
ALUMNO DEVELOPMENTS

Supplementary Energy & Sustainability Assessment

Proposed Student Accommodation, Higher Cambridge Street, Manchester

29 January 2021

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1. Executive Summary

This Supplementary Environmental Standards Statement has been prepared by Watt Energy on behalf of Alumno Developments to support a planning application for the development at Higher Cambridge Street, Manchester.

This document responds to the National Policy Framework (NPPF) and Manchester City Council's (MCC) Core Strategy Development Plan (2012) and specifically deals with the following policies and guidance.

- **Core Strategy Policy EN 4 - Reducing CO₂ Emissions by Enabling Low and Zero Carbon Development**
- **Core Strategy Policy EN 6 - Target Framework for CO₂ Reductions from Low or Zero Carbon Energy Supplies**
- **Core Strategy Policy EN 8 – Adaptation to Climate Change**

The report details how the development will incorporate Sustainable Design and resource efficiency measures in accordance with the Energy Hierarchy in order to meet the policy requirements and reduce its overall environmental impact.

In order to demonstrate a reduction in carbon emissions, resource efficiency measures, improvements to building fabric and high efficiency building services plant have been considered and implemented.

In addition, a LZC feasibility assessment has been made, with a solar photovoltaic array of **10kW** peak output as the recommended technology.

The proposed building has been modelled using dynamic thermal modelling (DSM) to predict Energy Usage and CO₂ reductions against building regulations approved document Part L 2010 and 2013.

To comply with the MCC Planning policy the development is required to achieve 15% better than Part L2010 which equates to 9% better than Part L 2013.

As a result of the above modelling the predicted site wide reduction in regulated CO₂ over Part L 2010 of the Building Regulations is **15.0%**. This corresponds to a **12.0%** reduction based on Building regulations Part L 2013 therefore demonstrating compliance with the MCC's Policy EN 6.



2. Planning Statement

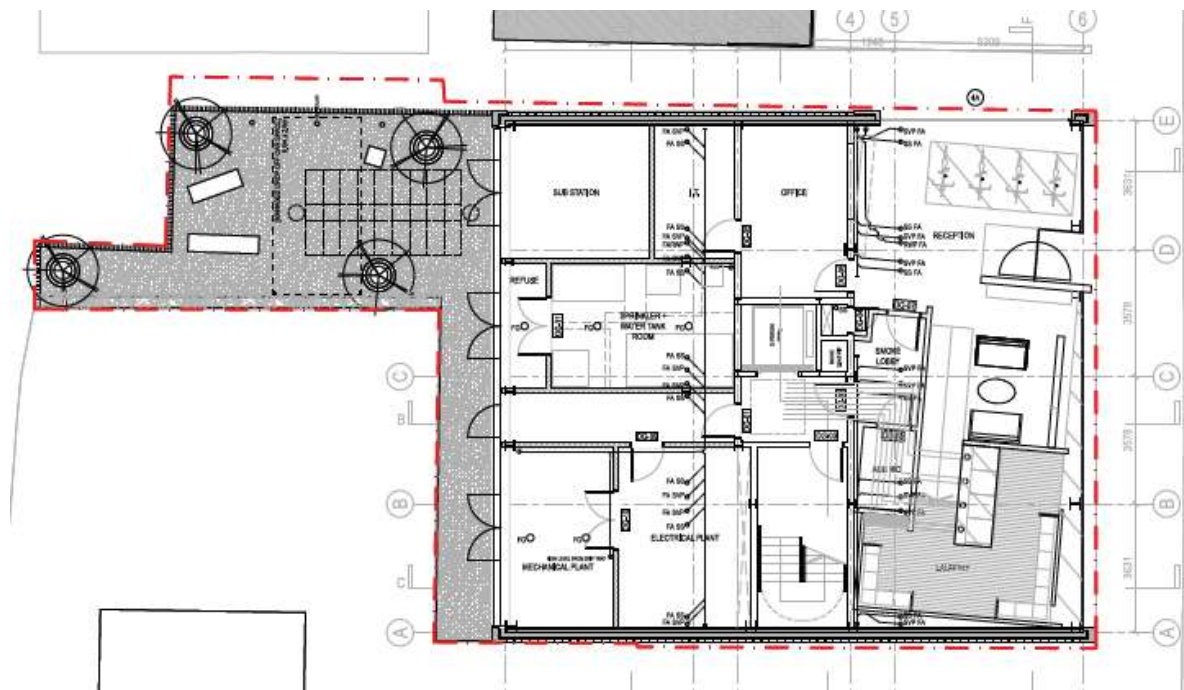
The following report relates to the proposed new student accommodation, Church Inn, Manchester.

2.1 The Development

The development is located on the former site of the “Church Inn” public house. It is bounded by Cambridge Street to the north-east, and the existing Cambridge House and Manchester House apartment buildings to the north-west and south-east. South west of the site are a number of existing terraced houses. All existing buildings on the site will be demolished as part of the proposed works.

The development consists of student accommodation over nine stories, comprising 62no. units, communal amenity space, laundry, reception, plant space and circulation. Each “unit” comprises a studio and WC.

An image of the ground floor of the proposed development can be seen below.



Proposed Ground Floor Plan (not to scale)

2.2 Relevant Policies

This report is a resultant production in response to the National Policy Framework (NPPF) and Manchester City Council's (MCC) Core Strategy Development Plan (2012). Manchester's Core Strategy (CS) was adopted on 11th July 2012 and is the key Development Plan Document (DPD) guiding the measures assessed in this report.

CS Policy EN 4 – Reducing CO₂ Emissions: This policy targets the reducing of CO₂ emissions through the following of the energy hierarchy; firstly reducing the need for energy through efficient design measures, followed by clean energy and lastly, the application of renewable or LZC technologies. In addition to this point, MCC state within this policy all new development is required to use building materials that have low embodied carbon.

CS Policy EN 5 – strategic areas for low and zero carbon decentralized energy infrastructure. This policy highlights that developments in core strategy areas should give detailed consideration to the role of low and zero carbon (LZC) infrastructure and decentralized energy networks, where feasible.

CS Policy EN 6 - Target Framework for CO₂ Reductions from Low or Zero Carbon Energy Supplies: This Policy requires electricity intense residential development of 10 or more units to meet, as a minimum, a 15% reduction in non-domestic CO₂ emissions over Part L of the 2010 Building Regulations, unless proven to be unviable. As Part L 2013 of the Building Regulations represents a 6% improvement on 2010 levels, this target is subsequently equivalent to a 9% improvement in CO₂ emissions over Part L 2013.

CS Policy EN 8 – Adaptation to Climate Change: Expects all new development to be adaptable to climate change in terms of its design, layout, siting, and function of both building associated external spaces.



2.3 Sustainable Design Strategy

2.3.1 Energy and Carbon Emissions

Energy Hierarchy

To achieve accurate estimates for the relevant building type, the proposed development has been modelled using IES to create an SBEM (simplified building energy model), which is a government approved methodology for modelling commercial/ non-domestic buildings. An image of the model in the IES Virtual Environment (VE) software can be seen below:

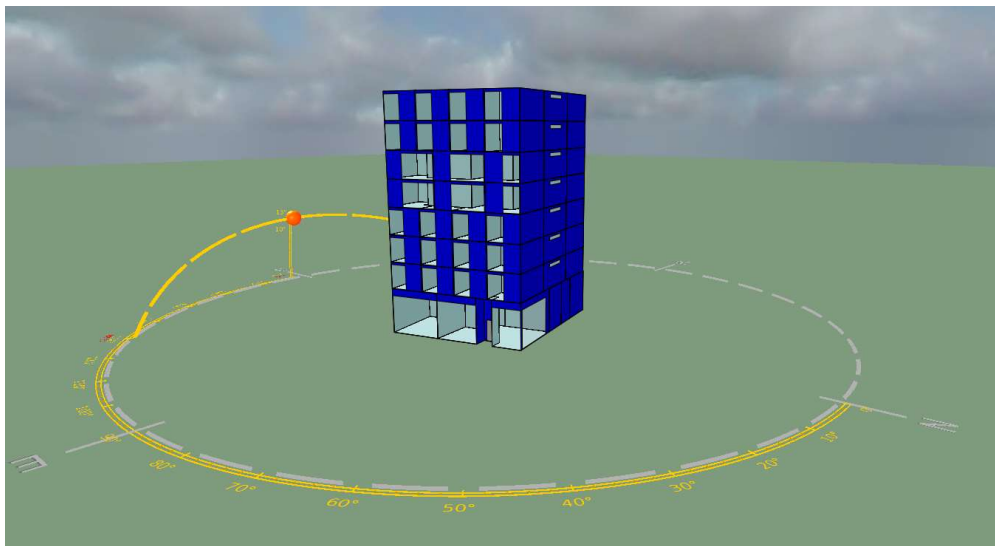


Image taken from the IES VE software.

A Part L compliant baseline has been established, and then further improvements have been made to the building fabric and specification in alignment with good practice benchmark figures, prior to the addition of LZC technologies. This is in accordance with the Energy Hierarchy, as detailed in the figure below:



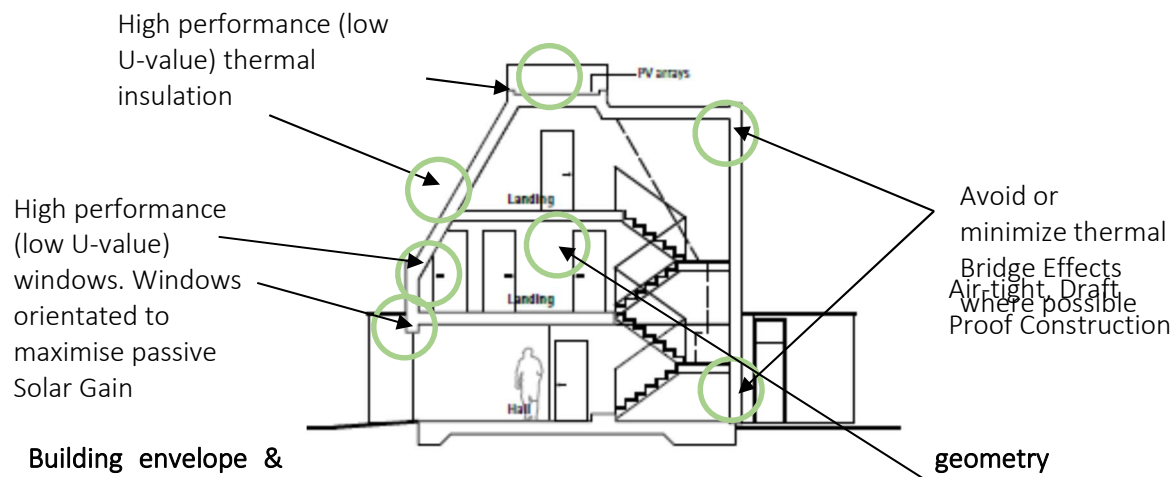
Graphical representation of the energy hierarchy.

In accordance with the above methodology, the design will utilise high efficiency M&E services with the aim to achieve targets that are above and beyond Building Regulations Compliance. Where possible, improvements have been made to the building fabric to reduce U-values, at the minimum to comply with the threshold figures in Building regulations ADL 2013, or better.

Further efficiency measures to building services will be incorporated to reduce the energy demand further and associated carbon emissions. This approach demonstrates a holistic low energy design concept, involving very low limiting values and thus leads to high energy performance targets.

2.3.2 Energy Efficiency Measures

In line with the above Sustainable Design Strategy, a summary of the proposed Energy Efficient design measures is provided below.



Specifying a well-insulated and air-tight building fabric will help to reduce the carbon emissions of the development from space heating. The U-values of the thermal elements are listed in the table below:

Thermal Element	Building Regulations L2A	Proposed U-value.
	U-value (W/m ² .K)	U-value (W/m ² .K)
Ground Floor	0.25	0.15
External Walls	0.35	0.18
Roof	0.25	0.15
Windows	2.2	1.4

A low air permeability of 3m³/m².hr @ 50 Pa is targeted. This is significantly better than the Building Regulations maximum allowable figure of 10m³/m².hr @ 50 Pa. In addition, minimising thermal bridges will help prevent leakage of heat at junctions, further reducing carbon emissions.

Furthermore, passive solar control via low G-value glazing will be adopted to minimise radiant solar gains and mitigate summertime overheating. The windows in the break-out communal space will be oriented North to minimise solar gains. The proposed G-value of the glazing is **40%**, with **60%** visible light transmission.

Lighting

Low energy lighting fittings will be provided along with daylighting dimming in specific areas and absence/presence detection to switch off lights when not in use. The design has been considered to maximise available daylight within bedrooms to reduce reliance on artificial lighting.

Heating, Ventilation & Air Conditioning (HVAC)

The proposed heating system for the development is electric panel heaters, with natural ventilation via openable windows for purge and to mitigate summertime overheating. Extract ventilation shall be provided to studios kitchens and WCs.

A mechanical ventilation with heat recovery (MVHR) system will be required for the communal breakout space on each level, to provide tempered fresh air to occupants in the absence of openable windows in these areas.

An MVHR system will also be provided to the ground floor office, reception & laundry. Extract ventilation will be provided to the water tank room and cleaner's cupboard at each level.

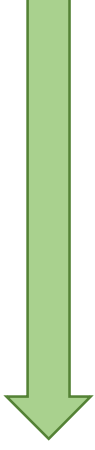
Hot Water

The proposal is for an air source heat pump hot water system, with external units located on the roof and internal hot water storage cylinders located in the mechanical plant room. Hot water will be circulated from this central system to the hot water outlets throughout the building.



Cooling Hierarchy and Overheating

In addition to following the energy hierarchy, the development has been designed in accordance with the cooling hierarchy in order to reduce the potential for overheating and sole reliance on air-conditioning systems. Therefore, the development abides by the following principles in order to reduce the overheating potential and also the need for any air conditioning systems.

London Plan Cooling Hierarchy	Proposed Design Measures	Priority
Minimise internal heat generation through energy efficient design	Limiting heat losses through good design and thermally efficient build-ups.	Highest 
Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls	Use of thermally efficient windows with low-g values to minimise heat losses but also control amount of heat entering building.	
Manage the heat within the building through exposed internal thermal mass and high ceilings	The development is expected to have a medium thermal mass to reduce risk of overheating.	
Passive ventilation	Internal doors left open to maximise cross ventilation and reduce risk of overheating.	
Mechanical ventilation	Promote natural ventilation. Where mechanical ventilation is unavoidable, utilise free cooling and recover heat via heat exchange devices.	Lowest
Active cooling systems (ensuring they are the lowest carbon options)	As above.	

By following the energy hierarchy the proposed development has automatically followed the cooling hierarchy as design measures have been prioritised, thereby also reducing the potential overheating of the development by minimising solar heat gains with low G-value windows.

Clean Energy Supply

In addition to efficient design measures, systems providing a 'clean energy supply' were also assessed in order to potentially achieve greater carbon savings.

District Heat networks

The feasibility of connecting to a new or existing heat network to serve the development was investigated.

Although there are a number of new or proposed heat networks in the Manchester area, including the Manchester Oxford Road Corridor, Manchester Civic Quarter Phase two and Media City UK. However, connecting to these is not considered feasible either due to the distance from the site or the capacity limits of the proposed networks.

2.3.3 Adaptation to Climate Change

As well as the primary building design and fabric, many other issues will influence creating a Sustainable Development, including flood prevention, material use, waste minimisation and transport. Sustainability should be shown early consideration and then continually promoted throughout construction. Additional internal features which enable more efficient usage should also be specified to encourage the building users to maintain efficient use throughout occupation.



2.4 Energy & CO2 Reduction Summary

A summary of all stages of the energy demand assessment from baseline figures to final carbon reduction are shown in Figures 1 & 2 below:

Fig 1. Summary of CO₂ Reductions

CO ₂ emissions after each stage of the energy hierarchy	Total Regulated CO ₂ emissions (kgCO ₂ /m ² year) – Approved Document Part L (2010)	% Saving	Total Regulated CO ₂ emissions (kgCO ₂ /m ² year) – Approved Document Part L (2013)	% Saving
Target emission rate (TER)	39.5	-	39	-
Building emission rate (BER) (Be Lean & Be Clean)	35.9	9%	36.5	6%
Improved emissions (after incorporation of renewable energy technology) % CO ₂ displaced in total (Be Green)	33.5	15%	34.3	12%



3. Feasibility assessment of renewable energy technologies

All reasonable technologies were investigated for their suitability for the site. In addition to energy efficiency measures, it is proposed that the development will feature a Photovoltaic array to offset carbon emissions and reach the required carbon reduction target, with further details provided in the section below.

Solar Hot Water (Thermal)

Solar water heating systems are one of the more familiar renewable technologies used at present. They use the energy from the sun to heat water, most commonly for hot water needs. Solar heating systems use a heat collector that is usually mounted on a roof in which the sun heats a fluid. This fluid is used to heat water that is stored in either a separate hot water cylinder or in a twin-coil hot water cylinder (the second coil is used to provide additional heating from a boiler or other heat source).

The proposed development is served by a high efficiency air source heat pump. Incorporating a solar thermal array will not provide a significant additional CO₂ reduction, so is not considered the most appropriate technology for the site.

Renewable Technology Not Chosen.

Wind

Wind turbines convert the kinetic energy in wind into mechanical energy and then again into electricity. Turbines are available in a range of sizes and designs and can be freestanding, mounted on a building or integrated into a building structure.

The wind speed in the area is under the advised minimum and the small size of the site in addition to the large initial costs means that a wind turbine would not be feasible.

Renewable Technology Not Viable.



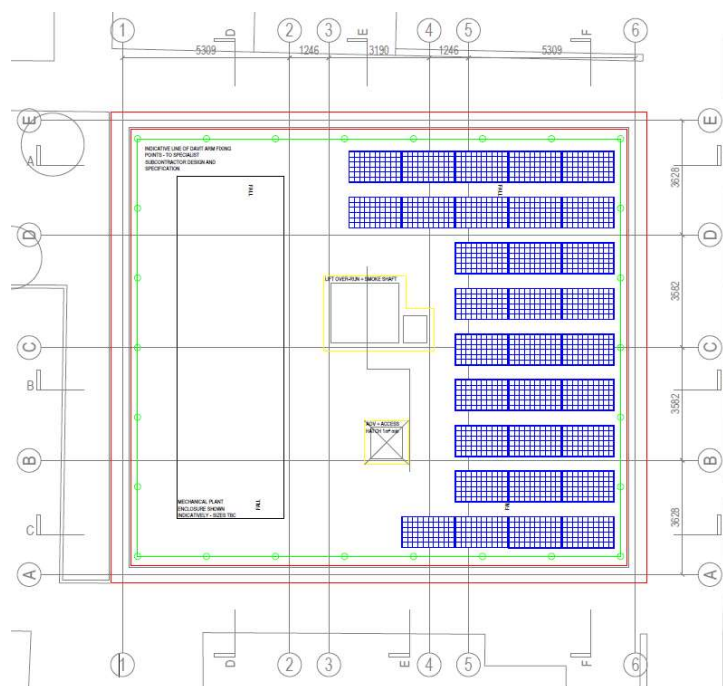
Photovoltaic Panels (PV)

Photovoltaic modules convert sunlight directly to DC electricity. The solar cells consist of a thin piece of semiconductor material, in most cases of silicon. Through a process called doping, very small amounts of impurities are added to the semiconductor, which creates two different layers called n-type and p-type layers.

Certain wavelengths of light are able to ionize the silicon atoms, which separates some of the positive charges (holes) from the negative charges (electrons). The holes move into the positive or p-layer and the electrons into the negative or n-layer. These opposite charges are attracted to each other, but most of them can only re-combine by the electrons passing through an external circuit, due to an internal potential energy barrier. This flow of electrons produces a DC current.

A PV array could be mounted on the roof space, oriented south. Planning implications for the array are unlikely due to the low visual impact and no noise generated by the array.

The proposed array would have a peak output of **10kW**, equivalent to 30no. 340W panels. An image of the proposed array can be seen below:



Proposed roof plan showing PV array.

Renewable Technology Chosen.



Biomass Heating

Biomass is any plant-derived organic material that renews itself over a short period.

Biomass energy systems are based on either the direct or indirect combustion of fuels derived from those plant sources. The most common form of biomass is the direct combustion of wood in treated or untreated forms. The use of biomass is becoming increasingly common in some European countries (some countries such as Austria are heavily dependent on biomass).

The environmental benefits relate to the significantly lower amounts of energy used in biomass production and processing compared to the energy released when they are burnt. This can range from a four-fold return for biodiesel to an approximate 20-fold energy return for woody biomass. Biomass-fuels can be used to produce energy on a continuous basis (unlike renewables such as wind or solar energy) and it can be an economic alternative to fossil fuels as it is a potential source of both heat and electricity.

However, Biomass systems have particular design management and maintenance requirements associated with sourcing, transportation and storage and are therefore more commonly used in commercial developments rather than domestic installations. It can be less convenient to operate than mains-supplied fuels such as natural gas and are more management intensive and require expertise in facilities management. Sources of biomass can also fluctuate, so boilers should be specified to operate on a variety of fuels without risk of overheating or tripping out.

A communal biomass system would not be feasible for this development due to use, space and maintenance issues. The system would be extremely large and there is very little space around the properties to locate the boilers, hoppers and fuel stores that is suitable for deliveries, but also appropriate for feeding the boiler.

Renewable Technology Not Viable.



Ground Source Heat pumps

A heat pump is a device that takes up heat at a certain temperature and releases it at a higher temperature. The essential components of a heat pump are heat exchangers (through which energy is extracted and emitted) and a means of pumping heat between the exchangers. The effectiveness of the heat pump is measured by the ratio of the heating capacity to the effective power input, usually known as the coefficient of performance (COP). Ground-source heat pumps (GSHP) extract heat from the ground. They are classified as either water-to-air or water-to-water units depending on whether the heat distribution system in the building uses air or water. Ground source heat pumps either use long shallow trenches or deep vertical boreholes to take low grade heat from the ground and then compress it to create higher temperatures.

Ground source heat pumps would not be suitable due to the lack of land space around the properties and the associated costs.

Renewable Technology Not Viable.

Air Source Heat pumps

Air source heat pumps absorb heat from the outside air. This is usually used to heat radiators, underfloor heating systems, or warm air convectors and hot water in your home. An air source heat pump extracts heat from the outside air in the same way that a fridge extracts heat from its inside.

The system performs down to air temperatures of -20°C which means that they are more than suitable for installations within the UK. Hot water and Heating can be provided 365 days a year. The hot water is produced without the aid of electrical immersions and at 55°C is more than hot enough for baths and showers.

There are two main types of air source heat pump system:

- An air-to-water system distributes heat via your wet central heating system. Heat pumps work much more efficiently at a lower temperature than a standard boiler system would. So they are more suitable for under-floor heating systems or larger radiators, which give out heat at lower temperatures over longer periods of time.
- An air-to-air system produces warm air which is circulated by fans to heat your home. They are unlikely to provide you with hot water as well.



Air Source heat pumps are a good option to provide heating. However, the payback period is longer than the PV array, and the 15% carbon emission saving target can be achieved with the PV array alone.

Renewable Technology Not Chosen



4. Conclusion

This statement has assessed the proposed student accommodation development on the former site of the Church Inn pub against the relevant climate change and sustainability policies and targets, as outlined within the Manchester City Council Core Strategy (July 2012) through the following of the energy hierarchy, the modelling of apartments in the IES Virtual Environment (VE) software and addressing all aspects of a sustainable development.

As part of this process, the development was designed with a fabric first approach; with low U-values and design air permeability therefore significantly exceeding Building Regulations Part L 2013 standards. A high efficiency services strategy has been adopted which demonstrates a holistic low energy design concept, involving very low limiting values and thus led to high-energy performance targets.

Furthermore, an LZC feasibility assessment was carried out, with all suitable technologies investigated for their suitability to the site and development. The assessment determined that a **10kWp** system can be proposed at this stage, which would equate to 30No panels and would provide an additional **6%** reduction in carbon emissions over the residual emissions: bringing the total carbon reduction to **15%** and **12%** against Building Regulations ADL 2010 and 2013 respectively.

In addition to the following of the energy hierarchy through the efficient design and renewable technology measures mentioned and meeting all relevant Manchester City Council carbon targets the proposal will include a large number of sustainability measures throughout construction and once completed, which will contribute heavily to the development's sustainability performance and accord with the requirements of the NPPF.

As a result of all the above, the proposed sustainable design and energy strategy allows the development to comply with Manchester City Council's planning policy requirement and is in line with all targets put forward in their planning documents.



Appendix A - Building Regulations UK Output documents (BRUKLs)

Appendix B - PV layout



Project name

Student Accommodation

As designed

Date: Thu Jan 21 11:50:13 2021

Administrative information

Building Details

Address: Church Inn, Manchester, TBC

Certification tool

Calculation engine: SBEM

Calculation engine version: v4.1.h.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v6.4.0

BRUKL compliance check version: v4.1.h.0

Certifier details

Name: Dan Watt

Telephone number: 01614343103

Address: Watt Energy & Consulting Engineers, 40 King Street, Manchester, M26BA

Criterion 1: The calculated CO₂ emission rate for the building should not exceed the target

1.1	CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	39.5
1.2	Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	39.5
1.3	Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	33.5
1.4	Are emissions from the building less than or equal to the target?	BER ≤ TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

2.a Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	"CR000000_W3"
Floor	0.25	0.15	0.15	"CC000000_F"
Roof	0.25	0.15	0.15	"CR000000_C"
Windows***, roof windows, and rooflights	2.2	1.4	1.4	"HL000007_W1_O0"
Personnel doors	2.2	2.2	2.2	"CR000000_W3_O0"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
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)] * There might be more than one surface where the maximum U-value occurs. ** 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. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

The building services parameters listed below are expected to be checked by the BCO against guidance. No automatic checking is performed by the tool.

1- Electric Heating

2- Comms Room - split system

1- SYST0001-DHW

Local mechanical ventilation and exhaust

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Local mechanical ventilation and exhaust

[illegible]

Local mechanical ventilation and exhaust

Zone	Supply/extract SFP [W/(l/s)]	HR seasonal efficiency	Exhaust SFP [W/(l/s)]
WC	-	-	0.5
WC	-	-	0.5
WC	-	-	0.5
WC	-	-	0.5
WC	-	-	0.5
WC	-	-	0.5
WC	-	-	0.5
WC	-	-	0.5
WC	-	-	0.5
WC	-	-	0.5
WC	-	-	0.5
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WC	-	-	0.5
WC	-	-	0.5
WC	-	-	0.5
WC	-	-	0.5
WC	-	-	0.5
WC	-	-	0.5
WC	-	-	0.5
WC	-	-	0.5
RECEPTION	1.9	0.75	-
LAUNDRY	1.9	0.75	-

General lighting and display lighting

[illegible]

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
STUDIO	20	-
STUDIO	20	-
STUDIO	20	-
STUDIO	20	-
STUDIO	20	-
STUDIO	20	-
STUDIO	30	-
STUDIO	20	-
STUDIO	30	-
STUDIO	20	-
STUDIO	20	-
STUDIO	20	-
STUDIO	20	-
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STUDIO	20	-
STUDIO	20	-
STUDIO	20	-
STUDIO	20	-
STUDIO	20	-
STUDIO	20	-
SUB STATION	70	-
WC	20	-
WC	20	-
WC	20	-
WC	20	-
WC	30	-
WC	20	-
WC	20	-
WC	20	-
WC	20	-
WC	20	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
WC	20	-
WC	20	-
WC	30	-
WC	20	-
WC	20	-
WC	20	-
WC	20	-
WC	20	-
WC	20	-
WC	20	-
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WC	20	-
WC	20	-
WC	20	-
WC	20	-
WC	20	-
RECEPTION	170	25
LAUNDRY	170	-
I.T.	30	-

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
LIFT	10	-
LIFT	10	-
LIFT	10	-
LIFT	10	-
LIFT	10	-
LIFT	10	-
LIFT	10	-
LIFT LOBBY	10	-
LIFT LOBBY	10	-
LIFT LOBBY	10	-
LIFT LOBBY	10	-
LIFT LOBBY	10	-
LIFT LOBBY	10	-
LIFT LOBBY	10	-
RISER	0	-
RISER	0	-
RISER	0	-
RISER	0	-
RISER	0	-
RISER	0	-
RISER	0	-
SMOKE	0	-
SMOKE	0	-
SMOKE	0	-
SMOKE	0	-
SMOKE	0	-
SMOKE	0	-
SMOKE	0	-

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
OFFICE	N/A	N/A
STUDIO	NO (-33.3%)	NO
STUDIO	NO (-72.2%)	NO
STUDIO	NO (-72.8%)	NO
STUDIO	NO (-52.7%)	NO
STUDIO	NO (-33%)	NO
STUDIO	NO (-72.3%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-7.9%)	NO
STUDIO	NO (-72.9%)	NO
STUDIO	NO (-71.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-30.5%)	NO
STUDIO	NO (-30.2%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-72.3%)	NO
STUDIO	NO (-33%)	NO
STUDIO	NO (-33%)	NO
STUDIO	NO (-52.7%)	NO
STUDIO	NO (-72.3%)	NO
STUDIO	NO (-7.9%)	NO
STUDIO	NO (-72.9%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-33%)	NO
STUDIO	NO (-72.2%)	NO
STUDIO	NO (-33.3%)	NO
STUDIO	NO (-72.8%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-72.3%)	NO
STUDIO	NO (-33%)	NO
STUDIO	NO (-72.3%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-30.2%)	NO
STUDIO	NO (-30.5%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-33%)	NO
STUDIO	NO (-72.8%)	NO
STUDIO	NO (-33%)	NO
STUDIO	NO (-33%)	NO
RECEPTION	YES (+35.3%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	1810.7	1810.7
External area [m ²]	2553.8	2553.8
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	3	5
Average conductance [W/K]	850.47	1441.04
Average U-value [W/m ² K]	0.33	0.56
Alpha value* [%]	21.63	15.64

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

Building Use

% Area Building Type

A1/A2 Retail/Financial and Professional services
A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
B1 Offices and Workshop businesses
B2 to B7 General Industrial and Special Industrial Groups
B8 Storage or Distribution
C1 Hotels
C2 Residential Inst.: Hospitals and Care Homes
C2 Residential Inst.: Residential schools

99 C2 Residential Inst.: Universities and colleges

C2A Secure Residential Inst.
Residential spaces
D1 Non-residential Inst.: Community/Day Centre
D1 Non-residential Inst.: Libraries, Museums, and Galleries
D1 Non-residential Inst.: Education
D1 Non-residential Inst.: Primary Health Care Building
D1 Non-residential Inst.: Crown and County Courts
D2 General Assembly and Leisure, Night Clubs and Theatres
Others: Passenger terminals
Others: Emergency services

1 Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs
Others - Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	28.35	44.16
Cooling	0.67	0.54
Auxiliary	5.7	3.28
Lighting	8.53	13.02
Hot water	23.33	35.46
Equipment*	28.05	28.05
TOTAL **	66.57	96.46

* Energy used by equipment does not count towards the total for 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	1.16	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Indicative Target
Heating + cooling demand [MJ/m ²]	183.38	231.88
Primary energy* [kWh/m ²]	192.45	195.7
Total emissions [kg/m ²]	33.5	39.5

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
Actual	90.9	82.9	30	0	5.7	0.84	0	1	0	
Notional	133.3	87.7	46.7	0	3.5	0.79 / 0.81	0	----	----	
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
Actual	0	1428.1	0	132.7	0	0	2.99	0	4	
Notional	0	1378.7	0	106.4	0	0	3.6	----	----	
[ST] No Heating or Cooling										
Actual	208.4	30.2	0	0	0	0	0	0	0	
Notional	307	15.4	0	0	0	0	0	----	----	

Key to terms

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

Key Features

The BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.18	"CR000000_W3"
Floor	0.2	0.15	"CC000000_F"
Roof	0.15	0.15	"CC000000_C_A4"
Windows, roof windows, and rooflights	1.5	1.4	"HL000007_W1_O0"
Personnel doors	1.5	2.2	"CR000000_W3_O0"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

Project name

Student Accommodation

As designed

Date: Thu Jan 21 11:51:12 2021

Administrative information

Building Details

Address: Church Inn, Manchester, TBC

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Dan Watt

Telephone number: 01614343103

Address: Watt Energy & Consulting Engineers, 40 King Street, Manchester, M26BA

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	39
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	39
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	34.3
Are emissions from the building less than or equal to the target?	BER ≤ TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	"CR000000_W3"
Floor	0.25	0.15	0.15	"CC000000_F"
Roof	0.25	0.15	0.15	"CR000000_C"
Windows***, roof windows, and rooflights	2.2	1.4	1.4	"HL000007_W1_O0"
Personnel doors	2.2	2.2	2.2	"CR000000_W3_O0"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
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)]				
* There might be more than one surface where the maximum U-value occurs. ** 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. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	0.9 to 0.95

1- Electric Heating

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

2- Comms Room - split system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	3	-	-	-
Standard value	2.5*	2.6	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	4.2	0.001
Standard value	2*	N/A

* Standard shown is for all types except absorption and gas engine heat pumps.

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I	Zone	Standard
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1		
ACC WC		-	-	0.5	-	-	-	-	-	-	-	N/A
ELECTRICAL PLANT		-	-	-	1.9	-	-	-	-	-	0.75	0.5
HALL		-	-	-	1.9	-	-	-	-	-	0.75	0.5
HALL		-	-	-	1.9	-	-	-	-	-	0.75	0.5
HALL		-	-	-	1.9	-	-	-	-	-	0.75	0.5
HALL		-	-	-	1.9	-	-	-	-	-	0.75	0.5
HALL		-	-	-	1.9	-	-	-	-	-	0.75	0.5
HALL		-	-	-	1.9	-	-	-	-	-	0.75	0.5

[illegible]

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
LIFT	90	-	-	7
LIFT	90	-	-	7
LIFT	90	-	-	7
LIFT	90	-	-	7
LIFT	90	-	-	7
LIFT LOBBY	-	90	-	17
LIFT LOBBY	-	90	-	17
LIFT LOBBY	-	90	-	17
LIFT LOBBY	-	90	-	17
LIFT LOBBY	-	90	-	17
LIFT LOBBY	-	90	-	17
LIFT LOBBY	-	90	-	17
LIFT LOBBY	-	90	-	17
RISER	-	90	-	5
RISER	-	90	-	5
RISER	-	90	-	5
RISER	-	90	-	5
RISER	-	90	-	5
RISER	-	90	-	5
RISER	-	90	-	5
SMOKE	-	90	-	5
SMOKE	-	90	-	5
SMOKE	-	90	-	5
SMOKE	-	90	-	5
SMOKE	-	90	-	5
SMOKE	-	90	-	5
SMOKE	-	90	-	5

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
OFFICE	N/A	N/A
STUDIO	NO (-33.3%)	NO
STUDIO	NO (-72.2%)	NO
STUDIO	NO (-72.8%)	NO
STUDIO	NO (-52.7%)	NO
STUDIO	NO (-33%)	NO
STUDIO	NO (-72.3%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-7.9%)	NO
STUDIO	NO (-72.9%)	NO
STUDIO	NO (-71.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-30.5%)	NO
STUDIO	NO (-30.2%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-72.3%)	NO
STUDIO	NO (-33%)	NO
STUDIO	NO (-33%)	NO
STUDIO	NO (-52.7%)	NO
STUDIO	NO (-72.3%)	NO
STUDIO	NO (-7.9%)	NO
STUDIO	NO (-72.9%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-33%)	NO
STUDIO	NO (-72.2%)	NO
STUDIO	NO (-33.3%)	NO
STUDIO	NO (-72.8%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-30.4%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-72.3%)	NO
STUDIO	NO (-33%)	NO
STUDIO	NO (-72.3%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-30.2%)	NO
STUDIO	NO (-30.5%)	NO
STUDIO	NO (-71.2%)	NO
STUDIO	NO (-33%)	NO
STUDIO	NO (-72.8%)	NO
STUDIO	NO (-33%)	NO
STUDIO	NO (-33%)	NO
RECEPTION	YES (+35.3%)	NO
I.T.	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	1810.7	1810.7
External area [m ²]	2553.8	2553.8
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	850.47	1339.17
Average U-value [W/m ² K]	0.33	0.52
Alpha value* [%]	21.63	16.83

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

Building Use

% Area Building Type

A1/A2 Retail/Financial and Professional services
A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
B1 Offices and Workshop businesses
B2 to B7 General Industrial and Special Industrial Groups
B8 Storage or Distribution
C1 Hotels
C2 Residential Institutions: Hospitals and Care Homes
C2 Residential Institutions: Residential schools

99 C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions
Residential spaces
D1 Non-residential Institutions: Community/Day Centre
D1 Non-residential Institutions: Libraries, Museums, and Galleries
D1 Non-residential Institutions: Education
D1 Non-residential Institutions: Primary Health Care Building
D1 Non-residential Institutions: Crown and County Courts
D2 General Assembly and Leisure, Night Clubs, and Theatres
Others: Passenger terminals
Others: Emergency services

1 Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs
Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	28.98	38.98
Cooling	0.67	0.55
Auxiliary	5.7	4.11
Lighting	8.44	11.37
Hot water	23.57	36.38
Equipment*	28.05	28.05
TOTAL **	67.36	91.39

* 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	0.63	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	186.16	222.24
Primary energy* [kWh/m ²]	204.73	199.75
Total emissions [kg/m ²]	34.3	39

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	93	83.8	30.7	0	5.7	0.84	0	1	0
	Notional	121.6	89.5	41.2	0	4.4	0.82	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	0	1435.6	0	133.4	0	0	2.99	0	4
	Notional	0	1412.6	0	109	0	0	3.6	----	----
[ST] No Heating or Cooling										
	Actual	203.7	33.5	0	0	0	0	0	0	0
	Notional	293.9	17.4	0	0	0	0	0	----	----

Key to terms

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

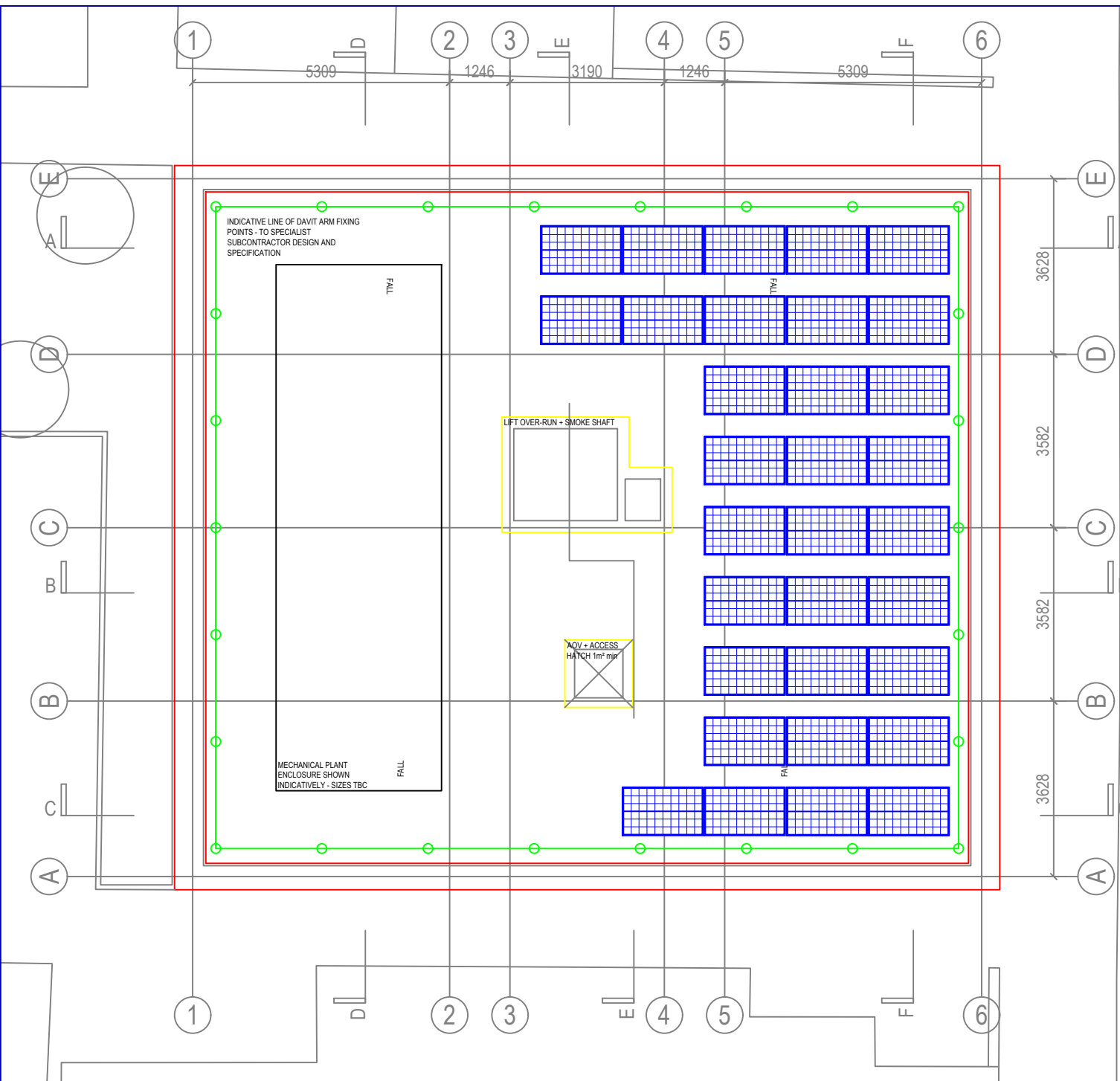
Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.18	"CR000000_W3"
Floor	0.2	0.15	"CC000000_F"
Roof	0.15	0.15	"CC000000_C_A4"
Windows, roof windows, and rooflights	1.5	1.4	"HL000007_W1_O0"
Personnel doors	1.5	2.2	"CR000000_W3_O0"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3



CLIENT: WATT ENERGY
PROJECT: CHURCH INN
TITLE: 10kWp PV LAYOUT
SCALE: 1:500 @ A4

iGen Energy Ltd, Broadstone House, Broadstone Rd, Gtr Manchester, SK5 7DL
0161 5071593 | info@igen-energy.com | www.igen-energy.com

PROPOSAL