.5	1.5	1.5	1.6
Cooling	3.5	3.3	3.9	3.9	4.5	2.0	3.5
Aux	3.7	3.5	4.1	3.7	4.6	3.7	5.0
Lighting	5.9	5.6	6.5	5.9	6.5	5.9	7.1
Equipment	25.3	24.1	27.7	25.3	25.3	25.3	27.7
Total	46.5	44.3	50.9	46.4	49.2	51.5	58.5

Table 12 TM54 energy results for each scenario

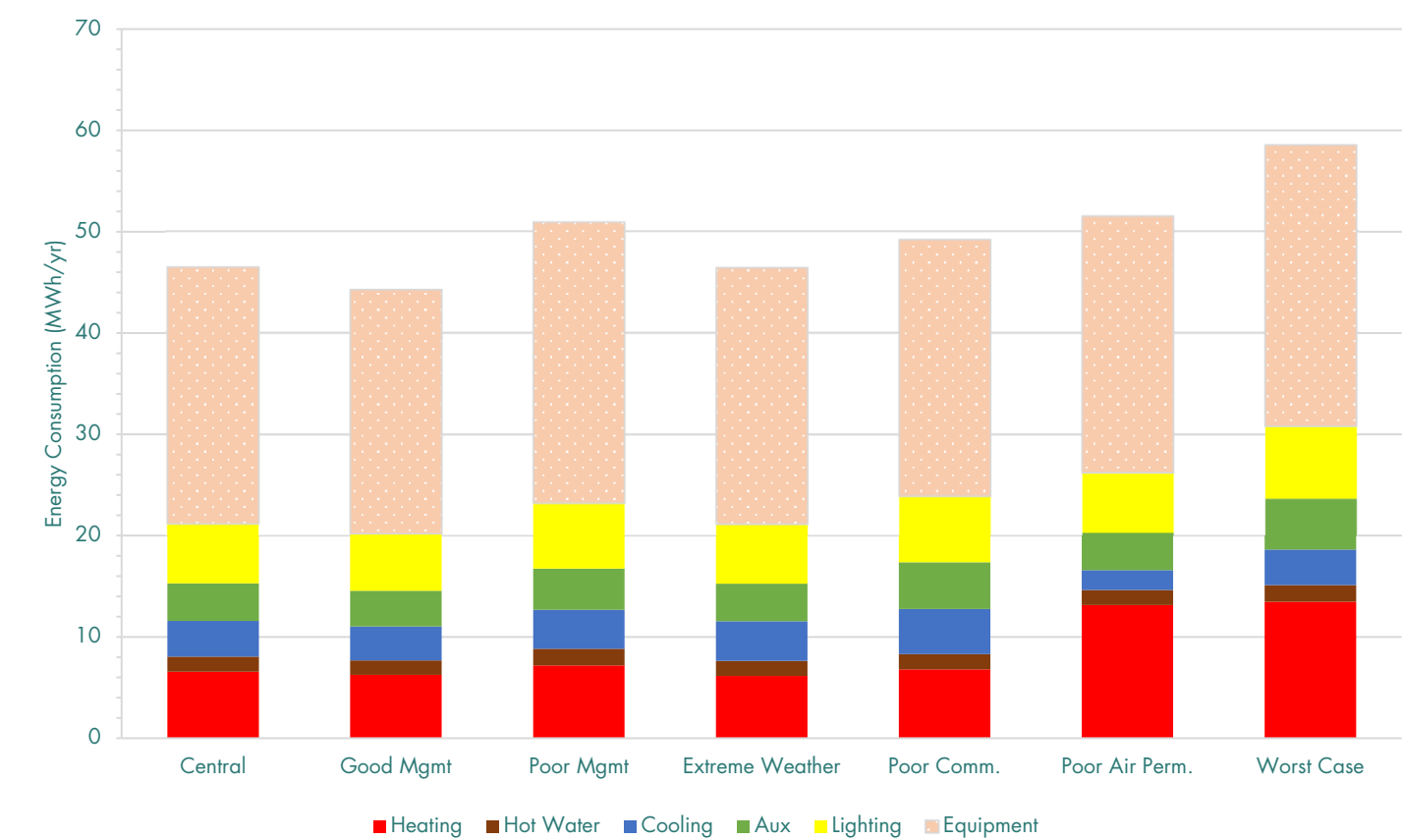


Figure 7. TM54 energy results for each scenario

conclusion



conclusion

This sections concludes the outcome of the TM54:2022 Energy Assessment for the proposed Whitefield Primary Care Health Centre, Manchester.

This report supports BREEAM 2018 credit issue *Ene01: predicted operational energy consumption*.

zed. have undertaken an energy audit for the proposed Whitefield Primary Care Health Centre, Manchester.

The thermal modelling and energy assessment has been carried out using IES Virtual Environment software version 2025.0.0.0 in accordance with CIBSE TM54:2022 (Evaluating operational energy use at the design stage). The IES model has been metered, with meters for different buildings and energy uses, allowing for detailed analysis of energy use within the building.

The assessment has established potential areas of risk for energy efficiency and the anticipated monthly energy consumption. Through this assessment the baseline predicted energy consumption for Whitefield Primary Care Health Centre has been established as 46.5 MWh/yr.

drawing register



drawing register

The thermal model has been constructed using the following drawings.

Drawing Title	Drawing Reference	Issued By	Revision
Proposed Ground Floor GA Plan	WFLREF-GDA-V1-00-DR-A-1001	Gilling Dod Architects	P04
Proposed Site Plan	WFLREF-GDA-V1-S1-DR-A-1002	Gilling Dod Architects	P06
Proposed Elevations	WFLREF-GDA-V1-ZZ-DR-A-1003	Gilling Dod Architects	P01
Proposed GA Sections	WFLREF-GDA-V1-ZZ-DR-A-1004	Gilling Dod Architects	P02
Proposed Roof Plan	WFLREF-GDA-V1-R1-DR-A-2001	Gilling Dod Architects	P01
Ground Floor Reflected Ceiling Plan	WFLREF-GDA-V1-00-DR-A-2101	Gilling Dod Architects	P01
Proposed Window Elevations & Schedule	WFLREF-GDA-V1-00-DR-A-2802	Gilling Dod Architects	P01
Proposed External Door Reference Plan	WFLREF-GDA-V1-00-DR-A-2805	Gilling Dod Architects	P01

Table 13. drawing register

appendix A1: TM54 detailed results



TM54 detailed results

Month	Energy Consumption (kWh)						
	Heating	Hot Water	Cooling	Aux	Lighting	Equipment	Total
Jan	899	122	92	299	566	2,124	4,101
Feb	836	115	105	284	499	1,980	3,819
Mar	978	131	114	327	511	2,226	4,287
Apr	549	126	227	313	448	2,109	3,771
May	361	122	334	299	413	2,027	3,555
Jun	207	126	499	313	424	2,069	3,637
Jul	155	127	618	313	423	2,071	3,707
Aug	176	127	556	313	435	2,085	3,691
Sep	244	126	454	313	465	2,095	3,698
Oct	389	122	276	299	494	2,082	3,661
Nov	774	126	137	313	589	2,149	4,088
Dec	994	131	106	327	633	2,267	4,458
Total	6,562	1,499	3,517	3,711	5,899	25,283	46,471

Table 15. predicted monthly energy consumption – 1) Central Case

Month	Energy Consumption (kWh)						
	Heating	Hot Water	Cooling	Aux	Lighting	Equipment	Total
Jan	856	116	87	284	539	2,023	3,905
Feb	796	109	100	271	476	1,886	3,637
Mar	931	125	108	311	487	2,120	4,083
Apr	523	120	216	298	426	2,008	3,592
May	344	116	318	284	393	1,930	3,385
Jun	198	120	475	298	404	1,970	3,464
Jul	148	121	589	298	403	1,972	3,530
Aug	167	121	530	298	414	1,986	3,515
Sep	233	120	433	298	443	1,996	3,522
Oct	371	116	263	284	470	1,983	3,487
Nov	737	120	131	298	561	2,047	3,893
Dec	946	125	101	311	603	2,159	4,246
Total	6,250	1,428	3,349	3,534	5,618	24,079	44,258

Table 16. predicted monthly energy consumption – 2) Good Management

TM54 detailed results

Month	Energy Consumption (kWh)						
	Heating	Hot Water	Cooling	Aux	Lighting	Equipment	Total
Jan	985	133	100	327	620	2,326	4,491
Feb	915	126	115	311	547	2,168	4,182
Mar	1,071	144	125	358	560	2,438	4,695
Apr	602	138	248	343	490	2,310	4,130
May	395	133	366	327	452	2,220	3,893
Jun	227	138	546	343	464	2,266	3,983
Jul	170	139	677	343	463	2,268	4,060
Aug	193	139	609	343	477	2,283	4,043
Sep	268	138	497	343	509	2,295	4,050
Oct	426	133	302	327	541	2,281	4,010
Nov	847	138	150	343	646	2,354	4,477
Dec	1,088	144	116	358	693	2,483	4,882
Total	7,187	1,642	3,852	4,064	6,461	27,691	50,897

Table 17. predicted monthly energy consumption – 3) Poor Management

Month	Energy Consumption (kWh)						
	Heating	Hot Water	Cooling	Aux	Lighting	Equipment	Total
Jan	1,115	122	54	299	562	2,124	4,276
Feb	758	115	104	284	496	1,980	3,737
Mar	677	131	198	327	509	2,226	4,068
Apr	546	126	246	313	449	2,109	3,788
May	315	122	386	299	406	2,027	3,555
Jun	233	126	488	313	430	2,069	3,659
Jul	125	127	690	313	422	2,071	3,746
Aug	107	127	760	313	439	2,085	3,830
Sep	264	126	432	313	465	2,095	3,696
Oct	456	122	260	299	492	2,082	3,710
Nov	634	126	178	313	577	2,149	3,976
Dec	910	131	108	327	631	2,267	4,374
Total	6,140	1,499	3,905	3,711	5,879	25,283	46,416

Table 18. predicted monthly energy consumption – 4) Extreme Weather

TM54 detailed results

Month	Energy Consumption (kWh)						
	Heating	Hot Water	Cooling	Aux	Lighting	Equipment	Total
Jan	948	122	156	370	630	2,124	4,349
Feb	877	115	166	353	555	1,980	4,045
Mar	1,026	131	185	405	565	2,226	4,539
Apr	591	126	307	388	494	2,109	4,014
May	372	122	415	370	454	2,027	3,759
Jun	191	126	586	388	466	2,069	3,825
Jul	135	127	711	388	465	2,071	3,897
Aug	153	127	646	388	479	2,085	3,876
Sep	230	126	540	388	513	2,095	3,893
Oct	411	122	356	370	547	2,082	3,888
Nov	823	126	213	388	656	2,149	4,354
Dec	1,044	131	176	405	705	2,267	4,728
Total	6,801	1,499	4,456	4,600	6,528	25,283	49,167

Table 19. predicted monthly energy consumption – 5) Poor Commissioning

Month	Energy Consumption (kWh)						
	Heating	Hot Water	Cooling	Aux	Lighting	Equipment	Total
Jan	1,837	122	11	299	566	2,124	4,958
Feb	1,728	115	26	284	499	1,980	4,632
Mar	1,915	131	17	327	511	2,226	5,127
Apr	1,131	126	65	313	448	2,109	4,191
May	731	122	168	299	413	2,027	3,758
Jun	424	126	330	313	424	2,069	3,685
Jul	297	127	474	313	423	2,071	3,703
Aug	332	127	405	313	435	2,085	3,697
Sep	468	126	295	313	465	2,095	3,762
Oct	821	122	118	299	494	2,082	3,935
Nov	1,485	126	31	313	589	2,149	4,693
Dec	1,967	131	15	327	633	2,267	5,340
Total	13,136	1,499	1,954	3,711	5,899	25,283	51,482

Table 20. predicted monthly energy consumption – 6) Poor Air Permeability

TM54 detailed results

Month	Energy Consumption (kWh)						
	Heating	Hot Water	Cooling	Aux	Lighting	Equipment	Total
Jan	2,528	133	17	405	686	2,326	6,095
Feb	1,602	126	44	386	604	2,168	4,931
Mar	1,462	144	119	444	616	2,438	5,223
Apr	1,217	138	170	425	542	2,310	4,800
May	747	133	339	405	489	2,220	4,333
Jun	524	138	464	425	519	2,266	4,335
Jul	243	139	739	425	508	2,268	4,321
Aug	181	139	847	425	530	2,283	4,404
Sep	559	138	406	425	562	2,295	4,385
Oct	1,054	133	201	405	598	2,281	4,672
Nov	1,359	138	113	425	703	2,354	5,091
Dec	1,999	144	50	444	769	2,483	5,889
Total	13,474	1,642	3,510	5,038	7,124	27,691	58,479

Table 21. predicted monthly energy consumption – 7] Worst Case

Our Services

We offer a wide range of high-quality building performance advice and evaluation,
Sustainability & Net Zero Carbon Consultancy.

We work across all construction sectors in the UK, Europe and Worldwide.



Building Physics



Carbon



Sustainability



Compliance



Projects



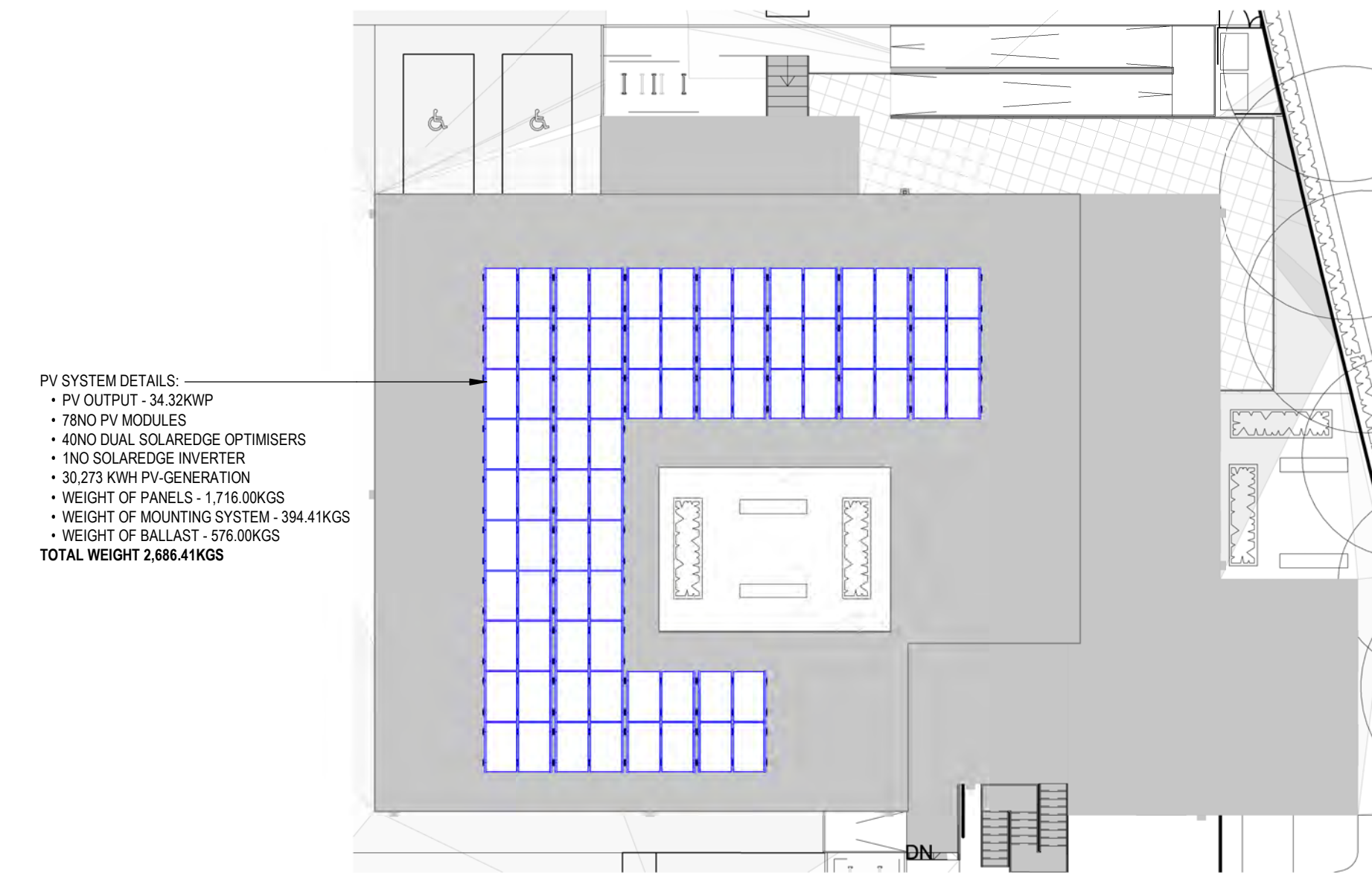
Planning Support

Upperbank House, Stoneythorpe, Leeds LS18 4BN

t: 0113 3933329 e: info@zed-uk.com



7.5 Appendix E – Solar PV Layout

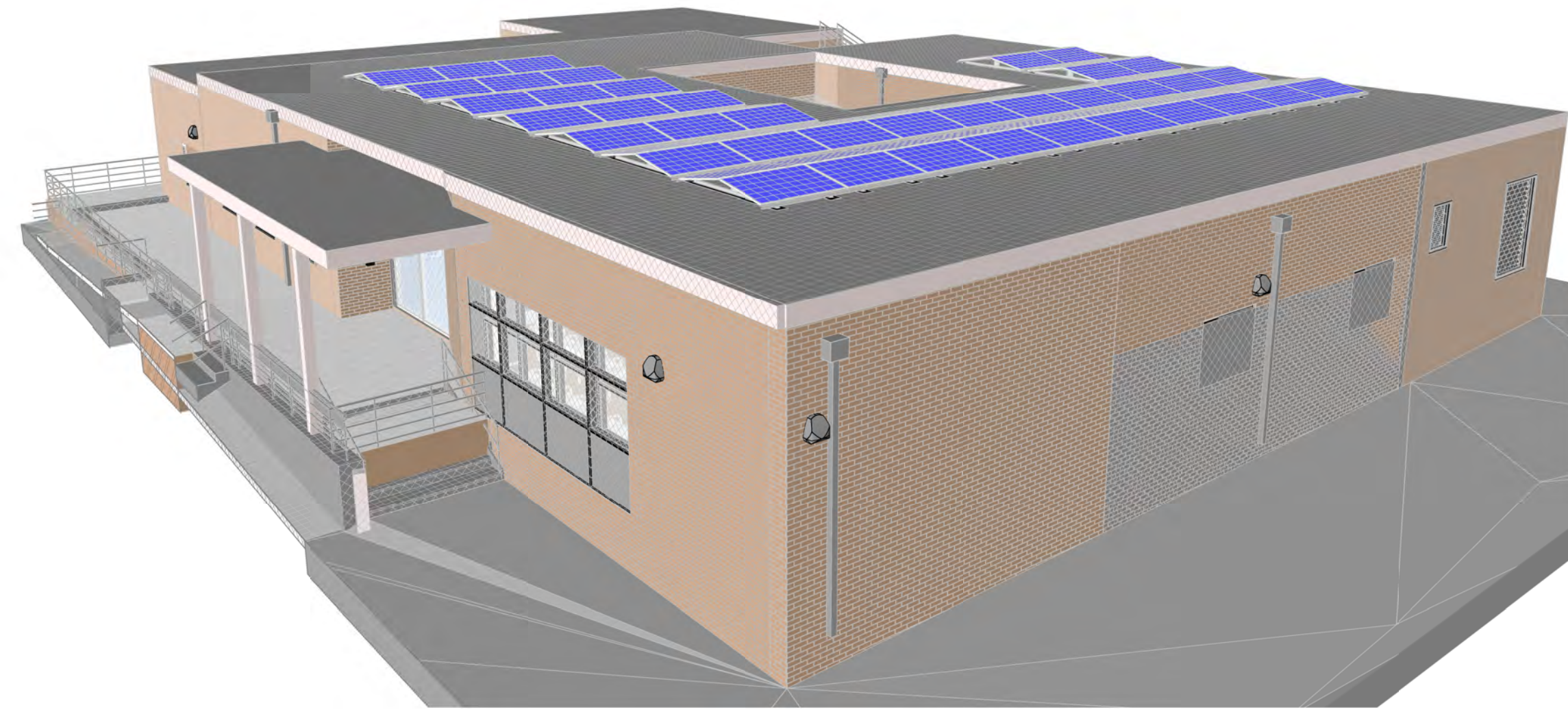


PV SYSTEM DETAILS:

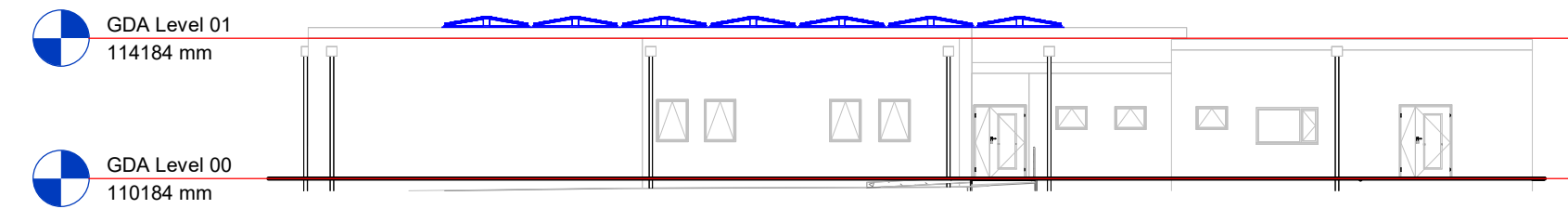
- PV OUTPUT - 34.32KWP
- 78NO PV MODULES
- 40NO DUAL SOLAREEDGE OPTIMISERS
- 1NO SOLAREEDGE INVERTER
- 30.273 KWH PV-GENERATION
- WEIGHT OF PANELS - 1,716.00KGS
- WEIGHT OF MOUNTING SYSTEM - 394.41KGS
- WEIGHT OF BALLAST - 576.00KGS

TOTAL WEIGHT 2,686.41KGS

1 ROOF LEVEL SOLAR PANEL ARRAY LAYOUT
1 : 200

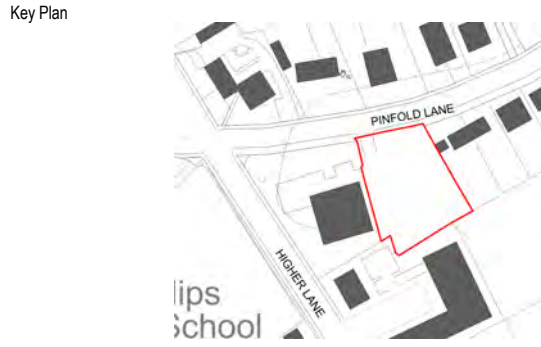


2 ROOF LEVEL SOLAR PANEL ARRAY PERSPECTIVE VIEW

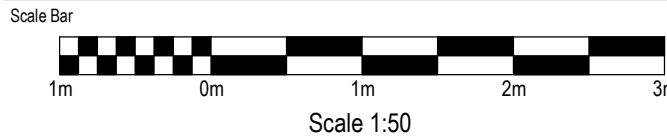


3 ROOF LEVEL SOLAR PANEL ARRAY SECTION
1 : 200

© 2021 Silcock Leedham Group Ltd.
This document is no longer controlled once downloaded.
Dimensions to be confirmed before scaling from this drawing.



Linked Model Schedule		
RVT Link Name	RVT Link Revision	RVT Link Rev Date
WFLREF-GDA-V1-ZZ-M3-A-8101_Architectural Model	P05	06.06.2025
WFLREF-GDA-V1-ZZ-M3-A-8101_FF&E Model	P05	06.06.2025



- NOTES:**
1. DO NOT SCALE FROM THIS DRAWING
 2. ALL DIMENSIONS ARE IN mm UNLESS INDICATED OTHERWISE.
 3. DRAWING TO BE READ IN CONJUNCTION WITH SPECIFICATION.

P01	PRELIMINARY ISSUE	JM	AB	22.07.25
Rev.	Description	DRN	CHK	Date

SILCOCK
LEEDHAM

Upperbank House, Horsforth, Leeds
LS18 4BN : UK
+44(0)113 3933310
www.silcockleedham.co.uk

an **RSK** company

Building Services Consulting Engineers

MEP design | building physics | commissioning management | building information modelling

Client/Main Contractor
NHS PROPERTY SERVICES

Architect
GILLING DOD

Project
WHITEFIELD MEDICAL CENTRE

Drawing Title
ELECTRICAL SERVICES
PROPOSED ROOF
SOLAR PANEL ARRAY

Scale @ Paper Size
SEE DRAWING @ A1

Project Number
3220239

Drawn By
AD

Date Created
JULY 2025

Project Status
PRELIMINARY

Issue Status
S3 - FOR REVIEW & COMMENT

Drawing Number
WFLREF-SLCE-V1-RF-DR-E-6500

Revision
P01

STAGE 3 PRELIMINARY ISSUE

7.6 Appendix F – LZC Report



Whitefield Primary Care Health Centre

Ene04: LZC Feasibility Report

August 2025

Project Ref: 3280460

We are **daylighting** experts

We are **thermal comfort** experts

We are **life cycle analysis** experts

We are **sustainability** experts

We are **building physics** experts

We are **zero carbon** experts

We are **zed.**



zero carbon
building physics
sustainability

zed.
an RSK company

contents

4

abbreviations

5

executive summary

7

introduction

9

initial review

11

thermal model

14

energy demand

16

feasibility

18

results - solar PV

21

results – ASHP (DHW)

24

conclusion

26

drawing register

28

appendix

prepared by:	Miquel Garcia – Senior Building Physics Engineer	date: 20 08 25	sig: 
checked by:	Jordan Turner – Senior Building Physics & Sustainability Engineer	date: 20 08 25	sig: 
revision:	00 - initial issue	date: 20 08 25	sig: 

abbreviations

A/C	-	Air Conditioning
AHU	-	Air Handling Unit
APR	-	Air Permeability Rate
ASHP	-	Air Source Heat Pump
BREEAM	-	Building Research Establishment Environmental Assessment Method
BER	-	Building Emission Rate
BPER	-	Building Primary Energy Rating
BRUKL	-	Building Regulations UK, Part L
CHP	-	Combined Heat & Power
COP	-	Coefficient of Performance
DHW	-	Domestic Hot Water
EER	-	Energy Efficiency Ratio
EPC	-	Energy Performance Certificate
HVAC	-	Heating, Ventilation & Air Conditioning
LED	-	Light Emitting Diode
LZC	-	Low and Zero Carbon
NCM	-	National Calculation Methodology
PV	-	Photo Voltaic (panels)
SEER	-	Seasonal Energy Efficiency Ratio
SFP	-	Specific Fan Power
TER	-	Target Emission Rate
TPER	-	Target Primary Energy Rating
TRY	-	Test Reference Year
VLT	-	Visible Light Transmittance
VRF	-	Variable Refrigerant Flow

executive summary



executive summary

This report has been compiled by zed., on behalf of the Silcock Leedham Consulting Engineers, to detail the results of the LZC feasibility assessment undertaken in accordance with BREEAM UK 'Refurbishment and Fit-out 2014' Ene04.

Miquel Garcia

Qualifications Non-Domestic Energy Assessor (Level 3)
Non-Domestic Energy Assessor (Level 4)
Non-Domestic Energy Assessor (Level 5)

Telephone 0113 393 3329

Email miquel@zed-uk.com

Accreditation scheme CIBSE Certification Limited
[► More information](#)

Assessor ID LCEA206041

Month	CO ₂ Emissions Factor (kg.CO ₂ /kWh)	
	Grid-supplied electricity	Grid-displaced electricity PV
Jan	0.163	0.196
Feb	0.160	0.190
Mar	0.153	0.175
Apr	0.143	0.153
May	0.132	0.129
Jun	0.120	0.106
Jul	0.111	0.092
Aug	0.112	0.093
Sep	0.122	0.110
Oct	0.136	0.138
Nov	0.151	0.169
Dec	0.163	0.197

Table 1. CO₂ emission factors

zed. have undertaken an LZC feasibility assessment for the proposed Whitefield Primary Care Health Centre, in Manchester, at RIBA Stage 2.

Works have been undertaken by Miquel Garcia, a Senior Building Physics Engineer and CIBSE registered Energy Assessor and Low Carbon Consultant (LCEA206041). **zed.** doesn't have any professional connection to a single low and zero carbon technology or manufacturer. Predicted energy consumption and CO₂ emissions have been calculated in accordance with CIBSE AM11. Baseline building performance has been calculated using the Part L (2021) Volume 2 approach with room templates taken from the NCM database.

The feasibility and impact of LZC technologies has been undertaken in accordance with BREEAM UK 'Refurbishment and Fit-out 2014' Ene04 guidance using the regulatory CO₂ emissions factors of the Building Regulations Part L (2021) Volume 2 version. The regulatory CO₂ emissions factors have been updated in the latest Buildings Regulation Part L 2021 version to account for the decarbonisation of the electricity grid. The emission factors now vary according to monthly profiles to reflect variability of grid generation mix as shown in adjacent Table 1. The feasibility and impact of LZC technologies has been undertaken in the context of these revised emission factors.

This assessment shows that the following LZC technologies are feasible for integration into this development, resulting in a total CO₂ emissions reduction of 3.64 tonnes CO₂/yr:

- Solar PV
- Domestic Hot Water (DHW) with combined ASHP & direct-electric heater

Payback calculations are based upon all - inclusive unit rates of 31.70 p/kWh for electricity.

introduction



introduction

The development is located at Whitefield, north Manchester.

The development comprises the refurbishment of an existing single-story building to accommodate a new primary health centre in Whitefield, Manchester. The facility consists of several consultant/examination and treatment rooms, admin offices and welfare facilities.

A fabric-first approach to design has been taken, comprising of low thermal U-values to reduce heat loss in winter and solar-control glazing to reduce heat gain in summer. High efficiency LED luminaires and low Specific Fan Powers (SFPs) on the ventilation systems will minimise the energy consumption associated with the fixed building services.

The feasibility for incorporating recognised LZC technologies has been undertaken in two stages. An initial high level desktop appraisal has been carried out to establish if a technology is technically viable considering the site opportunities and constraints in context with the building use. The second stage then considers each of the technologies taken forward against the scope described in 'BREEAM UK Refurbishment and Fit-out 2014' guidance, including; payback period, the feasibility of energy export and any available grants.



Figure 1. Site Location

initial review



initial review

Prior to detailed analysis, a high-level appraisal has been undertaken to determine broad potential.

technology	justification summary	consider
Building-mounted wind turbine	The Global Wind Atlas wind speed database shows an average wind speed of 3.2m/s at 10m above ground level for the site region, therefore below the recommended threshold of 6m/s for economic operation. Maximum turbine height must be no more than 3m above the top of the building of 15m above the ground risking a clash with rooftop plant and plant access routes. There may also be noise and planning issues.	✗
Pole-mounted wind turbine	The Global Wind Atlas wind speed database shows an average wind speed of 3.2m/s at 10m above ground level for the site region, therefore below the recommended threshold of 6m/s for economic operation. As maximum turbine height must be no more than 11.1m above the ground, average wind speed is anticipated to be further impeded by shelter from the building and associated landscaping. There may also be noise and planning issues.	✗
Solar thermal water	The development site has excellent solar access and a notable demand for domestic hot water. However, as hot water is likely to be drawn off at a relatively steady rate over the course of sunlight hours, a 'recovery period' doesn't exist when solar thermal energy could be harnessed and accumulated to make a meaningful contribution.	✗
Solar Photovoltaics (PV)	The development site benefits from adequate solar access and a relatively consistent electricity demand during opening hours. A roof-mounted PV panel system could significantly offset grid demand, with any surplus electricity sold back to the grid when generation exceeds onsite consumption. There is no noise impact associated with Solar PV.	✓
Tidal/hydro	There are no significant water courses within the vicinity of the development site.	✗
Ground source heat pumps	Due to the size of the development site, the source for ground-coupled heat pumps would be limited to vertical bore holes. Ground investigation and the required drilling to satisfy the building load is expected to make this technology economically unfeasible.	✗
Air source heat pumps	Low-grade heat from an air source heat pump could be used to provide pre-heating of domestic hot water. Outdoor units could be installed in the external plant enclosure. There would be no noise impact, subject to the attenuation of the plant and equipment.	✓
Biomass heating	Due to the level of hard landscaping and pedestrian movement around the perimeter building, there is inadequate space for bulk fuel storage. In addition, burning biomass/biofuel may cause a negative impact upon local air quality for nearby residents.	✗
Combined Heat and Power (CHP)	A small, commercially-available CHP unit (12kWth) operating at minimum turn-down would operate for 3100 hours per annum to meet the total DHW demand, therefore below the recommended 4500-5000 hours to be economically viable.	✗
District heating	There are no known existing heat networks within the vicinity of the development.	✗

Table 2. initial LZC technology review

model input data



model input data

Thermal modelling has been undertaken by a CIBSE registered Energy Assessor and Low Carbon Consultant, Miquel Garcia (LCEA206041).

Government approved IES-VE (v2025.0.0.0) dynamic thermal modelling software has been used in accordance with CIBSE AM11 & CIBSE TM54.

building typology and geometry

A thermal model has been created from the design team drawings provided by Gilling Dod Architects and Silcock Leedham Consulting Engineers. The proposed thermal envelope specification is set out in the table below.

climate data

The model has been coordinated for solar access and simulated against the CIBSE Manchester TRY (Test Reference Year) weather file. The weather data used for simulations was sourced from CIBSE (Chartered Institute of Building Services Engineers), an industry recognised organisation.

fabric & openings	U-value (W/m ² .K)	notes
Ground floor	0.18	
External walls	0.14 0.14	Type 1 Brickwork Type 2 Vertical rainscreen cladding
Roof	0.18	Replacement of the existing roof, including ceiling void and suspended ceiling
Windows	1.60	PPC aluminium Solar g-value = 0.40, visible light transmittance = 0.71
Curtain Wall	1.60	PPC aluminium Glazed door solar performance same as windows
Doors	1.60	PPC aluminium
air permeability	APR (m ³ /h.m ² @ 50Pa)	notes
Entire building	25.00	Following the EPC Convention 2.03 for air permeability in existing buildings.

Table 3. building envelope specification

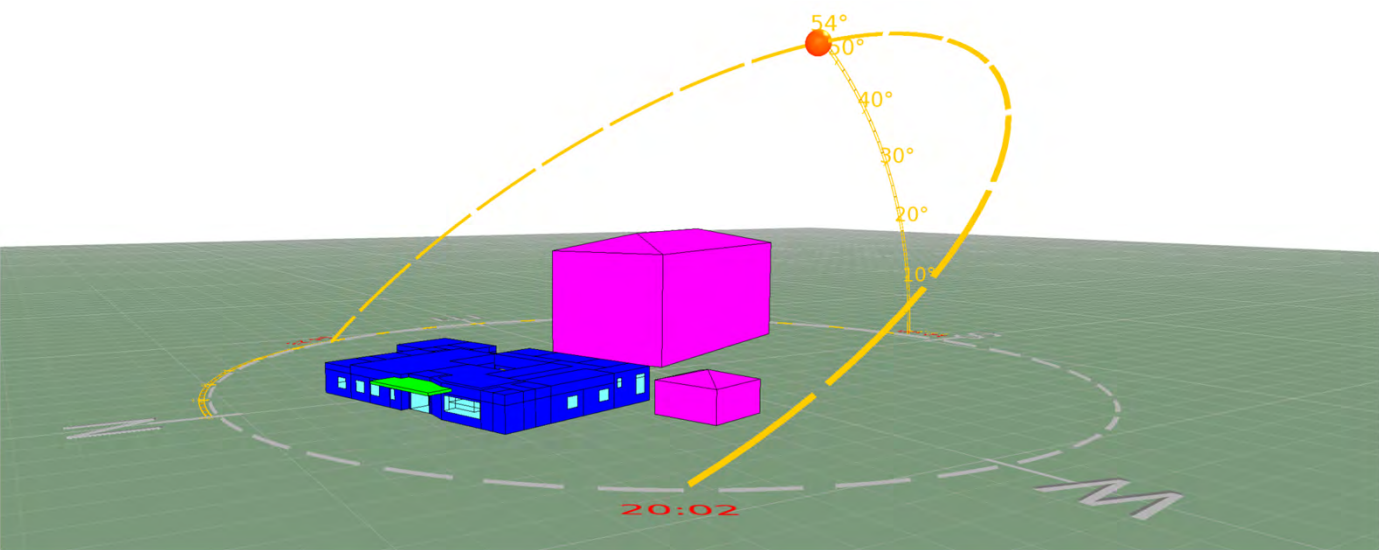


Figure 2. IES-VE thermal model

model input data

building services

The energy strategy and building services performance has been taken from Stage 2 design information by Silcock Leedham Consulting Engineers.

space conditioning

building area	system reference	efficiencies			ventilation		notes
		heating SCOP (kW/kW)	cooling EER (kW/kW)	cooling SEER (kW/kW)	heat recovery (%)	SFP (W/l/s)	
Consult/Exam Rooms	VRF w/ Nat Vent	4.10	2.50	6.4	n/a	n/a	
Waiting/Admin/Offices/Treatment/Staff Room	VRF w/ MVHR	4.10	2.50	6.4	88.0	1.50	MVHR Casing L2. Duct Class A
Circulation Spaces	Elec Rads w/ Nat Vent	1.0	n/a	n/a	n/a	n/a	
Staff Change/Shower*	Elec Rads w/ Extract	1.0	n/a	n/a	n/a	0.30	Duct Class A

Table 4. M&E specification – space conditioning

* Toilets and changing rooms to be indirectly heated by adjacent space.

domestic hot water

building area	source	storage	Distribution	Notes
All areas	Direct-electric water heater	300 litres	Loop Length – 130m Circulation Losses – 8 W/m	Heater efficiency 100%

Table 5. M&E specification – domestic hot water

internal lighting

building area	input method	performance	automatic control	notes
All areas	Inference	110 lm/W	Occupancy sensing	Daylight dimming in relevant spaces

Table 6. M&E specification – internal lighting

energy demand



energy demand

The building energy profile has been derived from initial Part L (2021) Volume 2 modelling undertaken at Stage 2.

The chart below shows the predicted energy and CO₂ for the baseline model. Results show energy attributable to heating and internal lighting to be dominant, with cooling demand being significantly lower partly due to the incorporation of energy-efficient VRF and packaged heat pump technology.

Predicted CO₂ emissions follow the same pattern with most emissions attributable to Heating and internal lighting, with DHW also being significant. Conversely, CO₂ emissions attributable to cooling remain low due to the reduced electricity demand.

Total regulated energy consumption = 31.10 MWh/yr.
Total emissions = 4.70 tonnes.CO₂/yr.

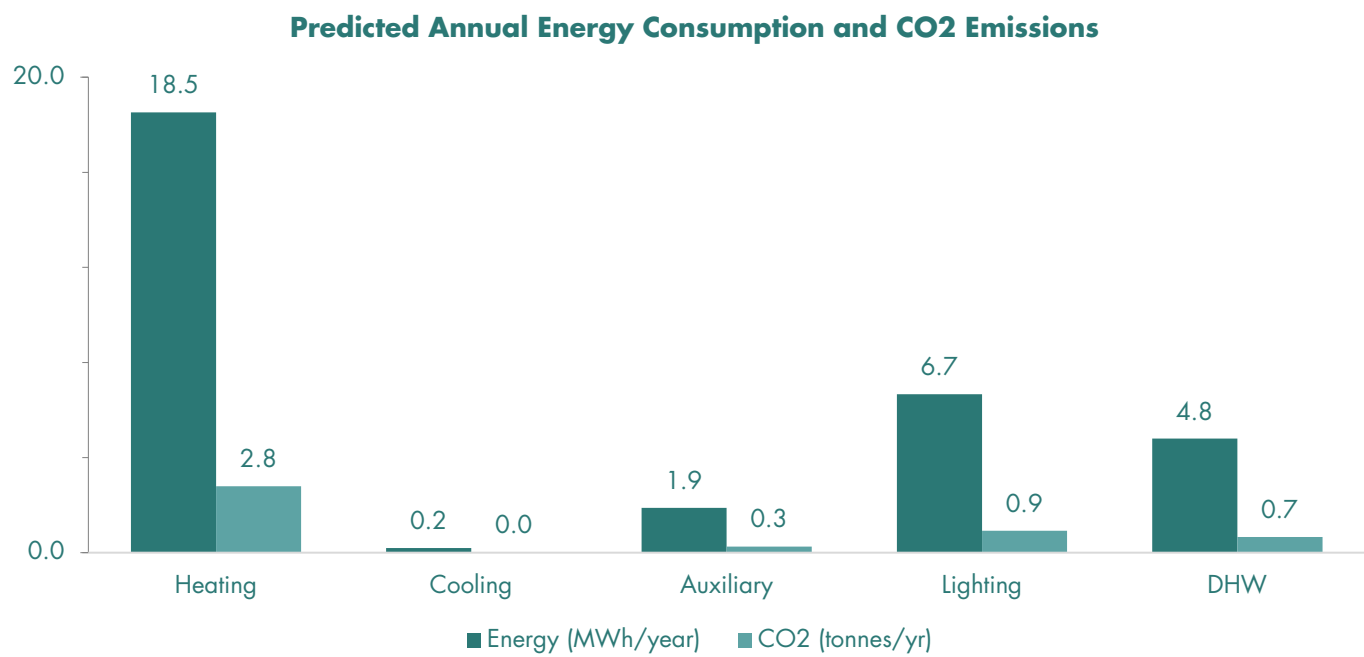


Figure 3. predicted baseline energy consumption and CO₂ emissions based on Part L (2021) Volume 2 modelling

feasibility



feasibility

Desktop feasibility has been based upon a combination of industry guidance and dynamic simulation modelling.

Further to the initial review, the detailed feasibility of the following LZC technologies are considered:

- Solar Photovoltaics (PV)
- DHW with combined heat pump (ASHP) and direct-electric system

Estimated plant and fuels costs are based upon a combination of Government data, industry guidance and supplier quotations.

Fuel costs are based upon published non-domestic price records for Q2 of 2025 from the Department for Business, Energy & Industry Strategy website, taken to be:

Electricity = 31.70p/kWh, inclusive of VAT and CCL

Fuel price inflation is based on a Consumer Prices Index of 3.58%.

results - solar PV



results - solar PV

Solar PV panels use semi-conductor technology to convert solar energy into electricity. Conversion efficiency is typically 18-22%

year	yield (kWh/yr)	saving (£/yr)	cumulative benefit (£)
1	25,030	£6,632	£6,632
2	24,779	£6,800	£13,432
3	24,532	£6,973	£20,406
4	24,286	£7,150	£27,556
5	24,043	£7,332	£34,888
6	23,803	£7,518	£42,406
7	23,565	£7,709	£50,116
8	23,329	£7,905	£58,021
9	23,096	£8,106	£66,127
10	22,865	£8,312	£74,438
11	22,636	£8,523	£82,961
12	22,410	£8,739	£91,701
13	22,186	£8,961	£100,662
14	21,964	£9,189	£109,851
15	21,744	£9,422	£119,274
16	21,527	£9,662	£128,936
17	21,312	£9,907	£138,843
18	21,099	£10,159	£149,002
19	20,888	£10,417	£159,419
20	20,679	£10,682	£170,100
21	20,472	£10,953	£181,053
22	20,267	£11,231	£192,285
23	20,065	£11,517	£203,801
24	19,864	£11,809	£215,610
25	19,665	£12,109	£227,719

Table 7. projected benefits – solar PV

capacity

A 34.3 kilo-Watt peak array comprising 78no. 440Watt panels could be installed to roof-mounted framework, pitched 10° and rotated to face east and west.

energy generation

In the first year, Part L simulation shows that a total yield of 25,030kWh would be expected, equivalent to 78.0% of the total predicted annual electricity demand through the use of this system. building's electricity consumption. During this period, under the government's Smart Export Guarantee (SEG), the energy provider will pay a tariff for any electricity exported to the grid. For the purpose of this assessment, an estimated tariff of 12 p/kWh has been applied to electricity fed back into the grid.

A panel degradation rate of approx.1% per annum is typical.

CO₂ reduction

Using the regulatory emissions factors, annual generation would abate 3.14 tonnes CO₂, equivalent to 67.2% of the total predicted regulated CO₂ emissions.

life cycle cost

The total estimated cost of the system including panels and inverters is £22,308.

On the basis that the payback is achieved through offsetting grid demand and selling the surplus electricity back to the grid, at unit tariffs of 31.7p/kWh and 12p/kWh respectively, simple payback would be achieved within 4 years. Although panel performance degrades over time, the useful lifespan is expected to be over 20 years and therefore exceeding the payback period.

local planning criteria

There are no known local policies that restrict the installation of small scale, building-mounted solar PV, and no associated noise issues.

Solar PV systems and installations should be Microgeneration Certification Scheme (MCS) accredited and adhere to the requirements of the District Network Operator (DNO).

results - solar PV



Figure 4. typical rooftop PV

energy storage

Battery systems are available to enable energy storage for times when supply exceeds demand.

grants

The Governments Smart Export Guarantee (SEG) has replaced the Feed-in-Tariff (FIT) scheme. Subject to an MCS installation and approved energy meter, a tariff will be payable by the energy provider for any electricity exported to grid.

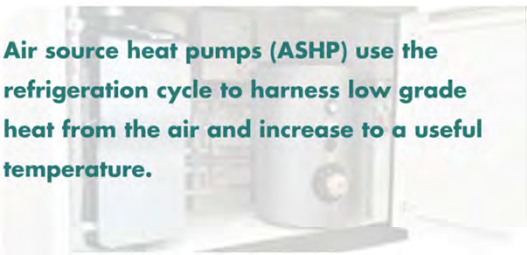
conclusion

Solar PV technology is considered technically and economically feasible for this development. It is therefore recommended that it be installed.

results - ASHP (DHW)



results - ASHP (DHW)



Air source heat pumps (ASHP) use the refrigeration cycle to harness low grade heat from the air and increase to a useful temperature.

year	yield (kWh/yr)	saving (£/yr)	cumulative benefit (£)
1	1,522	£371	£1,151
2	1,576	£384	£2,342
3	1,633	£398	£3,577
4	1,691	£412	£4,855
5	1,751	£427	£6,179
6	1,814	£442	£7,551
7	1,879	£458	£8,972
8	1,946	£475	£10,443
9	2,016	£492	£11,967
10	2,088	£509	£13,546
11	2,162	£527	£15,181
12	2,240	£546	£16,874
13	2,320	£566	£18,628
14	2,403	£586	£20,445
15	2,489	£607	£22,327
16	2,578	£629	£24,276
17	2,670	£651	£26,294
18	2,765	£674	£28,385
19	2,864	£699	£30,551
20	2,967	£724	£32,794

Table 8. projected benefits – ASHP: DHW

capacity

Calculations by VRF system provider (Daikin) show that using the VRF ASHP system to generate domestic hot water is a feasible option instead of the baseline direct-electric water heater. This packaged system would meet the entire DHW demand.

energy generation

Part L simulation shows that the annual DHW demand is reduced by 3,630kWh, equivalent to a reduction of 11.3% of the total regulated predicted electricity demand through the use of this system.

CO₂ reduction

Using the regulatory emissions factors, the annual energy saving would abate 0.50tonnes of CO₂, equivalent to 10.8% of the total predicted regulated CO₂ emissions.

life cycle cost

Calculations by the design team at concept stage show the uplift to be £3,625 for moving from a direct electric water heater to a VRF fed system.

Simulation results show a reduction in annual fuel cost of £1,151 in the first year, therefore, simple payback will be achieved within 4 years.

Over a 15 year plant service life, the cumulative fuel savings are calculated to be above £22.3k.

results - ASHP (DHW)



Figure 5. typical external packaged ASHP plant room

local planning criteria

There is no known planning policy that would affect the installation of air source heat pumps. Noise assessments will be undertaken to demonstrate compliance with boundary condition stipulations and units will be selected appropriately.

export feasibility

There are no current opportunities to export heat from the system.

energy storage

Pre-heated water from the air-to-water heat pump would be stored within a dedicated indirect cylinder. An additional immersion electric heater would be used to heat and preheat the water as required.

grants

There are currently no known grants available for this technology.

conclusion

The integration of heat pump technology will result in a significant reduction in annual CO₂ emissions and would enable the building to operate exclusively by electricity. This would omit the expense of introducing a gas connection and align with the Governments plan to reduce the consumption and reliance upon fossil fuels.

conclusion



conclusion

This assessment shows that Solar PV and ASHP (DHW) are feasible for integration into this development, resulting in a total CO₂ reduction of 3.64 tonnes CO₂/yr.

Month	CO ₂ Emissions Factor (kg.CO ₂ /kWh)	
	Grid-supplied electricity	Grid-displaced electricity PV
Jan	0.163	0.196
Feb	0.160	0.190
Mar	0.153	0.175
Apr	0.143	0.153
May	0.132	0.129
Jun	0.120	0.106
Jul	0.111	0.092
Aug	0.112	0.093
Sep	0.122	0.110
Oct	0.136	0.138
Nov	0.151	0.169
Dec	0.163	0.197

Table 9. CO₂ emission factors

zed. have undertaken an LZC feasibility assessment for the proposed Whitefield Primary Care Health Centre, in Manchester, at RIBA Stage 2

The feasibility and impact of LZC technologies has been undertaken in accordance with BREEAM UK 'Refurbishment and Fit-out 2014' Ene04 guidance using the regulatory CO₂ emissions factors of the Building Regulations Part L (2021) Volume 2 version. The regulatory CO₂ emissions factors have been updated in the latest Buildings Regulation Part L 2021 version to account for the decarbonisation of the electricity grid. The emission factors now vary according to monthly profiles to reflect variability of grid generation mix as shown in adjacent Table 1. The feasibility and impact of LZC technologies has been undertaken in the context of these revised emission factors.

This assessment shows that the following LZC technologies are feasible for integration into this development, resulting in a total CO₂ emissions reduction of 3.64 tonnes CO₂/yr:

- Solar PV
- Domestic Hot Water (DHW) with combined ASHP & direct-electric heater

Payback calculations are based upon all - inclusive unit rates of 31.70 p/kWh for electricity.

	energy (kWh/yr)	CO ₂ emissions (kg.CO ₂ /yr)
baseline	32,076	4,671
solar PV	-25,030	-3,138
ASHP (DHW)	-3,630	-504
total	3,416	1,031
saving	28,659	3,642
	89.4%	77.9%

Table 10. calculated energy and CO₂ savings

drawing register



drawing register

The thermal model has been constructed using the following drawings.

drawing title	drawing reference	issued by	revision
Proposed Ground Floor GA Plan	WFLREF-GDA-V1-00-DR-A-1001	Gilling Dod Architects	P04
Proposed Site Plan	WFLREF-GDA-V1-S1-DR-A-1002	Gilling Dod Architects	P06
Proposed Elevations	WFLREF-GDA-V1-ZZ-DR-A-1003	Gilling Dod Architects	P01
Proposed GA Sections	WFLREF-GDA-V1-ZZ-DR-A-1004	Gilling Dod Architects	P02
Proposed Roof Plan	WFLREF-GDA-V1-R1-DR-A-2001	Gilling Dod Architects	P01
Ground Floor Reflected Ceiling Plan	WFLREF-GDA-V1-00-DR-A-2101	Gilling Dod Architects	P01
Proposed Window Elevations & Schedule	WFLREF-GDA-V1-00-DR-A-2802	Gilling Dod Architects	P01
Proposed External Door Reference Plan	WFLREF-GDA-V1-00-DR-A-2805	Gilling Dod Architects	P01

Table 11. Drawing Register

appendix



BRUKL - baseline

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters			Building Use	
	Actual	Notional	% Area	Building Type
Floor area [m ²]	585.9	585.9		Retail/Financial and Professional Services
External area [m ²]	1709.6	1709.6		Restaurants and Cafes/Drinking Establishments/Takeaways
Weather	MAN	MAN		Offices and Workshop Businesses
Infiltration [m ³ /hm ² @ 50Pa]	25	3		General Industrial and Special Industrial Groups
Average conductance [W/K]	390.24	452.48		Storage or Distribution
Average U-value [W/m ² K]	0.23	0.26		Hotels
Alpha value* [%]	29.34	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
				Non-residential Institutions: Education
			100	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
				Others: Miscellaneous 24hr Activities
				Others: Car Parks 24 hrs
				Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	31.61	14.04
Cooling	0.34	0.96
Auxiliary	3.22	0.86
Lighting	11.38	10.13
Hot water	8.19	1.76
Equipment*	30.18	30.18
TOTAL**	54.75	27.74

* 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	0	6.62
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>6.62</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	275.33	129.56
Primary energy [kWh _{PE} /m ²]	84.24	31.91
Total emissions [kg/m ²]	7.97	3.1

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters			Building Use	
	Actual	Notional	% Area	Building Type
Floor area [m ²]	585.9	585.9		Retail/Financial and Professional Services
External area [m ²]	1709.6	1709.6		Restaurants and Cafes/Drinking Establishments/Takeaways
Weather	MAN	MAN		Offices and Workshop Businesses
Infiltration [m ³ /hm ² @ 50Pa]	25	3		General Industrial and Special Industrial Groups
Average conductance [W/K]	390.24	452.48		Storage or Distribution
Average U-value [W/m ² K]	0.23	0.26		Hotels
Alpha value* [%]	29.34	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
				Non-residential Institutions: Education
			100	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
				Others: Miscellaneous 24hr Activities
				Others: Car Parks 24 hrs
				Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	31.61	14.04
Cooling	0.34	0.96
Auxiliary	3.22	0.86
Lighting	11.38	10.13
Hot water	2	0.61
Equipment*	30.18	30.18
TOTAL**	48.55	26.6

* 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	42.72	6.62
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>42.72</i>	<i>6.62</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	275.33	129.56
Primary energy [kWh _{PE} /m ²]	12.5	30.23
Total emissions [kg/m ²]	1.76	2.94

Our Services

We offer a wide range of high-quality building performance advice and evaluation,
Sustainability & Net Zero Carbon Consultancy.

We work across all construction sectors in the UK, Europe and Worldwide.



Building Physics



Carbon



Sustainability



Compliance



Projects



Planning Support

Upperbank House, Stoneythorpe, Leeds LS18 4BN

t: 0113 3933329 e: info@zed-uk.com



7.7 Appendix G – Thermal Comfort Report



Whitefield Primary Care Health Centre

Hea04: Thermal Comfort Report

August 2025

Project Ref: 3280460

We are **daylighting** experts

We are **thermal comfort** experts

We are **life cycle analysis** experts

We are **sustainability** experts

We are **building physics** experts

We are **zero carbon** experts

We are **zed.**



zero carbon
building physics
sustainability
zed.
an **RSK** company

contents

4

abbreviations

5

executive summary

8

introduction

10

methodology

13

thermal model

15

internal gains

17

results – current weather
data (2016 DSY)

19

results – future weather
data (2050 Medium50
DSY2)

21

results – future weather
data (2050 Medium50
DSY3)

23

conclusion

26

drawing register

28

appendix A1: PMV & PPD
indices

32

appendix A2: possible
adaptation measures

prepared by:	Miquel Garcia – Senior Building Physics Engineer	date: 22 08 25	sig: 
checked by:	Jordan Turner – Senior Building Physics & Sustainability Engineer	date: 22 08 25	sig: 
revision:	01 – CIBSE AM11 reference added	date: 22 08 25	sig: 

abbreviations

ACH	- Air Changes per Hour
APR	- Air Permeability Rating
BREEAM	- Building Research Establishment Environmental Assessment Method
CIBSE	- Chartered Institution of Building Service Engineers
DSM	- Dynamic Simulation Modelling
DSY	- Design Summer Year
L/S	- Litres per Second
LWC	- London Weather Centre
MV	- Mechanical Ventilation
NCM	- Notional Calculation Method
PMV	- Predicted Mean Vote
PPD	- Predicted Percentage of Dissatisfied
VLT	- Visible Light Transmittance

executive summary



executive summary

This report has been compiled by zed., on behalf of Silcock Leedham Consulting Engineers, to detail the results of a thermal comfort assessment for the proposed Whitefield Primary Health Centre, Manchester.

This report supports BREEAM credit issue **Hea04: Thermal Comfort**.

Miquel Garcia

Qualifications	Non-Domestic Energy Assessor (Level 3) Non-Domestic Energy Assessor (Level 4) Non-Domestic Energy Assessor (Level 5)
Telephone	0113 393 3329
Email	miquel@zed-uk.com
Accreditation scheme	CIBSE Certification Limited ▶ More information
Assessor ID	LCEA206041

zed. have undertaken a Thermal Comfort assessment for the proposed Whitefield Primary Care Health Centre, Manchester.

Results have been derived through dynamic simulation modelling using IES Virtual Environment software version 2025.0.0.0 in accordance with CIBSE AM11 Building Energy and Performance Modelling, by a trained and accredited Level 5 Energy Assessor, Miquel Garcia (LCEA206041).

In accordance with BREEAM UK ‘Refurbishment and Fit-out 2014’ Hea04: Thermal Comfort guidance, thermal comfort has been assessed against the following criteria and requirements;

1. for air conditioning buildings, summer and winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental design, Table 1.5; or other appropriate industry standard. In this instance, the design requirements specified by NHS Property Services (NHSPS) take precedent over CIBSE Guide A.
2. for air conditioning buildings, the Predicted Mean Vote (PMV) and Predicted Percentage of Dissatisfied (PPD) indices are reported.
3. in accordance with HTM03-01, internal summer temperatures must not exceed 25°C dry bulb for more than 50 hours per year in treatment rooms, and 28°C dry bulb in other occupied spaces.

Internal Occupancy and heat gains have been based upon a combination of FF&E drawings, the building specification, and CIBSE guidance. Simulation has been undertaken against the current and future projected CIBSE weather files for the site location as indicated in the BREEAM guidance.

Weather Data		
Simulation	Region	Variant
Current	Manchester	2016 DSY1
Future	Manchester	2050 Medium 50 th Percentile DSY2 & DSY3

Table 1. Simulation Weather Data

executive summary

This report supports BREEAM Hea04: Thermal Comfort credit issue 'Thermal modelling', and credit issue 'Adaptability for a projected climate change scenario'.

once credit – thermal modelling

Results demonstrate that the credit issue Hea04: 'Thermal modelling' is achieved, as the predicted operative temperatures of all occupied rooms assessed are within the recommended ranges set out in *NHS Property Services* (NHSPS), and internal summer temperatures do not exceed 28°C dry bulb for more than 50 hours per year when assessed against the current weather file, 2016 DSY1.

once credit – adaptability for a projected climate change scenario

The results also demonstrate that the credit issue Hea04 'Adaptability for a projected climate change scenario' is achieved by showing that the proposed design can be easily adapted in the future using passive design solutions in order to subsequently meet the thermal comfort requirements. The possible adaptation measures are listed within the appendices of this report.

Following the BREEAM Hea04 requirements for air-conditioned buildings, the Predicted Mean Vote (PMV) and Predicted Percentage of Dissatisfied (PPD) indices for both current and future projected CIBSE weather files are included within the appendices of this report.

introduction



introduction

Thermal comfort has been assessed using dynamic thermal modelling using IES - VE software.

The development is located in Whitefield, Manchester.

The development comprises the refurbishment of an existing single-story building to accommodate a new primary health centre in Whitefield, Manchester. The facility consists of several consultant/examination and treatment rooms, admin offices and welfare facilities.

A fabric-first approach to design has been taken, comprising of low thermal U-values to reduce heat loss in winter and solar-control glazing to reduce heat gain in summer. High efficiency LED luminaires and low Specific Fan Powers (SFPs) on the ventilation systems will minimise the energy consumption associated with the fixed building services.

Heating and cooling will be provided via local low carbon technology Variable Refrigerant Flow (VRF) Air Conditioning systems. Back of house, WCs, and circulation areas will be provided with heating by direct electric panel heaters. The primary method of ventilation to the building will be natural ventilation. Areas with high occupancy or specific mechanical ventilation requirements will be served by high-efficiency heat recovery ventilation units. Toilet and changing areas will be served from various dirty extract systems.



Figure 1. Site Location

methodology



Occupied areas are comfort cooled and have therefore been assessed against the recommended environmental conditions set out within CIBSE Guide A Table 1.5.

compliance criteria

Anticipated occupant comfort is based upon the Predicted Mean Vote (PMV) and Predicted Percentage of Dissatisfied (PPD) indices. The PMV index, ranging from -3 to +3, ‘combines the influence of air temperature, mean radiant temperature, air movement and humidity with that of clothing and activity level into one value on a thermal sensation scale’. For comfort cooled buildings, where the PMV exceeds 0.5 it would be considered to be overheating. The Predicted Percentage of Dissatisfied (PPD) is a function of PMV, as shown by the below figure. A PMV of 0.5 equates to a PPD of 10%.

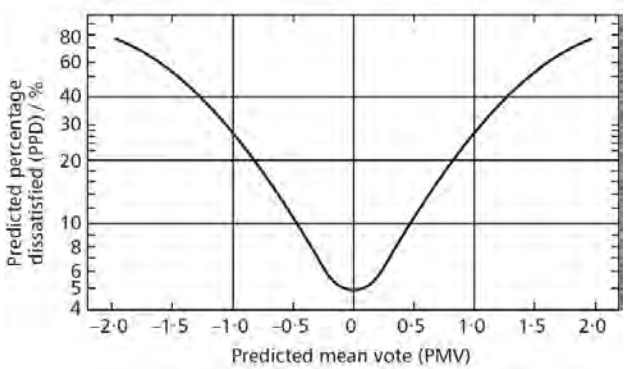


Figure 2. PPD as a function of PMV (CIBSE Guide Figure 1.4)

The recommended temperature ranges within CIBSE Guide A Table 1.5 are based upon maintaining an acceptable PPD. The centre of each range is expected to correspond to a neutral PMV based upon the stated activity rate (met) and clothing (clo).

It is suggested that a variation of $\pm 1\text{K}$ within a day would attract little notice, though a change in temperature of $\pm 2\text{K}$ would be noticed and might cause some complaint. An operative temperature 2K away from the optimum corresponds to approximately 0.6 units of PMV, or a PPD of 12%.

Adjustments can be made to the recommended ranges where the occupant clothing or activity differs from that expressed in CIBSE Guide A Table 1.5, or users are allowed to relax dress codes to suit their comfort. For example, a rise of 0.1 met corresponds to a possible reduction in temperature of 0.6K. Conversely, a drop off 0.25clo corresponds to a possible increase in temperature of 1.5K.

methodology

The following internal comfort conditions have been taken from *NHS Property Services (NHSPS)*. and are considered to be most fitting to this building.

operative temperature ranges

The summer and winter operative temperature ranges, activity and clothing levels have been assigned to each room type following the design requirements specified by *NHS Property Services (NHSPS)* and the recommended comfort criteria set out in CIBSE Guide A Table 1.5.

Building Type	Winter Operative Temperatures			Summer Operative Temperatures		
	Temp. /°C	Activity /met	Clothing /clo	Temp. /°C	Activity /met	Clothing /clo
Consult/Exam, Office/Admin, Reception, Waiting Area	21	1.4	1.0	28	1.4	0.6
Staff Room	22	1.4	1.0	28	1.4	0.6
Treatment Room	21	1.4	1.0	25	1.4	0.6

Table 2. recommended comfort criteria

thermal model



thermal model

A thermal model has been constructed by a CIBSE registered Energy Assessor and Low Carbon Consultant Miquel Garcia (LCEA206041) from the architectural drawings provided, using IES-VE software version 2025.0.0.0.

geometry model

A thermal model has been constructed from the architectural drawings provided by Gilling Dod Architects.

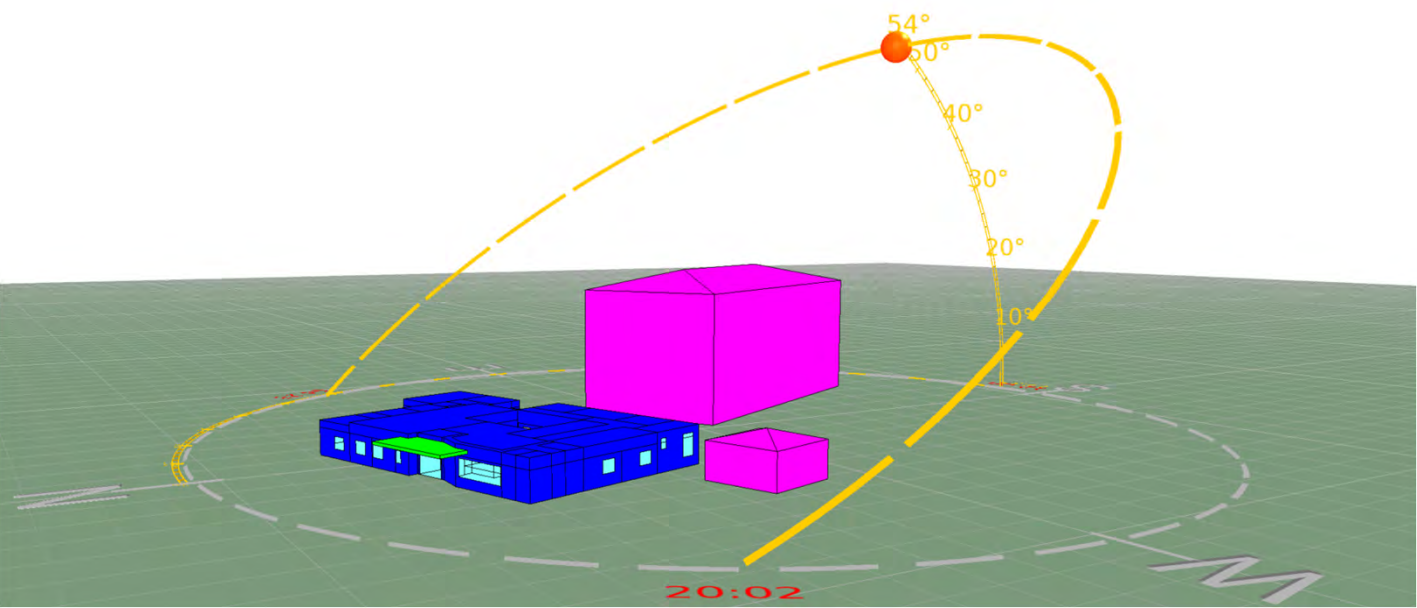


Figure 3. IES-VE thermal model geometry

building envelope

Building envelope performance has been provided by Gilling Dod Architects. The results provided within this report are achieved with the inputs detailed herein. Any amendments from these inputs will result in changes to the results of the thermal comfort assessment.

fabric & openings	U-value (W/m².K)	Notes
Ground floor	0.18	
External walls	0.14 0.14	Type 1 Brickwork Type 2 Vertical rainscreen cladding
Roof	0.18	Replacement of the existing roof, including ceiling void and suspended ceiling
Windows	1.60	PPC aluminium Solar g-value = 0.40, visible light transmittance = 0.71
Curtain Wall	1.60	PPC aluminium Glazed door solar performance same as windows
Doors	1.60	PPC aluminium
air permeability	infiltration (ach⁻¹)	Notes
Entire building	0.45	Equivalent to the design target APR of 10.0m³(hr.m²)@50Pa.

Table 3. building envelope specification

internal gains



internal gains

Internal gains are tabulated below.

The occupancy, lighting and equipment, gains and profiles have been taken from a combination of detailed design information and guidance contained within CIBSE Guide A and Part L Volume 2 (2021 edition).

Room	Source of Heat Gain		
	Occupancy	Lighting	Equip./Small Power
Consulting/Treatment Rooms/Reception	3 People (FF&E) 90W _{sens} /60W _{lat} per person Diversity: None Profile: 07:00 – 19:00	7.5 W/m ² (estimate) Daylight dimming Diversity: 0.82 Profile: 07:00 – 19:00	25 W/m ² (estimate) Diversity: None Profile: 07:00 – 19:00
V1.00.004 Office	1 People (FF&E) 90W _{sens} /60W _{lat} per person Diversity: None Profile: 07:00 – 19:00	7.5 W/m ² (estimate) Daylight dimming Diversity: 0.82 Profile: 07:00 – 19:00	25 W/m ² (estimate) Diversity: None Profile: 07:00 – 19:00
V1.00.023 Admin	8 People (FF&E) 90W _{sens} /60W _{lat} per person Diversity: None Profile: 07:00 – 19:00	7.5 W/m ² (estimate) Daylight dimming Diversity: 0.82 Profile: 07:00 – 19:00	25 W/m ² (estimate) Diversity: None Profile: 07:00 – 19:00
V1.00.024 Admin	3 People (FF&E) 90W _{sens} /60W _{lat} per person Diversity: None Profile: 07:00 – 19:00	7.5 W/m ² (estimate) Daylight dimming Diversity: 0.82 Profile: 07:00 – 19:00	25 W/m ² (estimate) Diversity: None Profile: 07:00 – 19:00
Waiting Area	30 People (FF&E) 90W _{sens} /60W _{lat} per person Diversity: None Profile: 07:00 – 19:00	7.5 W/m ² (estimate) Daylight dimming Diversity: 0.9 Profile: 07:00 – 19:00	5 W/m ² (estimate) Diversity: None Profile: 07:00 – 19:00
Interview Room	3 People (FF&E) 90W _{sens} /60W _{lat} per person Diversity: None Profile: 07:00 – 19:00	7.5 W/m ² (estimate) Daylight dimming Diversity: 0.82 Profile: 07:00 – 19:00	25 W/m ² (estimate) Diversity: None Profile: 07:00 – 19:00
Meeting Room	11 People (FF&E) 90W _{sens} /60W _{lat} per person Diversity: None Profile: 07:00 – 19:00	7.5 W/m ² (estimate) Daylight dimming Diversity: 0.82 Profile: 07:00 – 19:00	25 W/m ² (estimate) Diversity: None Profile: 07:00 – 19:00
Staff Room	8 People (FF&E) 90W _{sens} /60W _{lat} per person Diversity: None Profile: 07:00 – 19:00	7.5 W/m ² (estimate) Daylight dimming Diversity: 0.82 Profile: 07:00 – 19:00	25 W/m ² (estimate) Diversity: None Profile: 07:00 – 19:00

Table 4. internal gains

results – current weather data (2016 DSY1)



results

The following results have been derived through dynamic simulation.

The results below show that predicted operative temperatures of all occupied rooms assessed are within the recommended ranges set out in *NHS Property Services* (NHSPS), and that internal summer temperatures do not exceed 28°C dry bulb for more than 50 hours per year.

Room Name	Operative temperature				Dry bulb temperature (°C) hours > 28°C	
	Comfort Requirement Range	Minimum T _{operative} (°C)	Maximum T _{operative} (°C)	Pass/Fail	Comfort Requirement < 50 hours	Pass/Fail
V1.00.002 Waiting Room FH	21 - 28°C	21.19	23.58	Pass	0	Pass
V1.00.004 Office	21 - 28°C	21.23	23.65	Pass	0	Pass
V1.00.005 Reception	21 - 28°C	21.17	23.83	Pass	0	Pass
V1.00.011 Interview Room	21 - 28°C	21.48	23.43	Pass	0	Pass
V1.00.012 Consult/ Exam	21 - 28°C	21.52	23.37	Pass	0	Pass
V1.00.013 Consult/ Exam	21 - 28°C	21.19	23.52	Pass	0	Pass
V1.00.014 Consult/ Exam	21 - 28°C	21.49	23.39	Pass	0	Pass
V1.00.015 Consult/ Exam	21 - 28°C	21.42	23.52	Pass	0	Pass
V1.00.016 Consult/ Exam	21 - 28°C	21.40	23.51	Pass	0	Pass
V1.00.018 Consult/ Exam	21 - 28°C	21.32	23.65	Pass	0	Pass
V1.00.019 Consult/ Exam	21 - 28°C	21.28	23.64	Pass	0	Pass
V1.00.023 Admin	21 - 28°C	21.18	23.56	Pass	0	Pass
V1.00.024 Admin	21 - 28°C	21.17	23.68	Pass	0	Pass
V1.00.027 Staff Room	22 - 28°C	22.82	24.68	Pass	0	Pass
V1.00.028 Meeting Room	21 - 28°C	21.94	25.19	Pass	0	Pass
V1.00.032 Treatment Room	21 - 25°C	21.16	24.74	Pass	0	Pass
V1.00.033 Treatment Room	21 - 25°C	21.24	24.49	Pass	0	Pass
V1.00.034 Consult/ Exam	21 - 28°C	21.79	23.39	Pass	0	Pass
V1.00.035 Consult/ Exam	21 - 28°C	21.57	23.38	Pass	0	Pass

Table 5. results against the current weather file (2016 DSY1)

results – future weather data (2050 Medium50 DSY2)



results

The following results have been derived through dynamic simulation.

The results below show that predicted operative temperatures in 17 out of 19 occupied rooms assessed meet the recommended operative temperature set out in NHS Property Services (NHSPS). However, internal summer temperatures in all occupied rooms assessed do not exceed 28°C dry bulb for more than 50 hours per year.

Room Name	Operative temperature				Dry bulb temperature (°C) hours > 28°C	
	Comfort Requirement Range	Minimum T _{operative} (°C)	Maximum T _{operative} (°C)	Pass/Fail	Comfort Requirement < 50 hours	Pass/Fail
V1.00.002 Waiting Room FH	21 - 28°C	21.25	23.65	Pass	0	Pass
V1.00.004 Office	21 - 28°C	21.27	23.65	Pass	0	Pass
V1.00.005 Reception	21 - 28°C	21.23	23.92	Pass	0	Pass
V1.00.011 Interview Room	21 - 28°C	21.54	23.50	Pass	0	Pass
V1.00.012 Consult/ Exam	21 - 28°C	21.59	23.47	Pass	0	Pass
V1.00.013 Consult/ Exam	21 - 28°C	21.23	23.69	Pass	0	Pass
V1.00.014 Consult/ Exam	21 - 28°C	21.56	23.48	Pass	0	Pass
V1.00.015 Consult/ Exam	21 - 28°C	21.51	23.69	Pass	0	Pass
V1.00.016 Consult/ Exam	21 - 28°C	21.49	23.66	Pass	0	Pass
V1.00.018 Consult/ Exam	21 - 28°C	21.39	23.67	Pass	0	Pass
V1.00.019 Consult/ Exam	21 - 28°C	21.35	23.65	Pass	0	Pass
V1.00.023 Admin	21 - 28°C	21.23	23.73	Pass	0	Pass
V1.00.024 Admin	21 - 28°C	21.23	23.70	Pass	0	Pass
V1.00.027 Staff Room	22 - 28°C	22.87	24.68	Pass	0	Pass
V1.00.028 Meeting Room	21 - 28°C	21.98	25.57	Pass	0	Pass
V1.00.032 Treatment Room	21 - 25°C	21.22	25.54	Fail	0	Pass
V1.00.033 Treatment Room	21 - 25°C	21.30	25.27	Fail	0	Pass
V1.00.034 Consult/ Exam	21 - 28°C	21.88	23.52	Pass	0	Pass
V1.00.035 Consult/ Exam	21 - 28°C	21.67	23.49	Pass	0	Pass

Table 6. results against the future weather file (2050 Medium50 DSY2)

results – future weather data (2050 Medium50 DSY3)



results

The following results have been derived through dynamic simulation.

The results below show that predicted operative temperatures in 16 out of 19 occupied rooms assessed meet the recommended operative temperature set out in NHS Property Services (NHSPS). However, internal summer temperatures in all occupied rooms assessed do not exceed 28°C dry bulb for more than 50 hours per year.

Room Name	Operative temperature				Dry bulb temperature (°C) hours > 28°C	
	Comfort Requirement Range	Minimum T _{operative} (°C)	Maximum T _{operative} (°C)	Pass/Fail	Comfort Requirement < 50 hours	Pass/Fail
V1.00.002 Waiting Room FH	21 - 28°C	21.17	24.48	Pass	0	Pass
V1.00.004 Office	21 - 28°C	21.21	23.81	Pass	0	Pass
V1.00.005 Reception	21 - 28°C	21.15	24.50	Pass	0	Pass
V1.00.011 Interview Room	21 - 28°C	21.34	23.59	Pass	0	Pass
V1.00.012 Consult/ Exam	21 - 28°C	21.39	23.51	Pass	0	Pass
V1.00.013 Consult/ Exam	21 - 28°C	21.16	23.75	Pass	0	Pass
V1.00.014 Consult/ Exam	21 - 28°C	21.36	23.52	Pass	0	Pass
V1.00.015 Consult/ Exam	21 - 28°C	21.33	23.73	Pass	0	Pass
V1.00.016 Consult/ Exam	21 - 28°C	21.32	23.64	Pass	0	Pass
V1.00.018 Consult/ Exam	21 - 28°C	21.27	23.81	Pass	0	Pass
V1.00.019 Consult/ Exam	21 - 28°C	21.25	23.79	Pass	0	Pass
V1.00.023 Admin	21 - 28°C	21.16	25.18	Pass	0	Pass
V1.00.024 Admin	21 - 28°C	21.17	25.78	Pass	0	Pass
V1.00.027 Staff Room	22 - 28°C	22.62	26.92	Pass	0	Pass
V1.00.028 Meeting Room	21 - 28°C	21.69	28.08	Fail	4	Pass
V1.00.032 Treatment Room	21 - 25°C	21.15	27.73	Fail	0	Pass
V1.00.033 Treatment Room	21 - 25°C	21.23	27.42	Fail	0	Pass
V1.00.034 Consult/ Exam	21 - 28°C	21.68	23.56	Pass	0	Pass
V1.00.035 Consult/ Exam	21 - 28°C	21.48	23.54	Pass	0	Pass

Table 7. results against the future weather file (2050 Medium50 DSY3)

conclusion



conclusion

Thermal comfort has been assessed in accordance with BREEAM UK 'Refurbishment and Fit-out 2014'.

Results demonstrate that the credit issue Hea04: 'Thermal modelling' is achieved, as the predicted operative temperatures and dry bulb temperatures of all occupied rooms assessed are within the recommended ranges for current weather data.

The results also demonstrate that the credit issue Hea04 'Adaptability for a projected climate change scenario' is achieved by showing that the proposed design can be easily adapted in the future using passive design solutions in order to subsequently meet the thermal comfort requirements.

zed. have undertaken a Thermal Comfort assessment for the proposed Whitefield Primary Care Health Centre, Manchester.

Results have been derived through dynamic simulation modelling using IES Virtual Environment software version 2025.0.0.0 by a trained and accredited Level 5 Energy Assessor, Miquel Garcia (LCEA206041).

In accordance with *BREEAM UK 'Refurbishment and Fit-out 2014' Hea04: Thermal Comfort* guidance, thermal comfort has been assessed against the following criteria and requirements;

1. *for air conditioning buildings, summer and winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental design, Table 1.5; or other appropriate industry standard. In this instance, the design requirements specified by NHS Property Services (NHSPS) take precedent over CIBSE Guide A.*
2. *for air conditioning buildings, the Predicted Mean Vote (PMV) and Predicted Percentage of Dissatisfied (PPD) indices are reported.*
3. *in accordance with HTM03-01, internal summer temperatures must not exceed 25°C dry bulb for more than 50 hours per year in treatment rooms, and 28°C dry bulb in other occupied spaces.*

Internal Occupancy and heat gains have been based upon a combination of FF&E drawings, the building specification, and CIBSE guidance. Simulation has been undertaken against the current and future projected CIBSE weather files for the site location as indicated in the BREEAM guidance.

once credit – thermal modelling

Results demonstrate that the credit issue Hea04: 'Thermal modelling' is achieved, as the predicted operative temperatures of all occupied rooms assessed are within the recommended ranges set out in *NHS Property Services (NHSPS)*, and internal summer temperatures do not exceed 28°C dry bulb for more than 50 hours per year when assessed against the current weather file, 2016 DSY1.

conclusion

Thermal comfort has been assessed in accordance with BREEAM UK 'Refurbishment and Fit-out 2014' Hea04: Thermal Comfort.

Results demonstrate that the credit issue Hea04: 'Thermal modelling' is achieved, as the predicted operative temperatures and dry bulb temperatures of all occupied rooms assessed are within the recommended ranges for current weather data.

The credit issue Hea04 'Adaptability for a projected climate change scenario' is also achieved by demonstrating that the proposed design can be easily adapted in the future using passive design solutions, in order to continue meeting the thermal comfort requirements.

once credit – adaptability for a projected climate change scenario

The results for the future DSY2 weather scenario show that predicted operative temperatures in 17 out of 19 occupied rooms assessed meet the recommended operative temperatures set out in NHS Property Services (NHSPS), and that internal summer temperatures in all occupied rooms assessed do not exceed 28°C dry bulb for more than 50 hours per year.

The results for the future DSY3 weather scenario show that predicted operative temperatures in 16 out of 19 occupied rooms assessed meet the recommended operative temperatures, and that internal summer temperatures in all occupied rooms assessed do not exceed 28°C dry bulb for more than 50 hours per year.

Although 2 rooms in the DSY2 weather scenario and 3 rooms in the DSY3 weather scenario exceed the recommended maximum operative temperatures, these exceedance occur only for short periods during the hottest peak days in the projected summer. In line with BREEAM Hea04: Thermal Comfort guidance, where thermal comfort criteria are not met for the projected climate change environment, the credit issue 'Adaptability for a projected climate change scenario' can still be achieved by demonstrating that the proposed design has been adapted, or is designed to be easily adapted in the future using passive design solutions, in order to continue meeting the thermal comfort requirements. In this instance, the possible adaptation measures are listed within the appendices of this report.

Following the BREEAM Hea04 requirements for air-conditioned buildings, the Predicted Mean Vote (PMV) and Predicted Percentage of Dissatisfied (PPD) indices for both current and future projected CIBSE weather files are included within the appendices of this report.

drawing register



drawing register

The thermal model has been constructed using the following drawings.

Drawing Title	Drawing Reference	Issued By	Revision
Proposed Ground Floor GA Plan	WFLREF-GDA-V1-00-DR-A-1001	Gilling Dod Architects	P04
Proposed Site Plan	WFLREF-GDA-V1-S1-DR-A-1002	Gilling Dod Architects	P06
Proposed Elevations	WFLREF-GDA-V1-ZZ-DR-A-1003	Gilling Dod Architects	P01
Proposed GA Sections	WFLREF-GDA-V1-ZZ-DR-A-1004	Gilling Dod Architects	P02
Proposed Roof Plan	WFLREF-GDA-V1-R1-DR-A-2001	Gilling Dod Architects	P01
Ground Floor Reflected Ceiling Plan	WFLREF-GDA-V1-00-DR-A-2101	Gilling Dod Architects	P01
Proposed Window Elevations & Schedule	WFLREF-GDA-V1-00-DR-A-2802	Gilling Dod Architects	P01
Proposed External Door Reference Plan	WFLREF-GDA-V1-00-DR-A-2805	Gilling Dod Architects	P01

Table 8. Drawing Register

Appendix A1: PMV & PPD indices



A1: 2016 DSY1

PMV and PPD indices – 2016 DSY

The below results show that all occupied spaces assessed meet the Category C requirements for PPD and PMV set out in Table A.1 of Annex A of ISO7730:2005.

Room Name	PMV			PPD		Pass/Fail
	Min	Max	Pass/Fail	PPD	Pass/Fail	
	Limit			Limit		
	>-0.7	<0.7		< 15%		
V1.00.002 Waiting Room FH	-0.30	0.37	Pass	7.79	Pass	Pass
V1.00.004 Office	-0.31	0.42	Pass	8.66	Pass	Pass
V1.00.005 Reception	-0.29	0.44	Pass	9.13	Pass	Pass
V1.00.011 Interview Room	-0.30	0.36	Pass	7.70	Pass	Pass
V1.00.012 Consult/ Exam	-0.26	0.34	Pass	7.44	Pass	Pass
V1.00.013 Consult/ Exam	-0.29	0.37	Pass	7.93	Pass	Pass
V1.00.014 Consult/ Exam	-0.26	0.35	Pass	7.52	Pass	Pass
V1.00.015 Consult/ Exam	-0.29	0.38	Pass	8.00	Pass	Pass
V1.00.016 Consult/ Exam	-0.29	0.36	Pass	7.63	Pass	Pass
V1.00.018 Consult/ Exam	-0.29	0.42	Pass	8.75	Pass	Pass
V1.00.019 Consult/ Exam	-0.30	0.42	Pass	8.71	Pass	Pass
V1.00.023 Admin	-0.29	0.30	Pass	6.84	Pass	Pass
V1.00.024 Admin	-0.29	0.35	Pass	7.49	Pass	Pass
V1.00.027 Staff Room	-0.20	0.61	Pass	2.84	Pass	Pass
V1.00.028 Meeting Room	-0.28	0.64	Pass	3.67	Pass	Pass
V1.00.032 Treatment Room	-0.30	0.52	Pass	0.68	Pass	Pass
V1.00.033 Treatment Room	-0.29	0.46	Pass	9.34	Pass	Pass
V1.00.034 Consult/ Exam	-0.28	0.35	Pass	7.52	Pass	Pass
V1.00.035 Consult/ Exam	-0.29	0.35	Pass	7.48	Pass	Pass

Table 9. 2016 DSY1 PMV and PPD indices

A1: 2050 Medium50 DSY2

PMV and PPD indices – 2050 High50 DSY2

The below results show that all occupied spaces assessed meet the Category C requirements for PPD and PMV set out in Table A.1 of Annex A of ISO7730:2005.

Room Name	PMV			PPD		Pass/Fail
	Min	Max	Pass/Fail	PPD	Pass/Fail	
	Limit			Limit		
	>-0.7	<0.7		< 15%		
V1.00.002 Waiting Room FH	-0.30	0.35	Pass	7.51	Pass	Pass
V1.00.004 Office	-0.30	0.40	Pass	8.25	Pass	Pass
V1.00.005 Reception	-0.29	0.40	Pass	8.41	Pass	Pass
V1.00.011 Interview Room	-0.26	0.38	Pass	8.02	Pass	Pass
V1.00.012 Consult/ Exam	-0.28	0.37	Pass	7.88	Pass	Pass
V1.00.013 Consult/ Exam	-0.30	0.41	Pass	8.47	Pass	Pass
V1.00.014 Consult/ Exam	-0.28	0.37	Pass	7.92	Pass	Pass
V1.00.015 Consult/ Exam	-0.28	0.41	Pass	8.46	Pass	Pass
V1.00.016 Consult/ Exam	-0.29	0.40	Pass	8.41	Pass	Pass
V1.00.018 Consult/ Exam	-0.30	0.43	Pass	8.84	Pass	Pass
V1.00.019 Consult/ Exam	-0.30	0.42	Pass	8.75	Pass	Pass
V1.00.023 Admin	-0.29	0.29	Pass	6.76	Pass	Pass
V1.00.024 Admin	-0.29	0.30	Pass	6.92	Pass	Pass
V1.00.027 Staff Room	-0.18	0.57	Pass	1.82	Pass	Pass
V1.00.028 Meeting Room	-0.28	0.67	Pass	4.53	Pass	Pass
V1.00.032 Treatment Room	-0.30	0.63	Pass	3.38	Pass	Pass
V1.00.033 Treatment Room	-0.29	0.57	Pass	1.75	Pass	Pass
V1.00.034 Consult/ Exam	-0.28	0.38	Pass	8.03	Pass	Pass
V1.00.035 Consult/ Exam	-0.27	0.36	Pass	7.75	Pass	Pass

Table 10. 2050 DSY2 PMV and PPD indices

A1: 2050 Medium50 DSY3

PMV and PPD indices – 2050 High50 DSY3

The below results show that 15 out of 19 occupied spaces assessed meet the Category C requirements for PPD and PMV set out in Table A.1 of Annex A of ISO7730:2005.

Room Name	PMV			PPD		Pass/Fail
	Min	Max	Pass/Fail	PPD	Pass/Fail	
	Limit			Limit		
	>-0.7	<0.7		< 15%		
V1.00.002 Waiting Room FH	-0.29	0.52	Pass	0.62	Pass	Pass
V1.00.004 Office	-0.29	0.46	Pass	9.42	Pass	Pass
V1.00.005 Reception	-0.29	0.57	Pass	1.77	Pass	Pass
V1.00.011 Interview Room	-0.30	0.41	Pass	8.45	Pass	Pass
V1.00.012 Consult/ Exam	-0.27	0.38	Pass	8.07	Pass	Pass
V1.00.013 Consult/ Exam	-0.29	0.44	Pass	8.97	Pass	Pass
V1.00.014 Consult/ Exam	-0.27	0.39	Pass	8.11	Pass	Pass
V1.00.015 Consult/ Exam	-0.30	0.44	Pass	8.95	Pass	Pass
V1.00.016 Consult/ Exam	-0.29	0.41	Pass	8.44	Pass	Pass
V1.00.018 Consult/ Exam	-0.29	0.47	Pass	9.65	Pass	Pass
V1.00.019 Consult/ Exam	-0.29	0.46	Pass	9.49	Pass	Pass
V1.00.023 Admin	-0.29	0.61	Pass	2.92	Pass	Pass
V1.00.024 Admin	-0.29	0.69	Pass	4.89	Pass	Pass
V1.00.027 Staff Room	-0.26	0.91	Fail	2.46	Pass	Fail
V1.00.028 Meeting Room	-0.29	1.13	Fail	2.03	Pass	Fail
V1.00.032 Treatment Room	-0.30	1.01	Fail	6.73	Pass	Fail
V1.00.033 Treatment Room	-0.29	0.93	Fail	3.42	Pass	Fail
V1.00.034 Consult/ Exam	-0.29	0.40	Pass	8.30	Pass	Pass
V1.00.035 Consult/ Exam	-0.26	0.39	Pass	8.21	Pass	Pass

Table 11. 2050 DSY3 PMV and PPD indices

Appendix A2: possible adaptation measures



Adaptation measures

Possible adaptation measures to ensure the building continues to meet the thermal comfort requirements under more extreme future summer weather scenarios:

a) minimising internal heat generation through energy-efficient design

- Consider using low-energy equipment to reduce the internal equipment gains.
- Consider limiting the amount of equipment in use or the duration of use during periods when short-term discomfort may be likely.

b) reducing the amount of heat entering the building in summer

- Consider increased usage of internal blinds. If this limits natural ventilation, consider the use of mechanical ventilation.
- Consider installing external shading such as brise soleil to reduce solar gains.

c) managing heat within the building through exposed internal thermal mass

- Consider installing actuators on windows to provide night-time natural ventilation.
- Consider lowering the temperature set point at which night-time mechanical ventilation is activated to cool the thermal mass of the space.

d) passive ventilation by cross-flow and stack solutions and/or optimised high and low-level openings

- Consider installing actuators on windows to provide automated control and integration with mechanical ventilation.

e) mechanical ventilation, including limited periods of boost

- Consider lowering the temperature set point at which mechanical boost ventilation is activated

Note: All options will require further consideration with regard to daylight, acoustics, design loads, and Building Regulations.

Our Services

We offer a wide range of high-quality building performance advice and evaluation,
Sustainability & Net Zero Carbon Consultancy.

We work across all construction sectors in the UK, Europe and Worldwide.



Building Physics



Carbon



Sustainability



Compliance



Projects



Planning Support

Upperbank House, Stoneythorpe, Leeds LS18 4BN

t: 0113 3933329 e: info@zed-uk.com



7.8 Appendix H – Embodied Carbon Assessment



Whitefield Primary Care Health Centre

Life Cycle Assessment (LCA) for BREEAM Mat 01

February 2026

Project Ref: 3280516

We are **daylighting** experts

We are **thermal comfort** experts

We are **life cycle analysis** experts

We are **sustainability** experts

We are **building physics** experts

We are **zero carbon** experts

We are **zed.**



zero carbon
building physics
sustainability

zed.
an RSK company

contents

4

abbreviations

5

executive summary

8

introduction

12

methodology

17

design

21

results & appraisal -
LCA

24

results & appraisal –
BREEAM Mat 01

28

assessment benefits

30

appendix A1: BREEAM
Mat 01 tool

prepared by: Tom Owen – Building Physics and Sustainability Consultant

date: 02 02 26 sig: 

checked by: Jason Richards – Group Managing Director

date: 02 02 26 sig: 

revision: 00 – Initial issue

date: 02 02 26 sig: 

abbreviations

ACH	- Air Changes per Hour
ASHP	- Air Source Heat Pump
CLT	- Cross Laminated Timber
CIBSE	- Chartered Institution of Building Services Engineers
COP	- Coefficient Of Performance
DHW	- Domestic Hot Water
EPD	- Type III Environmental Declaration
EUI	- Energy Use Intensity
GGBS	- Ground Granulated Blast-furnace Slag
GIFA/GIA	- Gross Internal Floor Area/Gross Internal Area
GSHP	- Low Energy Transformation Initiative
GWP	- Global Warming Potential
LCA	- Life Cycle Assessment
MM	- Mixed Mode (Ventilation)
MVHR	- Mechanical Ventilation with Heat Recovery
PV	- Photo Voltaic (panels)
RC	- Reinforced Concrete
RIBA	- Royal Institute of British Architects
RICS	- Royal Institute of Chartered Surveyors
SFS	- Steel Frame System
SHD	- Space Heating Demand
WLC	- Whole Life Carbon

executive summary



executive summary

This report has been compiled by zed. on behalf of Gilling Dod, to provide a summary of inputs and results of the Life Cycle Assessment, for the proposed Whitefield Health Centre.

The LCA provides evidence for BREEAM Mat 01 using option 1: Project lifecycle assessment study. This approach uses One Click LCA to measure the life cycle environmental impact of the refurbishment or fit out works. The LCA covers new materials only.

The study has been conducted in accordance with ISO 14044 and EN15978. The software used was One Click LCA, an approved software for the BREEAM UK Mat 01 credits by BRE.

zed. have undertaken a project lifecycle assessment study for Whitefield Health Centre as part of the evidence for BREEAM credit Mat 01. This assessment evaluates the life cycle carbon associated with the whole building in line with BREEAM UK refurbishment and fit out 2014 Mat 01 Option 1, to reduce the projects' environmental impact at all stages, from construction to building use.

The report outlines the methodology, inputs and results of the LCA.

The number of credits achieved is based on the robustness of the LCA tool used and the scope of the assessment in terms of the materials specified that have been considered

A total of **6 credits** are achieved under BREEAM UK RFO 2014 Mat 01 since the percentage of points achieved surpasses 80%, with a total of 80.6% of Mat 01 points achieved. This is subject to approval by the BREEAM assessor.

group element	maximum achievable points	points achieved
Material Assessment Tool		
Output indicators available	8	2
Output life stage(s) available	12	8
Assessment level	10	8
Source LCA data quality – geographic applicability and age	10	5
Source LCA data quality - methodologies	20	20
Source LCA data quality - verification	10	10
Total	70	53
Material Assessment Scope		
Part 1: fabric and structure	12	12
Parts 2 and 3: building services	6.5	6
Part 4: interior design	6	4.5
Part 5: landscaping	0	0
Total	24.5	22.5
Combined Total	94.5	75.5

Table 1 . Whitefield Health Centre points achieved at Technical Design Stage

*3rd party / BREEAM assessor verification required.

executive summary

Results for the life cycle assessment are shown below in Table 2.

LCA results	value	unit
cradle to grave embodied carbon	473,295.94	kgCO ₂ e
cradle to grave embodied carbon intensity	804.93	kgCO ₂ e/m ²
operational energy (whole life)	4741.94	kWh/m ²
operational carbon intensity (whole life)	644.90	kgCO ₂ e/m ²
Total embodied carbon	1449.83	kgCO ₂ e/m ²

Table 2. Collective results summary for Whitefield Health Centre

introduction



introduction

A Life Cycle Assessment for the proposed Whitefield Health Centre is being carried out to provide evidence for UK BREEAM Mat 01 credits.

The development is located in Fallowfield, Manchester.

The project involves the adaptive reuse of the former Whitefield Library in Manchester to create the new Whitefield Medical Centre – a modern, community-focused healthcare facility designed to enhance local access to primary care services.

Works include internal reconfiguration to accommodate consultation rooms, treatment spaces, administrative offices, and patient support facilities. Sustainability is central to the refurbishment approach. The design maximises natural light, improves thermal performance, and introduces low-carbon technologies where feasible. A fabric-first design approach has been adopted, focussing on fabric upgrades and improved air-tightness, to reduce heat loss in winter and solar-control glazing to limit heat gain in summer. High-efficiency LED luminaires, an efficient VRF system, and low Specific Fan Powers (SFPs) for the ventilation systems will help minimise the energy consumption associated with the building's fixed services.

This assessment aims to ensure that, in addition to reducing operational energy consumption, the building's design considers its full life cycle including embodied carbon.



Figure 1. Site Location

introduction

As buildings become more energy efficient, with low-energy technologies and building systems becoming more commonplace, operational carbon emissions are making up a smaller portion of development's whole life cycle carbon emissions. It is vital to not only minimise operational carbon in new and existing buildings, but to take active steps in reducing carbon emissions associated with other aspects of a development's life cycle, specifically the embodied carbon emissions.

life cycle assessment (LCA)

LCAs involve a comprehensive assessment of all factors contributing to whole-life carbon, from raw material extraction and construction through to building use and eventual disposal. Conducting an LCA can assist design teams in taking measures towards minimising the carbon impact a project might have on the built environment.

This LCA for BREEAM Mat 01 assesses the design's life cycle embodied carbon at the technical design stage to give an insight into which building components and processes are the greatest contributors to embodied carbon.

embodied carbon is the carbon within a building, produced from raw material extraction and processing, manufacture, transportation and assembly, to disposal and end-of-life management of all assets and components. Carbon figures associated with the maintenance and replacement of building components are also included.

operational carbon is the CO₂ and equivalent Global Warming Potential (GWP) of other gases associated with the operation of a building. This is referred to as 'carbon' and presented in units of CO₂ equivalent (kgCO₂e). Operational carbon considers carbon associated with heating, hot water, cooling, ventilation, and lighting systems, and emissions from energy uses such as cooking, equipment, and lifts. The carbon content of the electricity grid is also accounted for.

energy use intensity is a measure of the total energy consumed in a building each year (kWh/m² GIA .yr). It is a good indicator of building performance as it solely measures energy use, rather than measuring carbon. EUI can be estimated at the design stage and can be easily monitored in-use, in order to assess how much energy a building consumes.

introduction

This breakdown of a built asset's life cycle reflects the modular approach outlined in the RICS methodology.

One Click LCA only produces data for modules A1-A4, B1-B5, C1-C4 to be included in the Mat 01 submission. Additional operational energy use has been calculated using CIBSE TM54 methodology.

For this assessment 'Cradle to Grave' total embodied carbon (CO₂e) is being reported, with operational energy reported separately.

The modular life cycle stages from the RICS are as follows:

A1 - A3, material impacts up to product stage

A4 - A5, on-site construction, including product transportation

B1 – B7, operational energy and water use, maintenance, replacement and building refurbishment

C1 - C4, end of life, including demolition and disposal processes

D, potential environmental benefits or burdens of materials beyond the life of the project

Table 3 shows the life cycle stages considered for this assessment, in line with the BREEAM requirements.

product stage			construction process stage	use stage								end-of-life stage				benefits and loads beyond the system boundary		
module A			module A	module B								module C				module D		
raw material supply	transport	manufacturing	transport to Building site	installation to building	use/application	maintenance	repair	replacement	refurbishment	operational energy use	operational water use	deconstruction/demolition	transport	waste processing	disposal	reuse	recovery	recycling
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
✓	✓	✓	✓	x	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	✓	x	x	x

Table 3. life-cycle stages included for LCA for Whitefield Health Centre

methodology



methodology

This portion of the report outlines the methodology used in One Click LCA and in the BREEAM Mat 01 calculator. This includes the input procedure and data used, including limitations of the software and subsequent assessment.

The BREEAM UK Refurbishment and Fit-out – Mat 01 Option 1 methodology has been followed for this assessment.

The LCA assessment uses the Royal Institute of Chartered Surveyors (RICS) methodology and adopts a 60-year life cycle.

The methodology followed in preparing this report is in keeping with the RICS professional statement for undertaking detailed carbon assessments, which follows the European standard EN 15978.

The results of the LCA have been exported and are included as part of the evidence package to achieve the relevant credits.

The BREEAM Mat 01 Results Submission Tool has also been populated and provided as part of the evidence package.

quality requirements

This assessment has been carried out using material specifications provided by the design team where possible, in line with 'Table 9.4 LCA quality requirements' in Mat 01.

Generic material constructions and systems information has been used where project specific information has not been provided. In cases where more detailed information is available, the closest component in the LCA tool has been selected.

The impacts for building material transportation, construction site operations and end-of-life impacts of each material have been included automatically by the database where appropriate using average scenarios for chosen materials. The LCA has been carried out using EPDs in accordance with BS EN 15804, ISO 14025 and ISO 14040/44.

Water use has not been included in the assessment of Whitefield Health Centre due to limited information. Similarly landscaping elements are also out of the scope of the assessment.

methodology

The tool used for this assessment is One Click LCA, which follows BS EN 15978 and is IMPACT-compliant and BRE certified. One Click LCA has been used to estimate the WLC values and offers a detailed carbon analysis and life cycle impacts, providing comprehensive results in both numerical and graphical forms.

One Click LCA

Within One Click LCA quantity information is input for each building element/building system based on information provided by the design team. After inputting quantity information for each design option, they can be compared against each other allowing for a robust calculation to be carried out.

scope of analysis

The LCA for Whitefield Health Centre covers the Cradle to Grave stages, including operational energy, of the building according to EN 15978 and outlines modules A1-A3, A4, B1-B5, and C1-C4 – reflecting 'cradle to grave'.

In line with BREEAM Mat 01, all mandatory building elements across 'Part 1: Fabric and structure', 'Parts 2 and 3: building services', 'Part 4: Interior Design', as well as all other categories that were addressed in the material specifications have been included in the assessment

Carbon values associated with deconstruction of certain elements on the project site (prior to works beginning for the Whitefield Health Centre) are considered within this LCA, as are the deconstruction at the end of the project's life.

BREEAM Mat 01 – Option 1

BREEAM Mat 01 – Option 1 was selected for this assessment due to the greater number of BREEAM credits that can be obtained by using this methodology

The number of BREEAM credits achieved in a 'Mat 01: Environmental impact of materials' is based on the robustness of the LCA tool used and the scope of the assessment in terms of the materials specified that have been considered. Use of the tool involves completing a questionnaire relating to how the assessment was carried out and the building elements that were and were not included. Points associated with elements that are not relevant to the project are not included in the maximum score and thus excluded in the percentage calculation.

The number of credits awarded is based on a points percentage score as outlined in Table 4 below

Percentage of BREEAM Mat 01 calculator points achieved	BREEAM credits
10	1
30	2
50	3
65	4
75	5
80	6
85	6 +1 exemplary

Table 4. Percentage of BREEAM Mat 01 calculator points achieved and credits awarded (Option 1)

methodology

out of scope elements

For the Mat 01 submission, only new components are evaluated. This means that any retained pre-existing components aren't input in One Click LCA. Certain building elements from the Mat 01 calculator aren't included in the new material specification and have also therefore been excluded from the One Click LCA model.

Out of scope elements include:

- Existing components
- Landscaping
- Upper floors
- Lift and conveyor system

design



building components

This part of the assessment outlines the information used in the calculation of the embodied carbon associated with the materials selected in the design of Whitefield Health Centre.

building components

Table 5 below outlines details of the material and component selections for the new building elements. The One Click LCA Output document outlines the input materials in full.

Building components	
building element	input
1.1.1 Standard Foundations	C30/37 DS-2, AC-2 reinforced concrete external stair strips Reinforced concrete infill brick cavity retaining wall
1.1.3 Lowest floor construction	Screed, damp proof membrane, insulation
2.1 Frame	Steel roof beams Roof timber posi-joists
2.3 Roof	Plywood, Armourplan SM/P, adhesive, IKO insulation, primer, OSB, Siniat standard board
2.4 Stairs and ramps	C30/37 DS-2, AC-2 reinforced concrete external ramp base Reinforced concrete infill brick cavity wall
2.5 External walls	Clay Facing Bricks, air gap, Rockwool Duoslab, Siniat weather defence board, SFS fully filled with rock or glass mineral wool, Siniat fire board
2.6 Windows and external doors	Fully glazed, PPC Aluminium frame windows Glass panel, PPC Aluminium Finish doors
2.7 Internal walls and partitions	Siniat universal board, Siniat C stud, Siniat metal ceiling channel – some with Superglass slab 32 insulation or wool insulation
2.8. Internal doors	Hardwood with Formica laminate finish – some with vision panels
3.2. Floor finishes	Vinyl Barrier matting
3.3. Ceiling finishes	Standard (600x600mm and 1200x600mm) mineral tiles, ceiling grid frame Siniat standard board, Siniat primary channel Corrosion resistance (600x600mm and 1200x600mm) mineral tiles, ceiling grid frame
5.3. Disposal installations	Wastewater drainage system
5.4. Water installations	Drinking water supply piping network, cold water pump system
5.6 Space Heating and Air Conditioning	Hot water cylinder VRF internal and external units Air conditioning cassettes Air curtain Split system external units Electric radiators
5.7 Ventilation	Heat recovery units Steel ductwork, intake and exhaust Louvers Attenuators

Table 5. Whitefield Health Centre material specification

building components

Building materials	
building element	input
5.8 Electrical Installations	Electricity distribution system Security system Wall sockets Cable baskets and trunking
5.8.3.Lighting installations	8.5W, 20W, 30W, 36W, 40W LED light fixtures Emergency lighting
5.8.5.Local electricity generation systems	PV panels
5.11.Fire and lightning protection	Fire alarms Smoke alarms

Table 5 (continued). Whitefield Health Centre material specification

construction site operations

This part of the assessment outlines the data used in the calculation of the embodied carbon associated with the site operations.

construction site operations

Table 6 below outlines the construction site operations that have been accounted for in One Click LCA

construction site operations	
operation	input
1. construction site scenarios	disassembly/deconstruction of existing building elements (24.3m ²)* average site impacts – temperate climate North (588m ²)
2. deconstruction/demolition scenarios	end-of-life deconstruction and demolition process (588m ²)

Table 6. Whitefield Health Centre construction site operations

*pro-rata allowance for pre-construction demolition.

results & appraisal - LCA



LCA results

This section presents the results of the BREEAM Mat 01 Results Submission Tool LCA, showing the carbon values and respective credits output from the tool.

cradle to grave results

Using OneClick LCA an assessment of the cradle to grave carbon consumption of the refurbishment, with exception to operational energy usage has been carried out.

Results are broken down by building element category below in table

component	global warming potential (kgCO ₂ e)
1.1.1.Standard foundations	17328.41
1.1.3.Lowest floor construction	10438.81
2.1. Frame	49139.28
2.2.1.Floors	5091.74
2.3.Roofs	47216.10
2.4.Stairs and ramps	23123.88
2.5.External walls	10371.73
2.6.1.External Windows	3456.12
2.6.2.External doors	1970.52
2.7.Internal walls and partitions	17242.48
2.8.Internal doors	10066.34
3.2.Floor finishes	24445.35
3.3.Ceiling finishes	19333.18
5.3.Disposal installations	499.36
5.4.Water installations	184.06
5.6.Space heating and Airconditioning	43622.66
5.7.Ventilation systems	10750.16
5.8.Electrical installations	22312.74
5.8.3.Lighting installations	6797.51
5.8.5.Local electricity generation systems	116822.64
5.11.Fire and lightning protection	468.66
Total	440,681.74
Construction site scenarios	30,615.00
Deconstruction/demolition scenarios	1999.20
Total	32,614.20
Total Cradle to Grave embodied carbon	473,295.94

Table 7. Whitefield Health Centre cradle to grave carbon per group element.

*3rd party / BREEAM assessor verification required.

LCA results

This section outlines the LCA associated with operational energy and the total LCA result.

month	energy consumption (kWh/yr)	
	central case	worst case
Jan	4,101	6,095
Feb	3,819	4,931
Mar	4,287	5,223
Apr	3,771	4,800
May	3,555	4,333
Jun	3,637	4,335
July	3,707	4,321
Aug	3,691	4,404
Sep	3,698	4,385
Oct	3,661	4,672
Nov	4,088	5,091
Dec	4,458	5,889
Total	46,471	58,479

Table 8. predicted monthly energy consumption

operational energy

A TM54 Assessment was carried out using Integrated Environmental Solutions Virtual Environment (IES VE) to establish the annual energy consumption of the building. The results of this assessment are shown in table 8.

Using the central case as the likely most accurate prediction, annual operational energy consumption is measured as 46,471 kWh/annum or 79.03kWh/m²/annum.

Over the 60-year lifespan of the building, this adds up to 2,788,260 kWh of energy consumption or 4741.94kWh/m²

When input into OneClick LCA this total operational energy consumption accounts for 379,203.36 kgCO₂e.

total life cycle assessment

The cradle to grave results in addition to the carbon associated with operational energy make up the total result of the LCA. Results are presented below in Table 8.

assessment	Global warming potential (kgCO ₂ e)	Global warming potential (kgCO ₂ e/ m ² NIA)
cradle to grave	473,295.94	804.93
operational energy	379,203.36	644.90
cradle to grave with operational energy	852,499.3	1449.83

Table 9. Whitefield Health Centre embodied carbon estimations (carbon unit - kgCO₂e/m² GIA)

results & appraisal

- BREEAM Mat 01



BREEAM Mat 01 results

This section outlines the points achieved in the materials assessment tool/method and data stage of the BREEAM Mat 01 assessment.

materials assessment tool/method

Table 10 outlines the assessment method and the corresponding Mat 01 points.

Material assessment tool/method and data	max. points	included in LCA
output indicators available	8	2
Embodied carbon (CO ₂ e)	2	Y
Embodied water OR waste processing	2	N
AND any two additional indicators	4	N
Output Life stage(s) available (for all indicators selected)	12	8
Cradle to Gate total	2	N
Cradle to Gate total AND End of Life	4	N
Cradle to Grave total	6	N
Cradle to Grave total WITH operational energy (reported separately)	8	Y
Cradle to grave with separate life stage reporting	12	N
Assessment level(s). Life cycle impact comparisons possible (and made) at the:	10	8
Elemental level	4	Y
Whole Building Level	4	Y
Whole building level; with user product-level specification (e.g. thickness, service life) and reporting aligned to (the current version of) EN 15978.	2	N
Source LCA data quality - Geographic applicability and age (Majority of individual materials/products in the building are assessed:)	10	5
Using LCA data of unknown geographic applicability OR not compensated to local conditions	0	Y
Using LCA data that has been compensated to local conditions (e.g. energy-mix) according to CEN/TR 15941	5	N
Using data no older than 10 years (generic) or 5 years (manufacturer specific)	5	Y
Source LCA data quality – Methodologies (Majority of individual materials/products in the building:)	20	20
Are assessed using data of unknown methodology	0	N
Are assessed to a publicly available methodology compliant with (the current version of) ISO 14040 & ISO 14044	4	N
Are assessed to a publicly available AND peer reviewed methodology compliant with (the current version of) ISO 14040 & ISO 14044	8	N
Are assessed to publicly available AND peer reviewed PCR compliant with (the current version of):		
PAS 2050	12	N
ISO 21930	16	N
EN 15804	20	Y
Source LCA data quality – Verification (Majority of individual materials/products in the building are assessed using:)	10	10
Unverified LCA data/data of unknown level of verification	0	N
Verified/peer reviewed LCA data	6	N
Verified/peer reviewed LCA data AND majority of EPD used (manufacturer or trade association) are verified to ISO 14025, ISO 21930 or EN 15804	10	Y
Total points	70	53

Table 10. Whitefield Health Centre materials assessment tool/method and data points

BREEAM Mat 01 results

This section outlines the points achieved in the materials assessment scope stage of the BREEAM Mat 01 assessment.

materials assessment scope

The scope of materials assessed in the LCA also impacts the number of points achieved in the Mat 01 calculator. Table 11 outlines the materials assessed and the corresponding Mat 01 points. Excluded categories are out of the scope of the project.

Material assessment tool/method and data	max. points	included in LCA
Part 1: Fabric and structure:	12	12
External walls (envelope, structure and finishes)	2.00	Y
External windows and rooflights	2.00	Y
Foundations (including excavation)	2.00	Y
Stairs and ramps	1.00	Y
Structural frame (vertical)	2.00	Y
Upper floors (including horizontal structure)	-	N
Roof (including coverings)	1.00	Y
Basements/retaining walls (including excavation)	1.00	Y
External solar shading devices, access structures etc.	-	N
Ground/lowest floor	1.00	Y
Parts 2 and 3: Building Services:	6.5	6
Heat Source, Space Heating, Air Conditioning, Ventilation	2.00	Y
Communication, Security and Control Systems	1.00	Y
Electrical Installations	1.00	Y
Fire and Lightning Protection	1.00	Y
Lift and Conveyor Installations / Systems	-	N
Water and waste installations	1.00	Y
Sanitary Installations	0.50	N
Part 4: Interior design:	6	4.5
Internal ceiling finishes (incl. suspended/access ceilings)	1.00	Y
Internal walls and partitions	1.00	Y
Balustrades and handrails	0.50	N
Internal doors	0.50	Y
Internal floor finishes (incl. access floors)	2.00	Y
Internal wall finishes	0.50	N
Internal windows	0.50	N
Landscaping	-	N
Total points	24.5	22.5

Table 11. Whitefield Health Centre materials assessment tool/method and data points

BREEAM Mat 01 results

This section outlines the results of the LCA.

BREEAM points achieved

The 53 points achieved in the material assessment tool part of the Mat 01 calculator added to the 22.5 points achieved in the material assessment scope adds up to 75.5

In accordance with BREEAM UK – Refurbishment and Fit-out 2014 Table 46 (table 4 in this document) the number of points achieved in the BREEAM Mat 01

group element	maximum achievable points	points achieved
Material Assessment Tool	70	53
Material Assessment Scope	24.5	22.5
Combined Total	94.5	75.5

Table 12. BREEAM Mat 01 calculator points achieved in Whitefield Health Centre LCA

Percentage of BREEAM Mat 01 calculator points achieved (%)	BREEAM credits
80.6	6

Table 13. BREEAM credits achieved in Life Cycle Assessment of Whitefield Health Centre

assessment benefits



assessment impact

This section outlines the ways in which the Life Cycle Assessment has impacted the design of Whitefield Medical Centre.

assessment impact

One Click LCA was used through the early pre-planning stages to evaluate the embodied carbon through the life cycle stages of the project. Using the tool during RIBA Stages 2 and 3 allowed the embodied carbon impact and associated BREEAM credits to be assessed, adjustments made to the design and material selections, and their benefits evaluated. This allowed the design to be refined in terms of optimising the environmental impact of embodied carbon. Cost plans were run in parallel with design development to make sure that the best value was achieved, allowing both costs and environmental impacts to be optimised during the design stages.

In terms of changes to the building, the operational energy forming part of the LCA assessment was reduced through the change to VRF systems to deliver the heating and cooling combined with Mechanical Ventilation with Heat Recovery (MVHR). Changing to these systems, with the addition of electric door heaters and domestic hot water generation helped to reduce the operational energy and life cycle impact. The inclusion of solar PV on the roof also helped reduce operational energy, although this was carefully considered against the cost and embodied carbon impact associated with the manufacture and installation of the panels.

appendix A1:

BREEAM Mat 01 tool



appendix – Mat 01 Calculator

BREEAM Mat 01 calculator

BREEAM UK Refurbishment and Fit-out 2014 Mat 01 Calculator: Option 1

BREEAM® UK

Materials Assessment tool/method and data

Note: where 'M' is indicated against a section heading, at least one item must be indicated 'Y'.

	Mandatory	Maximum	Included in LCA tool?
Output Indicators available		Sum:-	
Embodied carbon (CO2e)	M	2	Y
Embodied water OR waste processing		2	N
AND any two additional indicators		4	N
Points	8	2	

(M) Output Life stage(s) available (for all indicators selected)

	Score:-	
Cradle to Gate total	2	N
Cradle to Gate total AND End of Life	4	N
Cradle to Grave total	6	N
Cradle to Grave total WITH operational energy (reported separately)	8	Y
Cradle to grave with separate life stage reporting to:-	12	N
a. Product stage		
b. Construction process stage		
c. Use stage (with operational energy reported separately)		
d. End of life		
Points	12	8

(M) Assessment level(s). Life cycle impact comparisons possible (and made) at the:

	Sum:-	
Elemental level	4	Y
Whole Building Level	4	Y
Whole building level; with user product-level specification (e.g. thickness, service life) and reporting aligned to (the current version of) EN 15978.	2	N
Points	10	8

(M) Source LCA data quality - Geographic applicability and age Majority of individual materials/products in the building are assessed:

	Sum:-	
Using LCA data of unknown geographic applicability OR not compensated to local conditions	0	N
Using LCA data that has been compensated to local conditions (e.g. energy-mix) according to CEN/TR 15941	5	N
Using data no older than 10 years (generic) or 5 years (manufacturer specific)	5	Y
Points	10	5

(M) Source LCA data quality - Methodologies

Majority of individual materials/products in the building:

	Score:-	
Are assessed using data of unknown methodology	0	N
Are assessed to a publicly available methodology compliant with (the current version of) ISO 14040 & ISO 14044	4	N
Are assessed to a publicly available AND peer reviewed methodology compliant with (the current version of) ISO 14040 & ISO 14044	8	N
Are assessed to publicly available AND peer reviewed PCR compliant with (the current version of):		
PAS 2050	12	N
ISO 21930	16	N
EN 15804	20	Y
Points	20	20

(M) Source LCA data quality - Verification

Majority of individual materials/products in the building are assessed using:

	Score:-	
Unverified LCA data/data of unknown level of verification	0	N
Verified/peer reviewed LCA data	6	N
Verified/peer reviewed LCA data AND majority of EPD used (manufacturer or trade association) are verified to ISO 14025, ISO 21930 or EN 15804	10	Y
Points	10	10

Total points 70 53

Materials Assessment Scope

	Mandatory (if new materials specified)	New materials specified?	Maximum	Included in assessment?
Building elements included			Sum:-	
Part 1: Fabric and structure:	Yes			
External walls (envelope, structure and finishes)	M	Y	2.00	Y
External windows and rooflights	M	Y	2.00	Y
Foundations (including excavation)		Y	2.00	Y
Stairs and ramps		Y	1.00	Y
Structural frame (vertical)		Y	2.00	Y
Upper floors (including horizontal structure)	M	N		N
Roof (including coverings)	M	Y	1.00	Y
Basements/retaining walls (including excavation)		Y	1.00	Y
External solar shading devices, access structures etc.		N		N
Ground/lowest floor		Y	1.00	Y
Parts 2 and 3: Building Services:	Yes			
Heat Source, Space Heating, Air Conditioning, Ventilation		Y	2.00	Y
Communication, Security and Control Systems		Y	1.00	Y
Electrical Installations		Y	1.00	Y
Fire and Lightning Protection		Y	1.00	Y
Lift and Conveyor Installations / Systems		N		N
Water and waste installations		Y	1.00	Y
Sanitary Installations		Y	0.50	N
Part 4: Interior design:	Yes			
Internal ceiling finishes (incl. suspended/access ceilings)		Y	1.00	Y
Internal walls and partitions	M	Y	1.00	Y
Balustrades and handrails		Y	0.50	N
Internal doors		Y	0.50	Y
Internal floor finishes (incl. access floors)	M	Y	2.00	Y
Internal wall finishes		Y	0.50	N
Internal windows		Y	0.50	N
Landscaping:	No			

Note: As building-level data is gathered, element weightings will be refined.

Total Points 24.5 22.5

Percentage of Mat01 points achieved:

80.6%

Select building type:
Credits achieved

All others

6

appendix – Mat 01 Calculator

(M) Additional questions (not related to credit score)

Majority of LCA data used originates from (in order of use, provide data source name, provider/institution name, version/date)	
1. Data source name, provider name, version/date	
2. Data source name, provider name, version/date	
3. Data source name, provider name, version/date	
Majority of LCA data used includes/uses:	
Sequestration (timber and biogenic products)	Y
Discounting for future emissions (e.g. to adjust for future changes to energy supply (fuel mix, technology etc.))	N
Future allocation of emissions	N
System expansion	N
Where indicated above as cradle-to-grave, the study period used is (years)	60
Where indicated above as including operational energy (heating, cooling, power etc) the following quantities have been used (direct, kWh/year) :	
grid electricity	46471
natural gas	Enter
coal	Enter
oil	Enter
other, please specify fuel type	Enter

Our Services

We offer a wide range of high-quality building performance advice and evaluation, Sustainability & Net Zero Carbon Consultancy.

We work across all construction sectors in the UK, Europe and Worldwide.



Building Physics



Carbon



Sustainability



Compliance



Projects



Planning Support

Upperbank House, Stoneythorpe, Leeds LS18 4BN

t: 0113 3933329 e: info@zed-uk.com

