

Our Ref: C1703

24th February 2017

Energy Statement

Showroom Building, Oldham Road, Manchester.

Site Address: Proposed Showroom Building
804-806 Oldham Road
Manchester
M40 2AB

Client: G. A. Armstrong Ltd

Architect: Si-Tec Design & Planning Consultants
188 Oldham Road
Ashton-Under-Lyne
OL7 9AN

Energy Assessor: Neil Unsworth
Bridgewater Energy Ltd
Accreditation ref STRO 002879

ENERGY STATEMENT

This statement has been prepared by Bridgewater Energy Ltd on behalf of G A Armstrong Ltd in support of the following planning application:

Application reference: 115222/FO/2017

Proposal: Proposed three storey showroom, storage and office building with associated service area

Address: 804-806 Oldham Road, Manchester, M40 2AB

In particular the statement addresses Policy EN6 of Manchester City Council's Core Strategy 2012 to 2027. This policy states that developments involving the erection of a building will be expected as a minimum to meet the target shown in Table 12.2 for non-domestic buildings.

The relevant target in Table 12.2 is Target 3 which states that non-domestic buildings should achieve a minimum 15% reduction of CO₂ emissions compared to Part L 2010.

Proposal Summary

Predicted CO₂ emissions reduction : 17.4%

It is predicted that the proposed new building will achieve a 17.4% reduction in CO₂ emissions compared to Building Regulations Approved Document L2A 2010.

This will be achieved by means of improving the thermal and building services performance of the building beyond the levels required to comply with the current regulations.

This will include a highly insulated building envelope, high specification windows and doors and excellent levels of air tightness. This 'fabric first' approach reduces emissions by lowering the demand for heating.

Emphasis will also be placed on installing high efficiency building services and control systems. Lighting in particular will be targeted by installing LED fittings throughout with occupancy and daylight controls.

Development Description

The proposed development comprises of a new three storey non-domestic building with primarily retail use and an external service/storage yard.

The building has a total floor area of approximately 578m² including 285m² showroom, 162m² admin/storage, 90m² circulation and 41m² other service uses.

The building is to be of steel frame construction with masonry external wall construction to the ground floor level, metal cladding to the upper floor walls and a shallow pitch metal clad roof.

The regulated energy uses, ie those assessed within Part L, are heating, cooling, hot water, lighting and ventilation. Of these the heating and lighting will have the greatest energy use and therefore create the greatest CO₂ emissions.

Technology Feasibility Study

In this section we will look at the various strategies available that could be utilised to reduce the CO2 emissions from the dwellings. These will include renewable technologies and passive measures.

Wind Turbines

Small scale on-site wind turbines can have the potential to make a contribution to on-site renewables targets. However barriers such as noise, and visual impact (planning issues), can severely restrict their use.

The space available for locating wind turbines on this development is very limited and is restricted to the use of roof mounted units. The performance of roof mounted turbines is considerably reduced when compared with freestanding models. Recent studies have also found that wind speeds actually seen in urban environments are considerably less than given in meteorological data.

In light of the visual impact and poor performance of roof mounted units we would consider that wind turbines are not viable for this development.

Ground Source Heat Pumps

Ground source heating takes advantage of the stable ground temperature of 12°C to heat either air or water to provide energy efficient heating (and optional comfort cooling) to a building.

The system involves the installation of underground pipework laid in a horizontal or vertical pattern in land adjacent to the building. The area of land available is small in comparison to the size of the building therefore ground source heat pumps are not feasible for this project.

Air Source Heat Pumps

Air source heat pumps work in the same manner as ground source heat pumps, but instead of extracting low temperature heat from the ground, they extract it from the air. They can do this even when the outside temperature is -15°C.

This technology has a long established record of suitability and efficiency in commercial buildings. Air source heat pumps are suitable for this project.

Biomass

The use of biomass systems to provide heating and hot water often lends itself towards a district heating approach whereby a central system is provided which distributes low temperature hot water to a number of buildings. Smaller units are available but, despite their continual development, these are still quite large and require a dedicated plant room.

A significant space will be required for the delivery and storage of fuel and the installation and maintenance costs of the systems are high when compared to traditional mains gas heating. Significantly this building will have a low heating and hot water demand.

Therefore we do not feel that a biomass system is suitable for use in this development.

Combined Heat and Power

Combined Heat and Power (CHP) is the simultaneous production of heat and electricity. Using a reliable internal combustion engine fed from a single source of fuel, such as natural gas or LPG, a CHP system can produce usable amounts of both heat and electricity.

However CHP works efficiently when there is a steady and continuous heat and hot water demand which the proposed building will not require. We would therefore consider that combined heat and power is not viable for this development.

Enhanced Efficiency Heating Systems

The heating system will be a significant generator of CO₂ emissions in this building. Traditional mains gas boilers produce significantly lower emissions when compared to electric, oil and LPG systems.

The addition of flue gas heat recovery systems and improved heating controls are proven to bring effective reductions in emissions. The costs of these options are not significant therefore this option is suitable for this development.

Photovoltaics

To achieve maximum output from photovoltaic's they should ideally be located on south facing surfaces, with clear, unobstructed views of the sky. The orientation of the building is not ideal but the large roof area would lead to good performance.

The installation of PV is technically feasible and could lead to reasonable CO₂ reductions however the costs of the installation are high.

We would consider that PV is suitable for this development but the cost implications would need careful consideration..

Solar Water Heating

Solar water heating systems use the energy from the sun to heat water for domestic hot water needs. Solar water heating systems use a heat collector that is usually mounted on a roof in which a fluid is heated by the sun, this fluid being used to heat water that is stored in a hot water cylinder.

However the CO₂ savings are not as great as those achieved through PV. This combined with the low hot water demand mean that solar water heating is not suitable for this development.

Enhanced Construction

The use of enhanced insulating materials, high specification glazing, composite insulated doors and improved air tightness can significantly reduce the energy demand of buildings. Indeed the current Building Regulations for new dwellings has introduced a target fabric energy efficiency that must be achieved in addition to the target emissions rate.

Using this method alone will have significant cost implications. However the use of improved construction in combination with other options will achieve the required emissions reductions and therefore is suitable for this development.

Proposed Energy Strategy

It is proposed that the building will incorporate enhanced construction and enhanced efficiency heating and lighting systems to reduce CO₂ emissions.

The building will adopt a 'fabric first' approach to energy efficiency following the principle that the demand for heating should first be minimised before addressing how the energy is produced. The building fabrics will be highly insulated and have an airtight building envelope. This will mean that energy efficiency will be embedded within the building throughout its lifetime rather than placing over reliance upon renewable technologies with a restricted working life.

The heating for this building will be by means of either mains gas boiler with radiators or underfloor heating or an air source heat pump system. Both of these options utilise high efficiency systems and will be fully zoned so that the timing and temperature settings can be varied to suit the use of each room or area.

It is usually the case that lighting is the largest generator of CO₂ emissions in this type of development. This building will use high efficiency LED fittings throughout every area. The efficiency will be enhanced by the use of daylight sensors that will reduce the lighting when suitable natural daylighting is available. This will be particularly beneficial in this building which has a good area of windows. The controls will also include occupancy sensing which automatically switches off lighting when there is no demand. This is particularly beneficial in service and storage areas.

It is anticipated this building will have a low domestic hot water demand. However the systems used will be high efficiency with minimal heat lost through stored hot water.

It should be noted that if an air source heat pump is used for heating then all the building services would be electric and all of the CO₂ emissions generated by the building would be from electricity use. Under Policy EN 6 this could mean that Target 2 for electricity intense buildings may apply. This would only require the building to achieve a minimum 10% reduction in CO₂ emissions rather than the 15% assumed earlier in this report.

Energy assessment method

A provisional planning stage SBEM calculation has been provided for this building. Final construction drawings have not been completed at the time of writing therefore this SBEM calculation is based upon a previously assessed building of similar design, scale and usage.

A copy of the BRUKL Output Document is Appendix A of this report. This is the standard document used to show compliance with building regulations Part L 2010. In order to pass an SBEM assessment the as designed Building Emissions Rate (BER) of CO₂ must be no greater than the Target Emissions Rate (TER) of CO₂.

In order to calculate the overall predicted CO₂ reduction a baseline CO₂ level must be established against which the reduction is measured. This is taken as the building regulations Target Emissions Rate (TER). To show a 15% of CO₂ emissions the BER must be shown to be 15% lower than the TER.

Calculation of Predicted CO₂ Reduction

The BRUKL document included in Appendix A states the Target Emissions Rate (TER) as 24.7 kg CO₂/m²/year. This would give the total baseline emissions as follows.

Building	Floor area (approx m ²)	Emissions per m ² (kg CO ₂ /year)	Baseline emissions (kg CO ₂ /year)
Showroom building	578	24.7	14,276

Using the proposed energy strategy outlined in this report gives an as designed Building Target Emissions Rate (BER) of 20.4 kg CO₂/m²/year. This would give total as designed emissions as follows.

Building	Floor area (approx m ²)	Emissions per m ² (kg CO ₂ /year)	As designed emissions (kg CO ₂ /year)
Showroom building	578	20.4	11,791

Comparing the total baseline emissions and the total as designed emissions the reduction in CO₂ emissions can be calculated as follows:

$$\text{Predicted CO}_2 \text{ reduction} = \left(1 - \frac{11,791}{14,276} \right) \times 100 = 17.4\%$$

Appendix A

BRUKL Output Document for typical showroom building

Project name

Typical showroom building

As designed

Date: Mon Feb 27 11:10:36 2017

Administrative information

Building Details

Address: Typical showroom building, 804-806 Oldham Road, Manchester, M40 2AB

Certification tool

Calculation engine: SBEM

Calculation engine version: v4.1.e.5

Interface to calculation engine: Carbon Checker

Interface to calculation engine version: v1.7.3

BRUKL compliance check version: v4.1.e.5

Owner Details

Name: -

Telephone number: -

Address: -, -, -

Certifier details

Name: Neil Unsworth

Telephone number: 01942 888092

Address: Astley Park Business Centre, Chaddock Lane, Astley, Manchester, M29 7JY

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	24.7
1.2	Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	24.7
1.3	Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	20.4
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	0.28	0.28	G store area_Surface_3_Exterior
Floor	0.25	0.15	0.15	G store area_Surface_1_Underground
Roof	0.25	0.16	0.16	F store 2_Surface_2_Exterior
Windows***, roof windows, and rooflights	2.2	1.6	1.6	G store area_Surface_8_Window1
Personnel doors	2.2	1.8	1.8	G store area_Surface_8_Door2
Vehicle access & similar large doors	1.5	1.5	1.5	G store area_Surface_8_Door1
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	7.5

2.b Building services

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

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

1- HVACTYPE - Mains gas boileri with radiators

Heating seasonal efficiency	Cooling nominal efficiency	SFP [W/(l/s)]	HR seasonal efficiency
0.9	-	-	-
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			YES

1- Mains gas boiler

Heating seasonal efficiency	Hot water storage loss factor [kWh/litre per day]
0.9	-

Local mechanical ventilation and exhaust

Zone	Supply/extract SFP [W/(l/s)]	HR seasonal efficiency	Exhaust SFP [W/(l/s)]
G kitchen	-	-	1
G WC	-	-	1
G office 1	-	-	1
G office 2	-	-	1

General lighting and display lighting

Zone	General lighting [W]	Display lamps efficacy [lm/W]
G store area	130	-
G stairs	30	-
G service desk	270	70
G kitchen	460	-
G WC	50	-
G office 1	150	-
G office 2	80	-
G shop sales	2090	70
F stairs/access	120	-
F store 1 adj access	40	-
F store 2	70	-
F store 3 front	170	-

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?
G service desk	N/A	N/A
G office 1	N/A	N/A
G office 2	N/A	N/A
G shop sales	NO (-41.6%)	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?	YES
Is evidence of such assessment available as a separate submission?	YES
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]	755.5	755.5
External area [m ²]	1411.9	1411.9
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	8	5
Average conductance [W/K]	401.31	485.59
Average U-value [W/m ² K]	0.28	0.34
Alpha value* [%]	13.9	9.44

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

Building Use

% Area Building Type

100	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
	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
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	52.76	61.3
Cooling	0	0
Auxiliary	4.49	1.45
Lighting	15.07	23.15
Hot water	0.69	0.74
Equipment*	8.21	8.21
TOTAL **	73.01	86.65

* 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	0	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]	220.86	253.64
Primary energy* [kWh/m ²]	110.2	133.34
Total emissions [kg/m ²]	20.4	24.7

* 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] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	160.5	60.4	52.8	0	4.5	0.85	0	0.9	0
	Notional	174.8	78.9	61.3	0	1.5	0.79 / 0.81	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	0.28	G store area_Surface_3_Exterior
Floor	0.2	0.15	G store area_Surface_1_Underground
Roof	0.15	0.16	F store 2_Surface_2_Exterior
Windows, roof windows, and rooflights	1.5	1.6	G store area_Surface_8_Window1
Personnel doors	1.5	1.8	G store area_Surface_8_Door2
Vehicle access & similar large doors	1.5	1.5	G store area_Surface_8_Door1
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	7.5