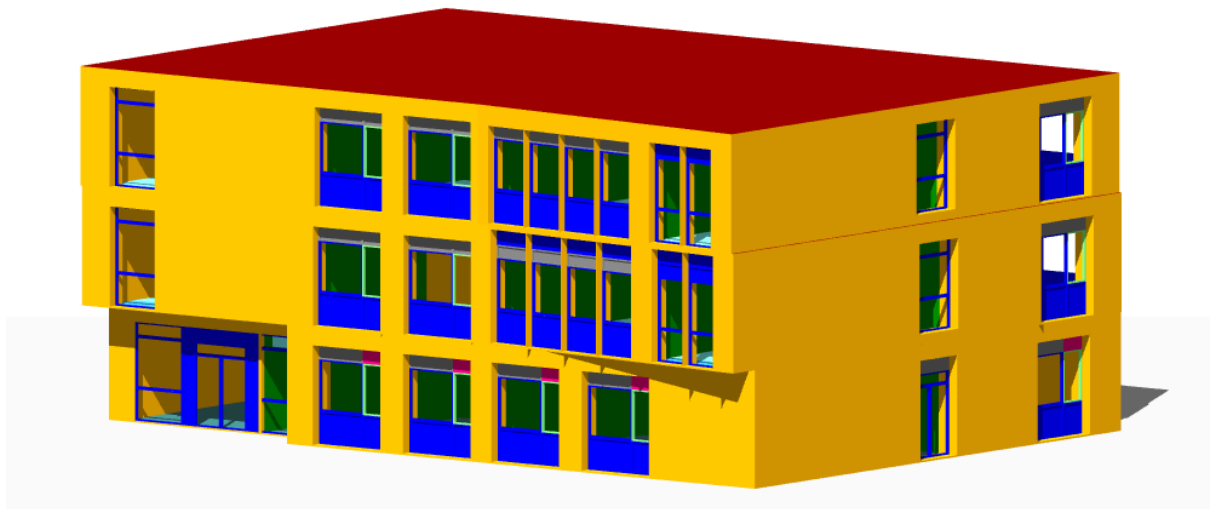


TACE[®]

Part L2 Compliance Report
Xaverian College Science Block
PA1684



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Controlled Document

<i>TACE Project Ref:</i>		PA1684	
	<i>Name</i>	<i>Signature</i>	<i>Date</i>
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A	05.05.23	AS	Preliminary Issue	SS	JM
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1.0 Executive Summary

This report has been prepared to satisfy the requirements of AA Projects and Borough of Manchester city council targets to demonstrate that, that thorough consideration has been given to the energy use and carbon consumption of the proposed new science block Xaverian College at Thurloe Street Manchester.

The proposed development complies with the requirements of the Building Regulations Approved Document L2 (ADL2) 2021.

1.1 Planning

The Local Planning Authority (LPA) is Manchester city council.

1.2 Low or Zero Carbon (LZC)

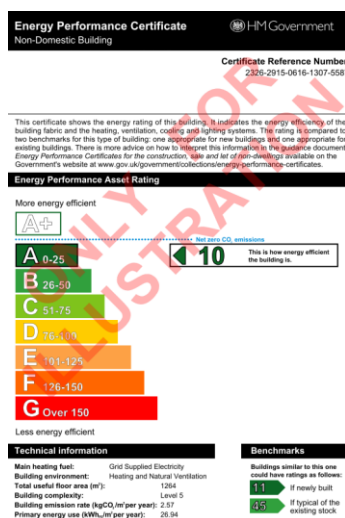
With Passive measures incorporated within the design of the proposed development it was not possible to achieve required BER over TER, therefore, passive measures alone are not enough and so renewables were adopted within the design philosophy. At this stage the advised source of renewable energy is photovoltaics.

1.3 Building Regulations Part L2A 2021

This building is currently complying with Part L2A 2021 with an actual building emissions rate (BER) demonstrating 7.8% reduction in carbon emissions in comparison with the notional building target emissions rate (TER).

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	2.79
Building CO ₂ emission rate (BER), kgCO ₂ /m ² ·annum	2.57
Target primary energy rate (TPER), kWh _e /m ² ·annum	29.72
Building primary energy rate (BPER), kWh _e /m ² ·annum	26.94
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER



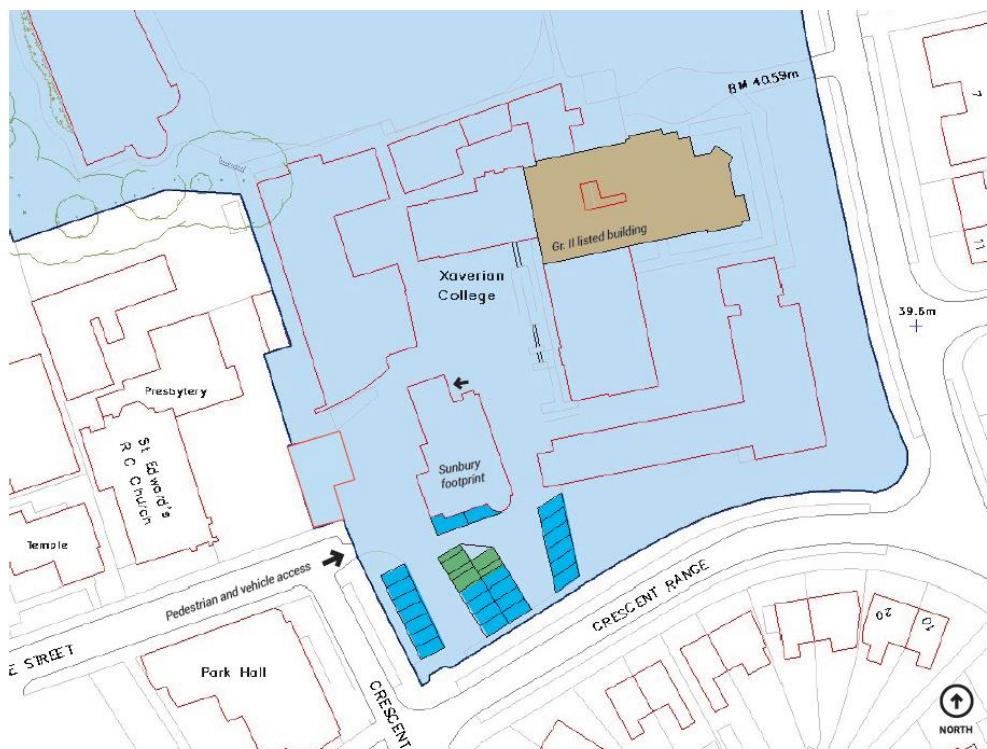
From the attached sketch of Criterion 1 and EPC, it can be seen the building not just comply with the Building Regulation Part L2A, but also achieve EPC rating A.

2.0 Introduction

TACE have been appointed to develop model and perform Part L2A analysis for new science block at Xaverian College.

This developed comprises of 3 storeys science block containing science labs, demo labs, staff room, prep rooms etc.

This report is about the areas within the building which falls under Building Regulations Part L2A.



Proposed Development

2.1 Software

This study has been undertaken using TAS dynamic simulation software V9.5.5 and UK Building regulations 2021 studio to generate a BRUKL and EPC rating. This allows us to assess the building servicing strategy and energy profiles.

2.2 Location

The weather file selected for the project is Manchester in accordance with the SBEM weather locations application.

The proposed development is situated off Thurloe Road, Manchester.



Project location

3.0 Energy & Sustainability Strategy

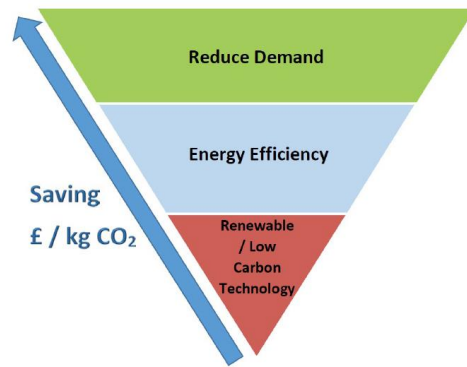
3.1 Introduction

A sustainable building will be delivered through the utilisation of a holistic approach, which considers, plans and monitors the use of natural resources. The strategy for achieving this is outlined as follows:

The Low Carbon Design Hierarchy

The strategy for reducing carbon dioxide (CO₂) emissions and energy consumption within the temporary accommodation, development will be to embrace a lean, mean and green approach as defined below.

- Lean – the use of advanced building modelling software and passive construction techniques.
- Mean – Incorporation of high-efficiency systems and effective controls throughout the design.
- Green – Incorporation of renewable energy sources where possible



3.1.1 Lean – Building Passive Measures

The passive measures are to be included within the design of the development to reduce energy use and the associated CO₂ emissions are;

- Improved building fabric parameters over those required by Building Regulations Part L2A 2021
- Windows with high thermal insulation
- Improved air permeability
- Maximisation of daylight
- Optimise glazing solar energy transmittance

Enhanced Insulation to The Building Envelope

Limiting heat losses across the entire building envelope will future proof the energy efficiency of the development over its whole life. To achieve this, the fabric thermal U-Value requirements as detailed within Approved Document L2A 2021 of the Building Regulations will be improved upon.

The table below shows the limiting U-values required to meet Building Regulations compared to the targeted values which exceed the Building Regulations requirements.

The targeted values as noted will be confirmed during the detailed design stage of the building in conjunction with finalisation of the energy efficiency measures included to meet the CO₂ emission rates required by Building Regulations.

Building Element	Building Regulations Limiting Value (W/m ² . K)	Proposed Construction Value (W/m ² . K)
Roof	0.16	0.1
External Wall	0.26	0.11
Floor	0.25	0.1
Windows & Door	1.6	1.1

Engineered Facade Design

The glazed proportion of the building facades and the glazing location will be designed to maximise the use of natural daylight to offset demand for artificial lighting.

Building Element	AD L2A Solar G Value	Target Solar G Value
Glazed Units	0.7	0.35

Reduced Air Permeability

The development will be constructed to improved building airtightness criteria beyond the level required to comply with Building Regulations.

Building Regulations Document	Maximum allowable air permeability ($\text{m}^3/\text{m}^2.\text{hr}$ at 50 Pa)	Targeted air permeability ($\text{m}^3/\text{m}^2.\text{hr}$ at 50 Pa)
Approved Document L2A	8.0	3.0

Weather File

For the analysis, the weather file used was Manchester.TRY weather file taken from CIBSE weather data.

3.1.2 Mean – High-Efficiency Systems, Plant and Controls

High-efficiency systems, plant, controls, and equipment will be incorporated as follows:

Optimised Plant Controls

Control of heating and cooling plant will be optimised, and weather compensated to ensure plant operates as close to demand as possible and not at full capacity.

Variable Speed Drives

Variable speed drives shall be installed on circulation pumps and ventilation fans to allow the speed of the respective motors to be amended by the automatic controls to suit changing load of the building. This will ensure energy usage matches demand requirements.

Energy Efficient LED Lighting

Internal lighting within the landlord areas will incorporate energy-efficient LED lighting where practicable.

Lighting controls will be provided to limit energy use. Automatic presence/absence detection, photocell control dimming (where appropriate) will be included in appropriate areas. This form of control will ensure lights are automatically switched off during periods of non-occupancy.

External lighting will be designed to incorporate energy efficient luminaires and an automatic lighting control system utilising daylight sensors and time clock control to ensure energy-efficient operation of the lighting.

Heat Recovery on Ventilation Systems

Where installed, the ventilation systems installed within the development will also incorporate heat recovery units within the building. This is then used to heat the incoming fresh air and therefore reduce energy usage.

The heat recovery units will have a low specific fan power to minimise the energy used by the fans.

3.1.3 Green – Renewable Technologies

The design of the building as detailed above place emphasis on passive energy saving by careful design of the building and the building services.

The thermal modelling undertaken based on the TACE M&E design strategy demonstrates that the passive design measures in conjunction with solar photovoltaics will meet the CO₂ requirement for Building Regulation Part L2A 2021 compliance.

PV data used for the Part L2A analysis is as followed.

- Total PV Area = 60m²
- PV Efficiency = 20%
- PV Inclination = 15°
- PV Orientation = South Facing

With the inclusion of 60m² of PV area for the science block, EDSL TAS thermal modelling analysis of the building achieve 7.8% improvement over TER.

4.0 Mechanical Services Design Criteria

The modelled mechanical services systems, configurations and efficiencies are all based on the current TACE design. Any deviations need to be carefully considered to ensure the minimum efficiencies are achieved.

It is the responsibility of the contractor as part of his plant selection and installation to implement these measures. Should the contractor deviate from these assumptions he will be responsible for producing a revised Part L calculation and report to demonstrate compliance.

The following table summarises the strategy adopted by TACE to the mechanical services installation:

Type of system	System Performance Data	System Performance Values
Heating System All Zones fitted with EPH	a) Heat Source Generator Type b) Fuel Type c) Generator Seasonal Efficiency d) Heat Recovery Effectiveness e) Delivery Efficiency	Electric Panel Heaters Grid Supplied Electricity 100% N/A N/A
Heating System Zones with VRF	a) Heat Source Generator Type b) Fuel Type c) Generator Seasonal Efficiency d) Heat Recovery Effectiveness e) Delivery Efficiency	VRF Grid Supplied Electricity 750% N/A 100%
Cooling System Comms Room DX Unit	a) Heat Source Generator Type b) Fuel Type c) Generator Seasonal Efficiency d) Heat Recovery Effectiveness e) Delivery Efficiency	ASHP Grid Supplied Electricity 5.59 N/A 100%
DHW	a) Method of DHW generation, i.e. combi boilers, cylinder, etc. b) Size and type of DHW cylinder c) DHW delivery efficiency d) Fuel Type e) Generator Seasonal Efficiency	Instantaneous Direct Electric Hot Water 1800L 95% Grid Supplied Electricity N/A
Mechanical Ventilation HRU	a) Details of all AHUs and which areas served by AHU b) Specific fan power of AHUs (W/l/s) c) Efficiency of heat recovery	AHU 1.4 80%
Mechanical Ventilation Extract Only	a) Details of all AHUs and which areas served by AHU b) Specific fan power of AHUs (W/l/s) c) Efficiency of heat recovery	Extract Fan 0.5 N/A
Control Corrections	a) Are there system provisions for metering? b) Does the system warn of 'out of range' values?	Yes No Following controls are installed on HVAC systems a) Room Temperature Control b)

5.0 Electrical Services Design Criteria

The modelled services systems, configurations and efficiencies are all based on the current TACE design. Any deviations need to be carefully considered to ensure the minimum efficiencies are achieved.

It is the responsibility of the contractor as part of his plant selection and installation to implement these measures. Should the contractor deviate from these assumptions he will be responsible for producing a revised Part L calculation and report to demonstrate compliance.

In the absence of the lighting calculation standard luminaire efficacy of 105 lm/W has been applied to all spaces excluding the science classrooms and circulation zones throughout. 140lm/W has been applied to science classrooms and 123 lm/W has been applied to circulation spaces.

The following table summarises the assumptions made to the electrical services installation:

Spaces	Power correction factor	Lighting level (Lux)	Day light dimming	Local manual switching
Circulation	0.95	100	No	Presence Detection
Stairs	0.95	150	No	Presence Detection
Plantroom	0.95	200	No	Manual
Toilets	0.95	200	No	Presence Detection
Science Labs	0.95	500	Yes	Absence Detection
Demo Labs	0.95	500	Yes	Absence Detection
Staff Room	0.95	300	No	Absence Detection
Stores	0.95	100	No	Presence Detection
Prep Rooms	0.95	500	No	Absence Detection

6.0 Conclusion

From this report, with the design parameters used within Part L2A compliance analysis, calculation performed exceeds the requirements set out in Building Regulation Part L 2021.

From the results in Appendix I it can be noted that with the passive measures, high efficiency mechanical and electrical systems in conjunction with photovoltaic cells as renewable energy source, the science block at Xaverian College school complies with Building Regulation Part L2A analysis.

Several passive design strategies have been incorporated into the building for it to achieve the requirements listed above:

- Low G-value glazing limits solar gains whilst still achieving daylighting figures.
- Openable windows to draw air through the building.

It should be noted that the calculation and subsequent results outlined within this report have been produced from TACE stage 3 information.

Appendix I – BRUKL Report

BRUKL Output Document

Compliance with England Building Regulations Part L 2021



Project name

Xaverian College

As designed

Date: Thu Aug 31 17:04:39 2023

Administrative information

Building Details

Address:

Certifier details

Name:

Telephone number:

Address: , ,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.5"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.5

BRUKL compliance module version: v6.1.e.0

Foundation area [m²]: 414.79The 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	2.79
Building CO ₂ emission rate (BER), kgCO ₂ /m ² :annum	2.57
Target primary energy rate (TPER), kWh _{ep} /m ² :annum	29.72
Building primary energy rate (BPER), kWh _{ep} /m ² :annum	26.94
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	0.11	0.11	External Wall
Floors	0.18	0.1	0.1	Ground Floor
Pitched roofs	0.16	-	-	No pitched roofs in project
Flat roofs	0.18	0.1	0.1	Roof
Windows** and roof windows	1.6	1.55	2.08	D1 UPPER
Rooflights***	2.2	-	-	No rooflights in project
Personnel doors^	1.6	1.57	1.59	D1
Vehicle access & similar large doors	1.3	-	-	No vehicle access or similar large doors in project
High usage entrance doors	3	-	-	No high usage entrance doors in project
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)] * Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. ** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position. ^ For fire doors, limiting U-value is 1.8 W/m ² K NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Appendix II – EPC

