

117-119 Portland Street Manchester

Energy Statement

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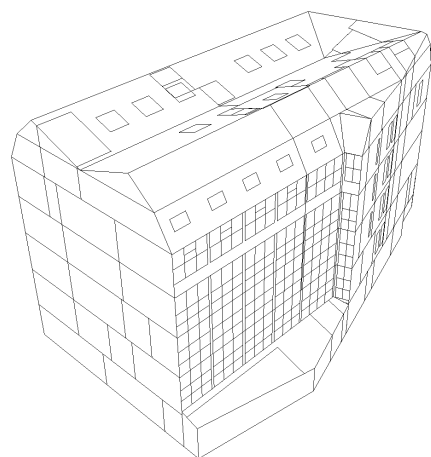
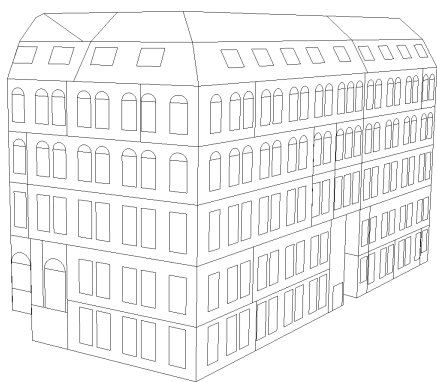
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Summary

Reference	117-119 Portland Street – Energy Statement
Author	Christian Southee (christian.southee@kaizen-ce.com)
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Executive Summary

This statement relates to the proposed redevelopment of 117-119 Portland Street, Manchester.



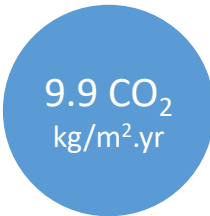
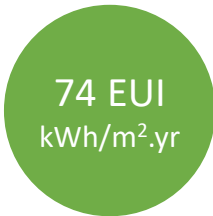
This energy statement has been compiled in support of the development to provide a summary of the proposed improvement measures, the energy strategy and dynamic simulation modelling.

In acknowledgement of the Manchester Core Strategy and Climate Change Framework, the project aims to improve the energy performance and reduce operational CO₂ emissions, whilst carefully respecting the historic and architectural values of the building.

Further to analysis of existing performance, a series of fabric improvement measures are proposed including secondary glazing and consequential air sealing.

The all-electric servicing strategy will avoid Scope 1 emissions, improve local air quality and provide building areas with an efficient source of heating and cooling. Zonal mechanical ventilation will ensure precise fresh air requirements are met in winter whilst retaining all the existing passive benefits or natural cooling in summer.

Detailed dynamic modelling has been undertaken using IES ApacheHVAC software by a CIBSE trained and accredited assessor.



The Building

117 - 119 Portland Street in Manchester - will become a gateway into Manchester's Innovation Corridor.'

The Grade II listed building is understood to date back to 1886 and was a key component of Manchester's significance within the textile industry.

Rich with fine architectural detail and robust construction, the building comprises six storeys from lower ground to fourth floor.



Fig 1. Google street view image of the 117-119 Portland Street

Structurally, the building comprises solid brick masonry walls, timber sash windows and a slate roof on timber trusses. Internal floors are supported by timber joists on cast iron bracketry and an array of columns.

Most building areas are naturally ventilated and heated via the three gas-fired atmospheric boilers located at lower ground level. Various split, multi-split and VRF air conditioning systems have been installed over the last two decades. Mechanical services are largely inefficient and uncoordinated by virtue of their phased installation.

Baseline Performance

Specialist surveys and inspections have been to assess the building fabric, servicing strategy, plant condition and performance of the existing asset.



Fig 2. Single glazing to East elevation



Fig 3. Roof U-value = $0.34\text{W/m}^2\cdot\text{K}$



Fig 4. Existing VRF outdoor units

The existing thermal envelope is largely original and inherently inefficient by current standards. However, heavy-weight construction offers large areas of exposed thermal mass which will help maintain thermal comfort in summertime. Tall windows promote high quality natural light across deep floor plates, offering wellbeing benefits and less demand for artificial lighting.

A whole-building air pressure test was undertaken on 16/01/2024 showing a current permeability of $15.9\text{m}^3/\text{h}\cdot\text{m}^2$ at 50Pa. Measured performance is 35% better than the default for buildings of this age, largely attributable to the robust fabric. Notable areas of leakage were identified and reported by the testers.

High levels of heat loss have been addressed previously through retrofitted roof insulation and areas of secondary glazing. The roof U-value is calculated to be $0.34\text{W/m}^2\cdot\text{K}$, within the recommended limit of Approved Document Part L2. Mindful of the Listed status and architectural value, potential fabric changes are limited.

Mechanical services are beyond or approaching their expected service life. Natural gas boilers are thermally inefficient and result in relatively high CO_2 emissions on site (Scope 1).

Electrical services are relatively uncoordinated. High efficacy lighting and offers limited automatic control.

Policy and Targets



Manchester's Local Development Framework

Core Strategy Development Plan Document

The Manchester City Core Strategy was adopted in July 2012 providing foundation to the development framework until 2027.

Spatial Objective S06. Environment

'Protect and enhance both the natural and built environment of the City and ensure the sustainable use of natural resources, in order to mitigate and adapt to climate change, support biodiversity and wildlife, improve air, water and land quality, recreational opportunities and provide networks of high quality green infrastructure, ensuring that the City is inclusive and attractive to residents, workers, investors and visitors.'

Core development principles states that developments should make a positive contribution to neighborhoods, protecting and enhancing the built and natural environment. Emissions should be minimised and natural resources used efficiently.

Policy EN3: Heritage

'Throughout the City , the Council will encourage development that complements and takes advantage of the distinct historic and heritage features of its districts and neighbourhoods, including those of the City Centre.'

Redevelopment of 117-119 Portland Street will contribute to keeping another heritage building to the fore of Manchester's rich portfolio.

Policy and Targets



Manchester's Local Development Framework

Core Strategy Development Plan Document

Policy EN6: Target Framework for CO₂ reductions from low or zero carbon energy supplies

'Applications for residential development of 10 or more units and all other development over 1,000sqm will be expected as a minimum to meet the target shown in Tables 12.1 or 12.2, unless this can be shown not to be viable. This should be demonstrated through an energy statement, submitted as part of the Design and Access Statement. Such a statement will be expected to set out the projected regulated energy demand and associated CO₂ emissions for all phases of the development. Developments smaller than the above threshold, but involving the erection of a building or substantial improvement to an existing building will also be expected to meet the minimum target, where viable, but will not be expected to submit an energy statement.'

Notwithstanding regulatory Part L requirements, it is understood that the CO₂ reduction targets set out in this policy do not apply to this proposed refurbishment. With that said, the energy strategy has been developed in accordance with the established energy hierarchy. Predicted energy modelling has been undertaken using dynamic ApacheHVAC software by IES, with outcomes reported within this statement.

Policy and Targets



Manchester's Local Development Framework

Core Strategy Development Plan Document

Policy EN8: Adaptation to Climate Change

'All new development will be expected to be adaptable to climate change in terms of the design, layout, siting and function of both buildings and associated external spaces. In achieving developments which are adaptable to climate change developers should have regard to the following, although this is not an exhaustive list:

- Minimisation of flood risk by appropriate siting, drainage, and treatment of surface areas to ensure rainwater permeability.*
- Reduction in urban heat island effect through the use of Green Infrastructure such as green roofs, green walls, increased tree cover and waterways.*
- The need to control overheating of buildings through passive design.*
- The opportunity to provide linked and diverse green space to enhance natural habitats which will assist species adaptation.*

Developers will be permitted to use green infrastructure elements such as green roofs, green walls, street trees and waterways to contribute to compliance with CO₂ mitigation under Policy EN6, subject to sufficient evidence to quantify their contribution to compliance.'

Approved Document Part O: 2021 also highlights the heightened risk of summertime overheating in central Manchester regions due to the dense urban development.

Policy and Targets



**Manchester's Local
Development Framework**

**Core Strategy
Development Plan Document**

Policy EN16: Air Quality

'The Council will seek to improve the air quality within Manchester, and particularly within Air Quality Management Areas, located along Manchester's principal traffic routes and at Manchester Airport. Developers will be expected to take measures to minimise and mitigate the local impact of emissions from traffic generated by the development, as well as emissions created by the use of the development itself, including from Combined Heat and Power and biomass plant.'

When assessing the appropriateness of locations for new development the Council will consider the impacts on air quality, alongside other plan objectives. This includes cumulative impacts, particularly in Air Quality Management Areas.'

Policy and Targets

MANCHESTER CLIMATE CHANGE FRAMEWORK 2020-25

Our strategy towards making Manchester a thriving, zero carbon, climate resilient city

Manchester Climate Change Framework 2020-25

Appendix 2:
Manchester Climate Change Partnership
Members' Action Plans – summary

The MCCF (Manchester Climate Change Framework) was released in February 2020 and includes four key objectives and targets:

1. Staying within carbon budgets.
2. Appropriate adaption to climate change and onward resilience.
3. Promoting good health and wellbeing.
4. Achieving inclusive, zero carbon and climate resilient economy.

The first of six priority areas for action concerns the built environment, both new and existing buildings.

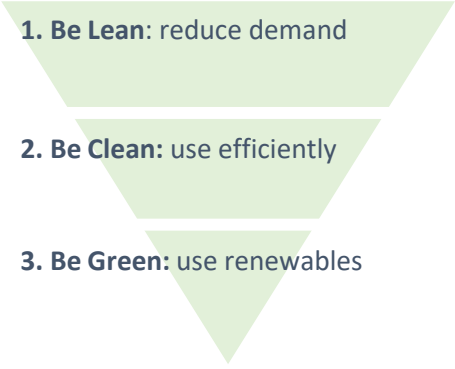
In achieving the said objectives, a process of residential empowerment and the establishment of strategic partnerships has undertaken. The challenge is shared across all stakeholders with respective commitment to do their part.

Appendix 2 of the MCCF provides a summary of the Manchester Climate Change Partnership Member's Actions Plans.

As an active member and significant property operator, Bruntwood have pledged their commitment to the MCCF.

Through a programme of measuring, improving and engagement, Bruntwood aims to reduce energy demand, develop science-based targets for Scope 3 emissions and procure 100% renewable electricity across the entire estate.

Proposed Energy Strategy



1. Be Lean: reduce demand

2. Be Clean: use efficiently

3. Be Green: use renewables

4. Be Seen: Measure and refine

The energy strategy has been developed by Kaizen-CE in accordance with the established hierarchy.

Step 1. Reducing Demand

Intrusive survey and physical testing have been undertaken to determine current thermal envelope performance.

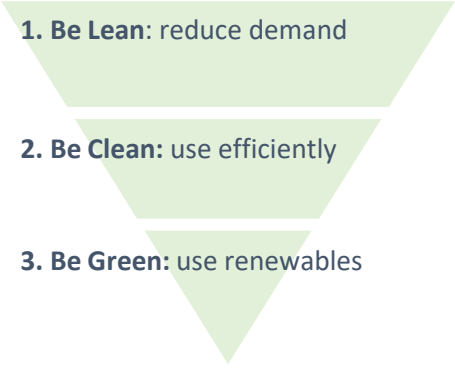
Heating demand will be reduced through the introduction of secondary glazing, lessening both conductive and convective losses. New fabric elements associated with the central fire escape route will achieve the requirements of Approved Document Part L2: 2021.

Mechanical ventilation units will ensure that the precise fresh air requirements are met in the wintertime with most of useful heat 'recovered' from the exhaust air stream. Natural ventilation openings will be retained for summertime purge ventilation to reduce the need for mechanical cooling and other associated services.

Step 2. Efficient use of Energy

Heating and cooling will be provided by VRF (Variable Refrigerant Flow) technology. These systems typically operate in the order of 4-5x the efficiency of gas-fired boilers, with the capability of transferring thermal energy around a building. This transfer of energy is particularly effective during the mid-seasons in buildings with east /west façade orientations.

Proposed Energy Strategy



1. Be Lean: reduce demand

2. Be Clean: use efficiently

3. Be Green: use renewables

4. Be Seen: Measure and refine

In addition to heat recovery sections, mechanical ventilation units include low energy 'EC' motors and variable speed control. Links to CO₂ sensors enables air supply to be varied to meet specific demands.

High-efficacy LED light fittings coupled with automatic controls will significantly reduce energy demand whilst increasing operating life.

Unregulated energy will be reduced through good practice and encouraging building users to embed within their own ESG related policies.

Step 3. Use Renewable Technology

Front of house areas will be served by VRF systems; a form of heat pump technology which extracts heat from ambient air.

Owing to the Grade II Listed status and the anticipated roof fragility, solar collection technologies are not considered viable currently. However, Bruntwood aim to procure all electricity from 100% renewable providers

Step 4. Be Seen

Through development of the servicing strategy, energy consumption will be predicted through dynamic modelling. Results will provide an initial benchmark to measure against.

Energy Modelling

Modelling has been undertaken by a CIBSE accredited assessor using IES ApacheHVAC dynamic software.

A model has been constructed from the current architectural drawings, including the immediate surroundings which cast shade.

Building fabric performance is taken from measurements where available, and targets where changes are proposed e.g. glazing.

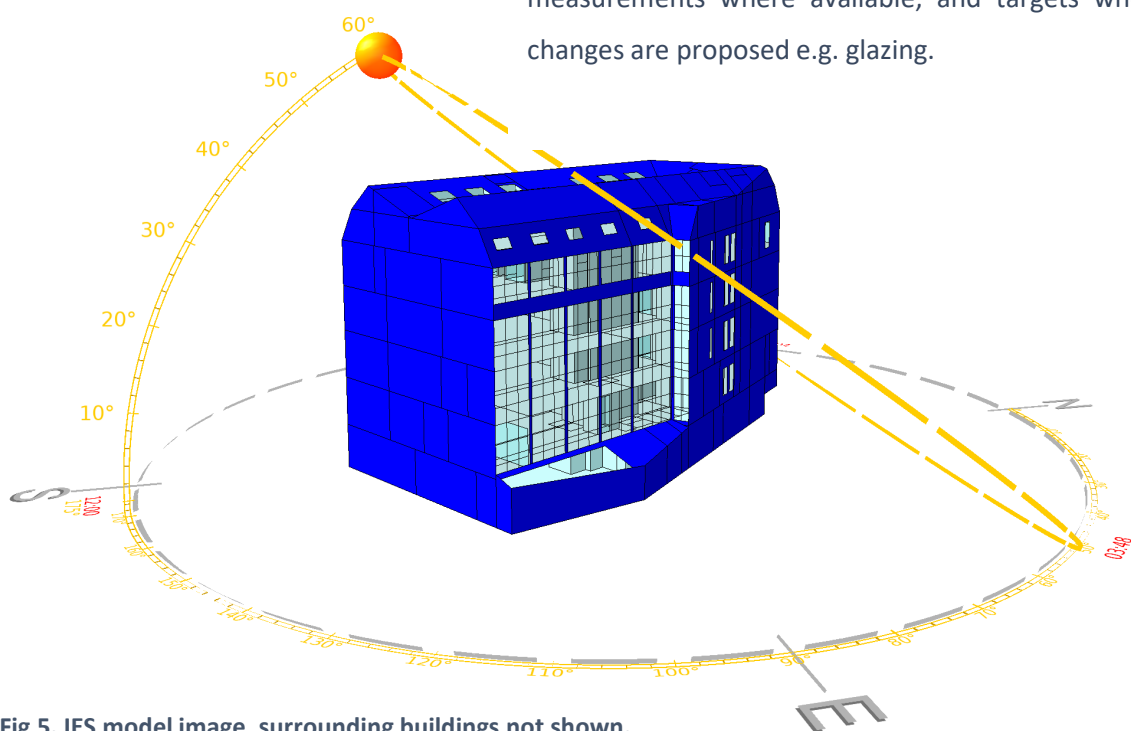


Fig 5. IES model image, surrounding buildings not shown.

Element	U-value (W/m ² .K)	
Ground floor	0.37	Estimated from construction and dimensions.
Existing wall	1.43	
New wall	0.26	Part L2: 2021 compliant
Roof	0.34	Calculated from the intrusive survey results
Window + secondary	1.50 (front elevation) 1.80 (rear elevation)	Secondary Glazing System
New window	1.40	Approved, double-glazed units
Rooflight	2.62	Estimated by the initial energy consultant

Table 1. Thermal envelope performance

Energy Modelling

Building operation and loads are based upon anticipation and guidance by LETI (London Energy Transformation Initiative).

Operational energy

Implement the following indicative design measures:

Fabric U-values (W/m².K)

Walls	0.12 - 0.15
Floor	0.10 - 0.12
Roof	0.10 - 0.12
Windows	1.0 (triple glazing) - 1.2 (double glazing)
Doors	1.2

Fabric efficiency measures

Air tightness	<1 (m ³ /h. m ² @50Pa)
Thermal bridging	0.04 (y-value)
G-value of glass	0.4 - 0.3

Power efficiency measures

Lighting power density	4.5 (W/m ² peak NIA)
Lighting out of hours	0.5 (W/m ² peak NIA)
Tenant power density	8 (W/m ² peak NIA)
ICT loads	0.5 (W/m ² peak NIA)
Small power out of hours	2 (W/m ² peak NIA)

System efficiency measures

MVHR	90% (efficiency)
Heat pump SCoP	≥ 2.8
Chiller SEER	≥ 5.5
Central AHU SFP	1.5 - 1.2 W/l.s
A/C set points	20-26°C

Fig 6. LETI Climate Emergency Design Guide for Offices

The building is taken to be occupied during typical weekday hours, with systems set back overnight, weekends and bank holidays. Daily occupancy follows a 'flexi-working' profile with a graduated start, middle and end of the day. A level of diversity is assumed to meeting rooms and breakout spaces.

Internal lighting consumption is taken to be 5W/m² with a 10% out-of-hours residual.

Small power/miscellaneous energy consumption is taken to be 8W/m² with a 25% out-of-hours residual.

Front of house areas are heated to 21°C, cooled to 24°C. Back of house, unoccupied areas are heated to 20°C.

Mechanical ventilation provides up to 12l/s/p, with a conservative HR (Heat Recovery) effectiveness of 65% and SFP (Specific Fan Power) of 2.0W/l/s.

Domestic hot water demand is taken to be 10l/p/day over a typical 8hour period, delivered by electric point of use units

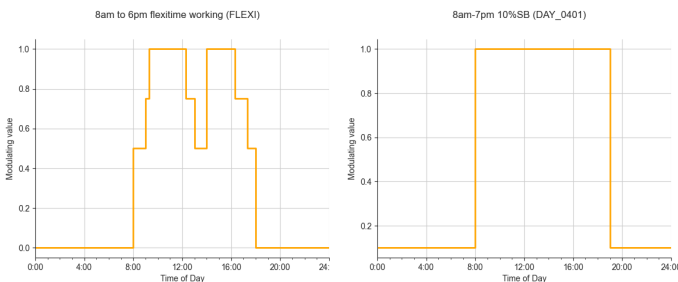


Fig 7. Weekday profile for occupancy and lighting

Energy Modelling

ApacheHVAC has been used to model areas served by mechanical ventilation and VRF.

Unlike more simplified alternatives, ApacheHVAC can account for part-load performance profiles of heat generators, chillers, pumps and fans.

Plant has been dynamically sized within the model by simulating the anticipated building use against the CIBSE Test Reference Year weather data for Manchester.

Manufacturers data has been used to represent the part load profile of each VRF outdoor unit.

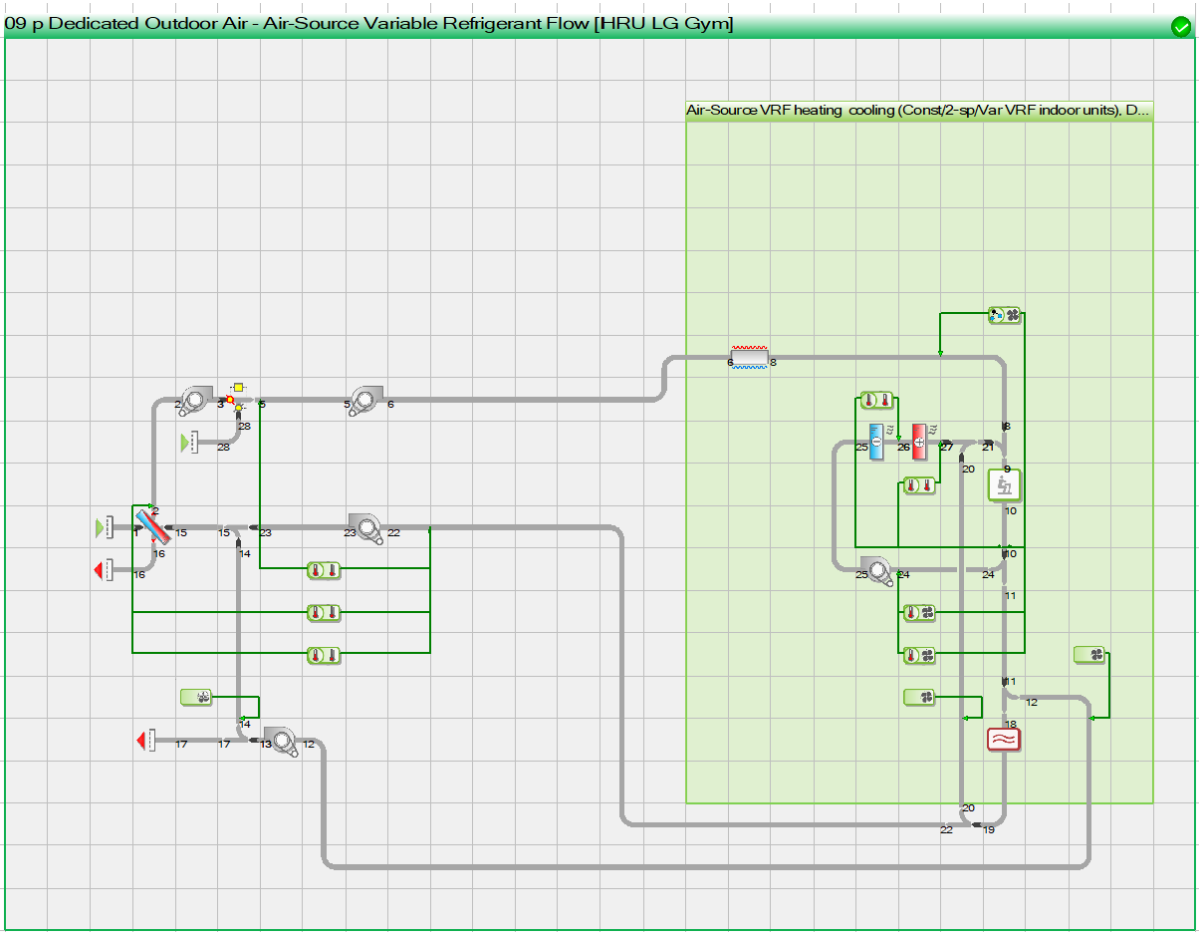


Fig 8. ApacheHVAC canvass representing an air handling unit and 'multiplexed' indoor fancoil units

Modelling Results

Results of the annual simulation
for the proposed building are
illustrated below.

Regulated energy = 74kWh/m².year

Regulated CO₂ = 9.9kg.CO₂/m².year



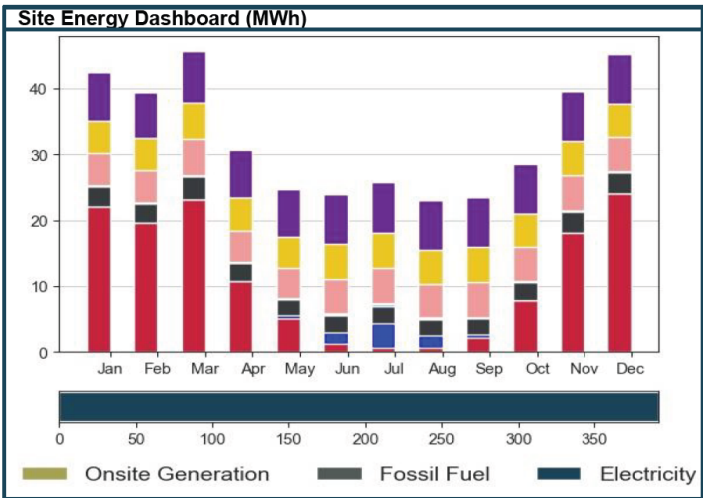
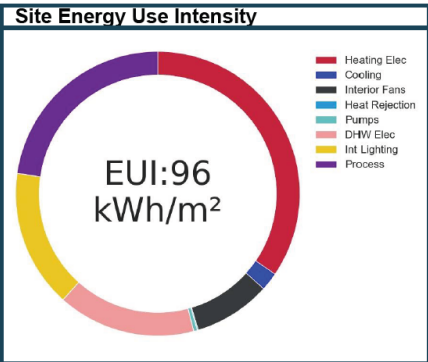
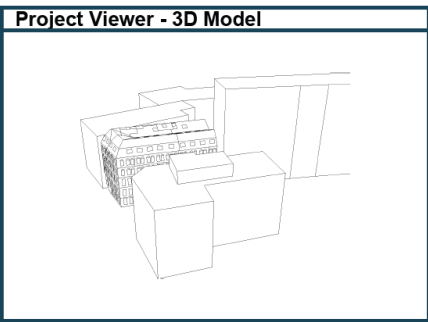
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Energy Model Output Report

Project:	117-119 Portland Street
Address:	Manchester
Climate File:	Manchester_TRY.epw
Simulation:	Portland ApacheHVAC_no DOAS coils_VRF not AS.aps

Design Team:	
Energy Analyst:	Kaizen-CE
Owner:	Bruntwood
Conditioned Area (m ²):	4047.5

Annual Energy Consumption (kWh/m ² /year) & CO ₂ kgCO ₂ /m ² /yr			
Energy End Use	Site Energy	Source Energy	CO ₂ Emissions
Heating Fossil Fuel	0.0	0.0	0.0
Heating Electricity	33.5	52.5	5.1
Space Cooling	2.0	2.9	0.2
Fans Interior	8.5	12.8	1.2
Heat Rejection	0.1	0.2	0.0
Pumps	0.4	0.6	0.1
DHW Fossil Fuel	0.0	0.0	0.0
DHW Electricity	15.2	22.9	2.1
Interior Lighting	15.2	23.1	2.1
Exterior Lighting	0.0	0.0	0.0
Receptacle	0.0	0.0	0.0
Data Center	0.0	0.0	0.0
Cooking Fossil Fuel	0.0	0.0	0.0
Cooking Electricity	0.0	0.0	0.0
Elevators & Escalators	0.0	0.0	0.0
Refrigeration	0.0	0.0	0.0
Process	22.0	33.3	3.1
TOTAL (ex renewables)	96	148	13



Annual Fuel Costs and Peak Demands				
Fuels	Cost (£)	Peak Day	Peak Time	Peak Demand
Electricity	36,181.00	13-Dec	9:00	236.0 kW
Fossil Fuel	0.00	01-Jan	0:00	0.0 kW
Total	36,181.00	01-Jan	0:00	

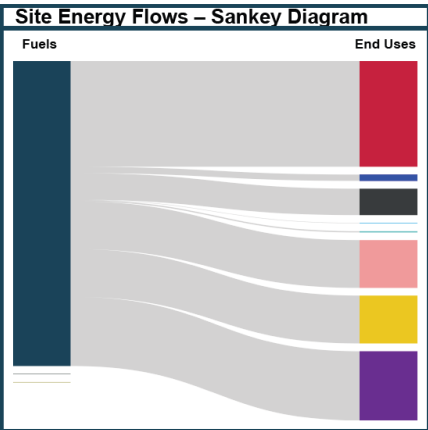


Fig 9. Predicted energy consumption and CO₂ emissions

Modelling Results

The thermally upgraded building
has been simulated with the
current servicing strategy applied.

Regulated energy = 147kWh/m².year (+100%)

Regulated CO₂ = 27.9kg.CO₂/m².year (+180%)



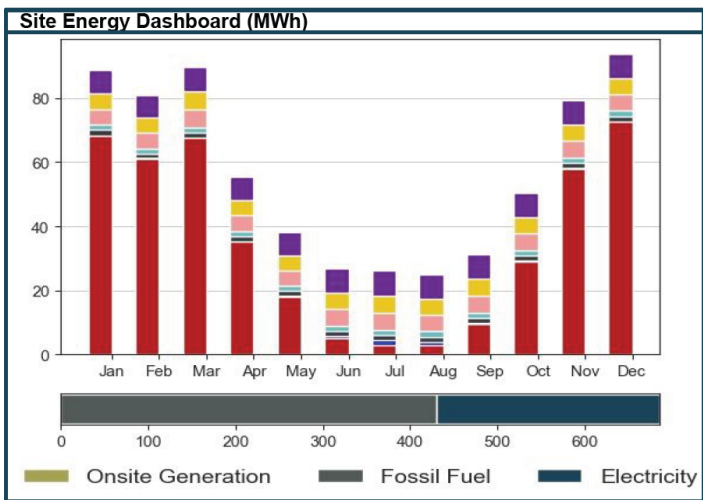
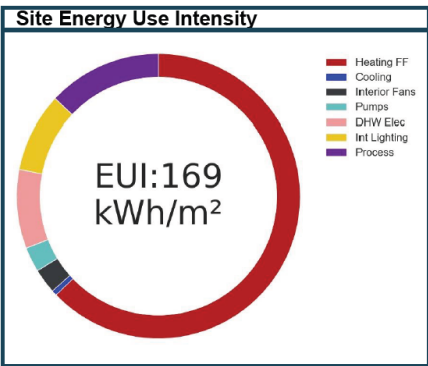
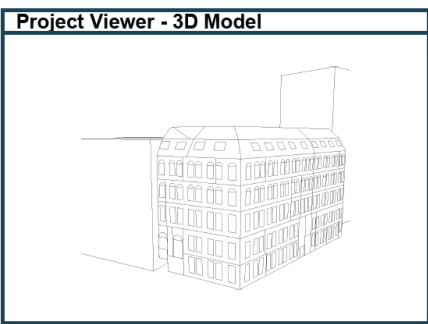
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Energy Model Output Report

Project:	117-119 Portland Street (Baseline)
Address:	Manchester
Climate File:	Manchester_TRY.epw
Simulation:	Portland ApacheSIM_Baseline.aps

Design Team:	
Energy Analyst:	Kaizen-CE
Owner:	Bruntwood
Conditioned Area (m ²):	4047.5

Annual Energy Consumption (kWh/m ² /year) & CO ₂ kgCO ₂ /m ² /yr			
Energy End Use	Site Energy	Source Energy	CO ₂ Emissions
Heating Fossil Fuel	106.5	119.9	22.4
Heating Electricity	0.0	0.0	0.0
Space Cooling	1.0	1.5	0.1
Fans Interior	4.8	7.2	0.7
Heat Rejection	0.0	0.0	0.0
Pumps	4.8	7.2	0.7
DHW Fossil Fuel	0.0	0.0	0.0
DHW Electricity	15.2	22.9	2.1
Interior Lighting	15.2	23.1	2.1
Exterior Lighting	0.0	0.0	0.0
Receptacle	0.0	0.0	0.0
Data Center	0.0	0.0	0.0
Cooking Fossil Fuel	0.0	0.0	0.0
Cooking Electricity	0.0	0.0	0.0
Elevators & Escalators	0.0	0.0	0.0
Refrigeration	0.0	0.0	0.0
Process	22.0	33.3	3.1
TOTAL (ex renewables)	169	215	31



Annual Fuel Costs and Peak Demands				
Fuels	Cost (£)	Peak Day	Peak Time	Peak Demand
Electricity	23,180.00	20-Jul	15:00	108.6 kW
Fossil Fuel	12,615.00	11-Jan	7:00	474.0 kW
Total	35,795.00	11-Jan	9:00	

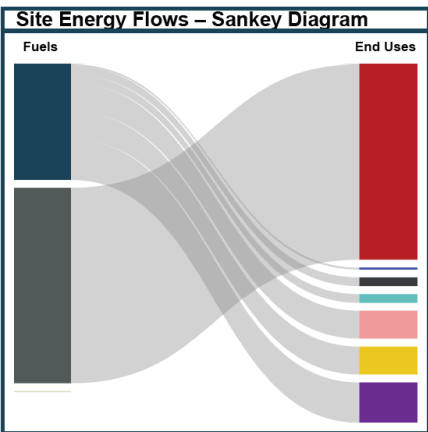


Fig 10. Predicted energy consumption and CO₂ emissions (comparative gas-fired strategy)

Summary

This report sets out the approach to energy strategy and predicted energy consumption for the proposed redevelopment.

Energy Hierarchy

Proposals aim first to reduce demand through limiting heat loss in winter and capture the passive benefits of natural ventilation and thermal mass in the summertime. Energy efficient plant, LED lighting and effective control will minimise consumption. Sub-metering and monitoring will enable control and operation to be optimised.

Predicted Regulated Energy

Results of the dynamic simulation show the predicted energy by end use in Figure 9. Regulated use intensity is **74kWh/m².year** against a total conditioned floor area of 4047m².

Policy Adherence, EN6: *CO₂ reductions*

Although 'new-build' targets do not apply directly to this refurbishment, the energy strategy aims to reduce regulated demand and CO₂ emissions. The all-electric solution will benefit from ongoing decarbonisation of the national grid and avoid Scope 1 emissions, also addressing the objectives of **Policy EN16: Air Quality**.

Dynamic simulation has been carried out as reported to derived the predicted regulated energy consumption and CO₂ emissions.

Summary

This report sets out the approach to energy strategy and predicted consumption for the proposed redevelopment.

Policy Adherence, EN8: *Adaptation to Climate Change*

Exposed thermal mass, deep window reveals, natural ventilation and an encouragement to reduce internal lighting and equipment gains will each help to mitigate the risk of thermal discomfort during increasingly warm summers. The provision of VRF systems will provide comfort cooling in extreme periods.

Conversely, insulated secondary glazing, reduced air infiltration and mechanical ventilation will each help to maintain thermal comfort in winter.

KAIZEN

Consulting Engineers



Low
Carbon Energy
Assessor



Low
Carbon
Consultant

