

LIDL LOWRY HOUSE, MAULDETH ROAD WEST, CHORLTON

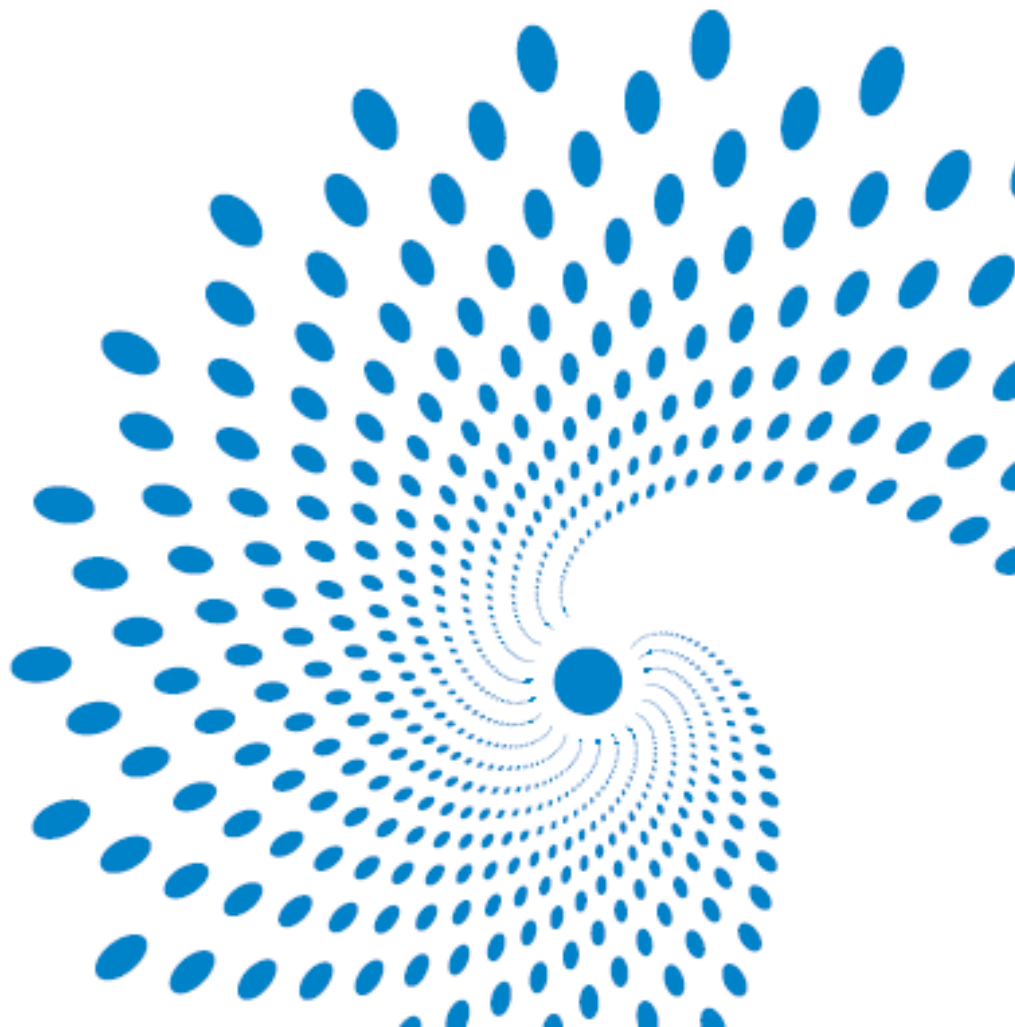
ENERGY USAGE & SUSTAINABILITY STATEMENT

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Lidl Great Britain Ltd

Architect:

SPACE Architects



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TABLE OF CONTENTS

1.00	EXECUTIVE SUMMARY	6
2.00	INTRODUCTION	8
2.01	Energy Statement Requirements	8
3.00	SITE LOCATION AND DESCRIPTION	9
4.00	PLANNING POLICIES & REFERENCE DOCUMENTS.....	10
4.01	National Planning Policy Framework (NPPF 2021)	10
4.03	Building Regulations Approved Document Part L: 2013	13
5.00	ENERGY HIERACHY	14
6.00	ASSESSMENT METHODOLOGY & DYNAMIC SIMULATION SOFTWARE	15
6.01	Calculation Process.....	15
6.02	TAS Software	15
6.03	National Calculation Methodology.....	15
6.04	Building Geometry.....	17
7.00	‘PART L’ – BASELINE PREDICTED ENERGY USAGE	19
7.01	Annual Carbon Dioxide Emissions of the Baseline Building	19
7.02	Annual Energy Consumption of the Baseline Building	20
8.00	‘BE LEAN’ – PASSIVE & ACTIVE DESIGN STRATEGIES	21
8.01	Orientation and Site Location.....	21
8.02	Fabric Performance and Thermal Mass.....	22
8.03	Thermal Mass	23
8.04	Heating System.....	23
8.05	Natural Ventilation	23
8.06	Mechanical Ventilation.....	23
8.07	Sub-Metering.....	24
8.08	Low Energy Lighting and Controls	24
8.09	Building Energy Management System.....	24
8.10	Building Energy Performance	24
8.11	Water Efficiency	25

9.00	'BE CLEAN' – DECENTRALISED LOW CARBON TECHNOLOGIES	26
9.01	Combined Heat and Power (CHP)	26
9.02	Decentralised Energy Networks (DEN).....	27
10.00	'BE GREEN' – LOW OR ZERO CARBON TECHNOLOGIES	29
10.01	Biomass Boiler	29
10.02	Solar Thermal	30
10.03	Air Source Heat Pump (ASHP)	31
10.04	Photovoltaics (PV)	32
11.00	'BE LEAN', 'BE CLEAN' AND 'BE GREEN' – PREDICTED ENERGY USAGE	33
11.01	Predicted Annual Carbon Emissions of the Actual Building	33
11.02	Predicted Annual Energy Consumption of the Actual Building.....	34
12.00	CONCLUSION	35
APPENDIX A – 'BE GREEN' BRUKL OUTPUT DOCUMENT.....		37

TABLE OF FIGURES

Figure 1 - Site Context	9
Figure 2 - Energy Hierarchy	14
Figure 3 - North View.....	17
Figure 4 - East View	17
Figure 5 - South View.....	18
Figure 6 - West View.....	18
Figure 7 - Annual Carbon Emissions - Baseline.....	19
Figure 8 - Annual Energy Consumption - Baseline	20
Figure 9 - Orientation & Sun Path Image.....	21
Figure 10 - U-value Comparison	22
Figure 11 -The Department for Business, Energy & Industrial Strategy Heat Density Map.....	27
Figure 12 - The Department for Business, Energy & Industrial Strategy Current District Heating Schemes	28
Figure 13 - Annual Carbon Dioxide Emissions - Be Green	33
Figure 14 - Annual Energy Consumption - Be Green	34

1.00 EXECUTIVE SUMMARY

DDA Consultant Engineers Ltd has been commissioned by Lidl GB Ltd to prepare an energy statement in support of the planning application for the proposed development at Mauldeth Road West, Chorlton.

The development is required to demonstrate:

- How the incorporation of passive design and energy efficient measures can contribute towards mitigating and adapting to climate change and reducing the development's carbon emissions and energy consumption.
- How the incorporation of good building design with a holistic approach to sustainability can enhance the development's sustainable credentials.
- How the incorporation of good building design with a holistic approach to sustainability can reduce the energy demand, carbon emissions and running costs.
- How the incorporation of passive and active design strategies and low zero carbon technologies can reduce the development's regulated emissions, to ensure a 15% betterment over Part L Building Regulations Part L Target Emission Rate (TER) calculation.
- That carbon dioxide emissions associated with energy demand can be reduced in accordance with the energy hierarchy:
 - a) Minimising energy requirements.
 - b) Incorporating high efficiency systems and controls.
 - c) Incorporating low or zero carbon energy sources.

This energy statement shows that:

- The store's incorporation of 'passive' design strategies will take advantage of:
 - a) Natural daylighting thus, reducing dependency on electric lighting and the associated running costs and carbon emissions through natural contribution towards internal lighting requirements.
 - b) Enhanced fabric efficiencies and thermal mass stabilise any temperature fluctuations within the building reducing heat gains and/or losses.

The incorporation of 'active' design strategies will take advantage of:

- Heat recovery ventilation to pre-heat incoming fresh air.

- Separate sub-metering to allow for all energy consumed to be monitored and any discrepancies to be easily identified and fixed thus minimising wasted energy.
- Low energy lighting with suitable controls provided.
- Building energy management system (BEMS) to manage all systems effectively, ensuring their efficiencies are achieved and maintained.

Combined Heat and Power (CHP) and De-centralised Energy Network (DEN) solutions have been reviewed and considered unviable for this store due to:

- Unsuitable energy consumption profiles for CHP (require high domestic hot water (DWS) consumption). CHP systems are well suited for buildings that have all year demand for heat. They require predictable and relatively constant base load for optimum performance, which can be found in applications with high domestic hot water loads. The store has a limited number of hot water outlets, therefore, connection to CHP plant would not be deemed viable, due to the lack of thermal demand.
- No suitable DEN within the vicinity of the proposed development.

Alternative Low or Zero Carbon (LZC) technologies have been reviewed with the following deemed to be both viable and advisable:

- Air Source Heat Pumps, or Aero-thermal Heat Pumps.

The 'Baseline' building annual carbon emissions and energy consumption has been calculated as follows:

- Regulated Annual Carbon Dioxide Emissions: **51,323.91kgCO₂/annum.**
- Regulated Annual Energy Consumption: **107,443.38kWh/annum.**

The 'Be Lean', 'Be Clean', 'Be Green' actual building annual carbon emissions and energy consumption has been calculated as follows:

- Regulated Annual Carbon Dioxide Emissions: **42,627.20kgCO₂/annum.**
- Regulated Annual Energy Consumption: **82,133.48kWh/annum.**

The results show a **16.94%** carbon dioxide reduction and a **23.56%** energy reduction, when assessed to Part L2A 2013 Building Regulations and accounting for the proposed passive, active and LZC strategies.

2.00 INTRODUCTION

DDA Consultant Engineers Ltd has been commissioned by Lidl GB Ltd to prepare an energy statement in support of the planning application for the proposed development at Mauldeth Road West, Chorlton.

The energy statement will demonstrate how the store will provide heating and power and meet the energy / carbon emission target set by national and local policy. The energy statement will demonstrate Lidl's commitments to sustainable development and how they intend to reduce their annual carbon emissions and energy consumption through the utilisation of; good practice engineering, passive and active strategies and Low or Zero Carbon (LZC) technologies.

The energy statement will demonstrate Lidl's commitment to go above and beyond the requirements of Part L2A minimum standards to ensure a high carbon reduction/off-set is achieved, as well as supply LZC technologies to contribute towards the store's annual regulated energy consumption.

2.01 Energy Statement Requirements

The objective of this report is to define and outline how the incorporation of sustainable building design, coupled with the incorporation of LZC technologies at an early stage of the design process can ensure compliance with relevant local and national planning policies, achieve building regulation compliance to a high standard and reduce the energy consumption, associated carbon emissions and running costs of a new build. The core design principals to be outlined within this report will be to:

- Reduce energy demand through the implementation of the energy hierarchy.
- Meet end-use energy demands efficiently and effectively.
- Supply LZC technologies to further reduce the development's energy demand, associated carbon emissions and utility costs.
- Enable effective energy management to ensure installed systems work to their maximum efficiencies.

The report will compare the energy usage and CO₂ emissions from a Notional Building (Building Regulation Part L 2013 compliant) to that of the proposed building including energy efficiency measures, decentralised energy, and renewable energy systems (where appropriate).

3.00 SITE LOCATION AND DESCRIPTION

The site is located on Mauldeth Road West, Chorlton.

As shown in Fig 1, the store is orientated with a heavily glazed façade facing South-West. The emphasis on the south-western orientation offers the advantage of natural daylighting contributions within the store. It may, however, lead to excessive levels of solar gains if left unmanaged. The incorporation of high-performance glazing coupled with solar shading / overhangs should assist in the solar gains management and justify the stores orientation. This reduces the dependency on electric lighting through the natural contribution towards internal lighting levels, whilst ensuring mechanical cooling loads are minimised.

The site receives little over shading or overlooking, offering privacy to the store and maintained privacy to residential houses surrounding the site.

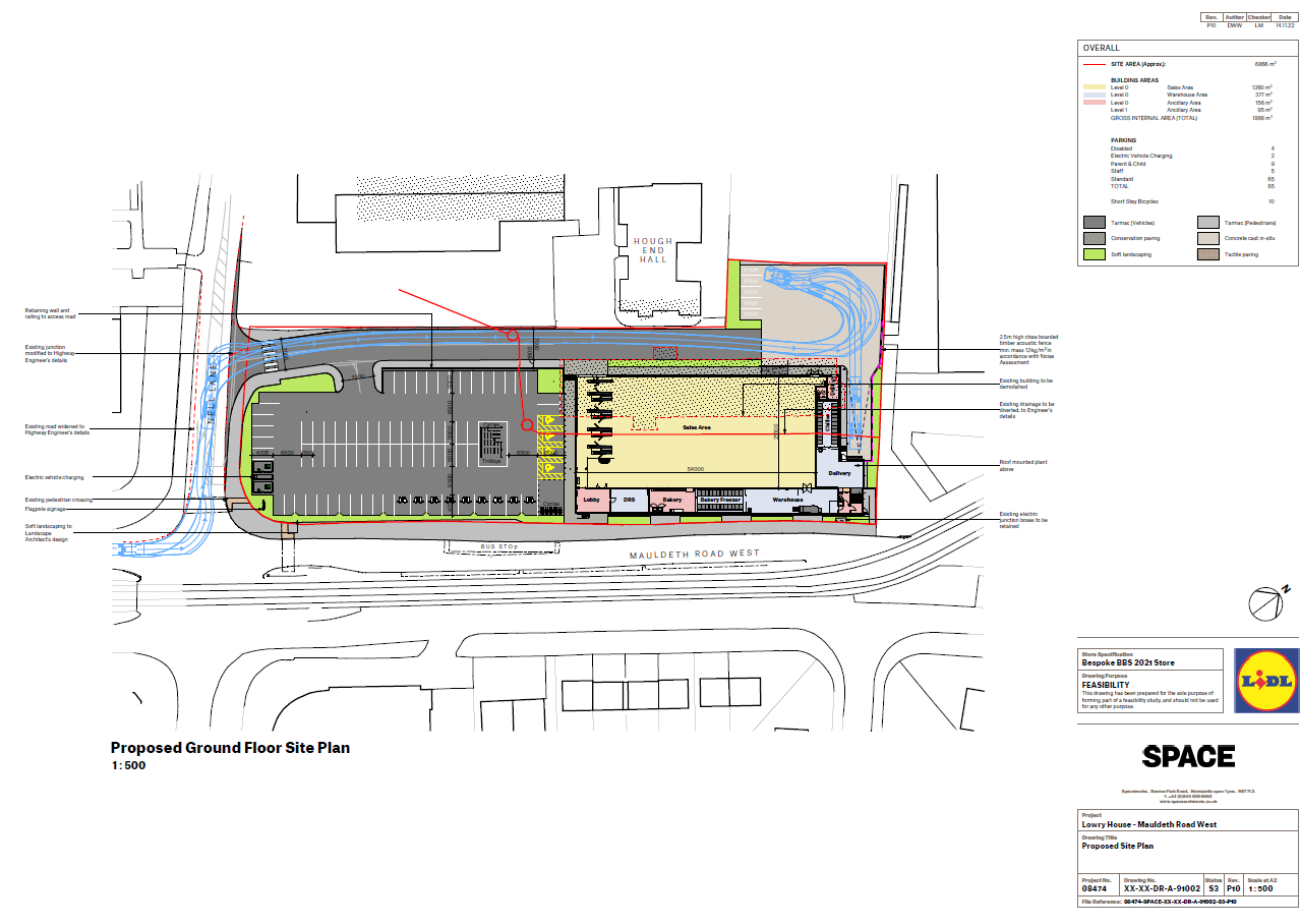


Figure 1 - Site Context

4.00 PLANNING POLICIES & REFERENCE DOCUMENTS

The following documents offer a review of the necessary planning policies and requirements to be adhered to, to ensure sustainable design standards are met and the relevant targets set by local and national authorities understood.

4.01 National Planning Policy Framework (NPPF 2021)

The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these are expected to be applied. Taken together, these policies articulate the Government's vision of sustainable development, which should be interpreted and applied locally to meet local aspirations. The ministerial foreword of this NPPF highlights that 'the purpose of planning is to contribute to the achievement of sustainable development' and that at the heart of the framework is a presumption in favour of sustainable development.

Sustainable development is defined in the NPPF as comprising developments "meeting the needs of the present without compromising the ability of future generations to meet their own needs" in line with the definition of the Brundtland Commission ('Our Common Future', 1987). The NPPF also refers to the three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways – an economic objective, a social objective and an environmental objective.

4.02 Manchester City Council, Manchester Core Strategy 2012 to 2027

Policy EN 4

Reducing CO₂ Emissions by Enabling Low and Zero Carbon Development

The Council will seek to reduce fuel poverty and decouple growth in the economy, growth in CO₂ emissions, and rising fossil fuel prices, through the following actions:

- All development must follow the principle of the Energy Hierarchy, being designed:

- to reduce the need for energy through design features that provide passive heating, natural lighting and cooling
 - to reduce the need for energy through energy efficient features such as improved insulation and glazing
 - to meet residual energy requirements through the use of low or zero carbon energy generating technologies
- Wherever possible new development and retrofit projects, including energy generation plant, must be located and designed in a manner that allows advantage to be taken of opportunities for low and zero carbon energy supplies.
 - Where possible new development and retrofit projects will be used as a mechanism to help improve energy efficiency and provide low and zero carbon energy supplies to existing buildings.
 - Where appropriate new development and retrofit projects will be required to connect to and/or make contributions to low or zero carbon energy schemes and/or to incorporate provision to enable future connection to any existing / potential decentralised energy schemes.
 - The use of building materials with low embodied carbon in new development and refurbishment schemes.

Policy EN 6

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 1,000 sq m 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.

The target framework relates to three broad development locations and their potential for low and zero carbon, decentralised energy. The areas are defined as follows

- Target 1 Network development areas: Locations where the proximity of new and existing buildings, the mix of uses and density of development provide the right conditions to support district heating (and cooling).
- Target 2 Electricity intense areas: Locations where the predominant building type has an all electric fit-out such as retail units and leisure complexes.
- Target 3 Micro-generation areas: Locations where lower densities and a fragmented mix of uses tend to mean that only building scale solutions are practical.

Domestic CO₂ emissions reduction targets

Table 12.1

Target	% Minimum requirement
Target 1: Network development area	CHP/district heating anchor or connection or where not feasible a 15% increase on Part L 2010
Target 2: Electricity intense buildings	+15% increase on Part L 2010
Target 3: Micro generation area	+15%increase on Part L 2010

Non-domestic CO₂ emissions reduction targets

Table 12.2

Target	% Minimum requirement
Target 1: Network development area	CHP/district heating anchor or connection or where not feasible, a 15% increase on Part L 2010
Target 2: Electricity intense buildings (Applies to commercial uses with a high proportion of emissions from electricity use (>45 kg CO ₂ /m ²))	+10%increase on Part L 2010
Target 3: Micro generation area	+15% increase on Part L 2010

4.03 Building Regulations Approved Document Part L: 2013

Part L of the current Building Regulations (2013) considers the reduction of carbon emissions in new and existing buildings. As the proposal consist of the creation of new domestic and non-domestic spaces it falls under Part L1A and L2A of the Regulations.

The overall structure of compliance with the 2013 Building Regulations for new buildings includes three criteria to comply with:

- Criterion 1 - The Dwelling/Building Emission Rate (DER/BER) should be better than the Target Emission Rate (TER).
- Criterion 2 - Limit on design flexibility.
- Criterion 3 - Limiting effects of heat gain in summer.

The energy strategy for the scheme has been developed to ensure the scheme meets the relevant requirements of the Building Regulations.

5.00 ENERGY HIERACHY

The Energy Statement has been prepared using the “fabric first” approach of the ‘Be Lean’, ‘Be Clean’, ‘Be Green’ Governmental energy hierarchy:

- **Be Lean** – reduce the need for energy.
- **Be Clean** – supply and use energy in the most efficient manner.
- **Be Green** – supply energy from renewable sources.



Figure 2 - Energy Hierarchy

Adhering to the principles of the Energy Hierarchy has several benefits:

- By reducing the energy requirement of the building, the potential renewable requirement shrinks in proportion. This has obvious cost benefits and will help reduce the building’s energy requirements and carbon emissions for the lifespan of the development.
- The sustainable credentials of each development are enhanced and are not validated by simply bolting on expensive renewable equipment. By focusing on fabric performance and the provision of efficient heating systems each building is intrinsically “green”.
- Provides reassurance to the end user the building is performing to its highest potential and all systems are working to their maximum efficiencies with minimal energy waste, thus reducing dependencies on natural resources (gas & electric) as well as minimising running costs.
- The incorporation of energy efficiency measures and a holistic approach to building design will ensure that the carbon emission from the building will be kept to a minimum.

6.00 ASSESSMENT METHODOLOGY & DYNAMIC SIMULATION SOFTWARE

6.01 Calculation Process

To detail the benefits of adhering to the energy hierarchy, we must first create a baseline to compare against. This is done using a Dynamic Simulation Modelling software tool which follows a set methodology for calculating the buildings carbon emissions and associated energy use. Dynamic Simulation Modelling (DSM), as used for Part L Building Regulations compliance, has been carried out using the EDSL TAS software, Version 9.5.4, in accordance with CIBSE AM11.

The TAS software has been deemed appropriate for this project, as it allows a single model to be used for all required analysis relating to the building energy performance regarding passive and active strategies, energy efficient mechanical and electrical systems, and LZC technologies.

6.02 TAS Software

TAS is a governmentally approved software capable of analysing multiple environmental credentials of a building. By creating a virtual environment where, geometric form, thermal mass, interaction with local weather & climate, fabric performance, energy consumption and carbon emissions are analysed, different design strategy characteristics and benefits can be assessed and discounted (where necessary).

The TAS software analyses two buildings in parallel with each other, the first representing the notional building as defined by the National Calculation Method (NCM), and the second the building as proposed. The difference in CO₂ emissions and energy consumption between the models represents the CO₂ reduction achieved by the proposed low energy and low carbon design.

By modelling each area to be analysed, and inputting a series of parameters, the software can give projected annual loadings for heating and cooling requirements, carry out part L2A compliance checks through the SBEM tool as well as multiple other dynamic simulations.

6.03 National Calculation Methodology

The National Calculation Method (NCM) is the methodology used for demonstrating compliance with Part L of the Building Regulations for buildings other than dwellings. Annual energy use and associated emissions for a proposed building are calculated and compared with the energy use and emissions of a comparable notional building. Both calculations make use of standard sets of data for different activity areas (internal conditions) and common databases are used to calculate emission factors, weather data, and set variables of construction and service elements.

The NCM allows the actual calculation to be carried out either by an approved simulation software or by a simplified tool. For this report, the building has been assessed using the Dynamic Simulation Software, TAS.

6.03.1 Weather Data

External weather conditions and variables must be considered within the Dynamic Simulation software.

The UK Meteorological Office (MO) collects and analyses weather data across the UK. They account for multiple climate variables such as wind speed and direction, air pressure, relative humidity, air temperature etc. across 14 locations. The weather data variables are broken into two types of weather files: Design Summer Year (DSY) and Test Reference Year (TRY)

Design Summer Year (DSY): This set of data represents a warmer than typical year and is used when calculating maximum resultant temperatures, cooling loads, TM52 calculations etc. as it will give a worst-case scenario with regards to UK temperatures.

Test Reference Year (TRY): This set of data represents a typical/average year and is used for calculating average energy uses within buildings for steady state calculations and for Part L compliance.

For the purposes of this report, the Test Reference Year (TRY) has been used to calculate the development's energy and carbon emissions and compliance with Part L2A.

6.03.2 Internal Conditions

To determine the energy requirement of each zone, internal conditions are assigned to all relevant areas. An internal condition details the conditions to which each zone will be maintained and accounts for parameters such as occupancy gains, equipment gains, lighting, infiltration and ventilation, upper and lower temperatures. The NCM calculation methodology has pre-defined internal conditions which must be used to ensure consistent Part L2A calculations.

6.04 Building Geometry

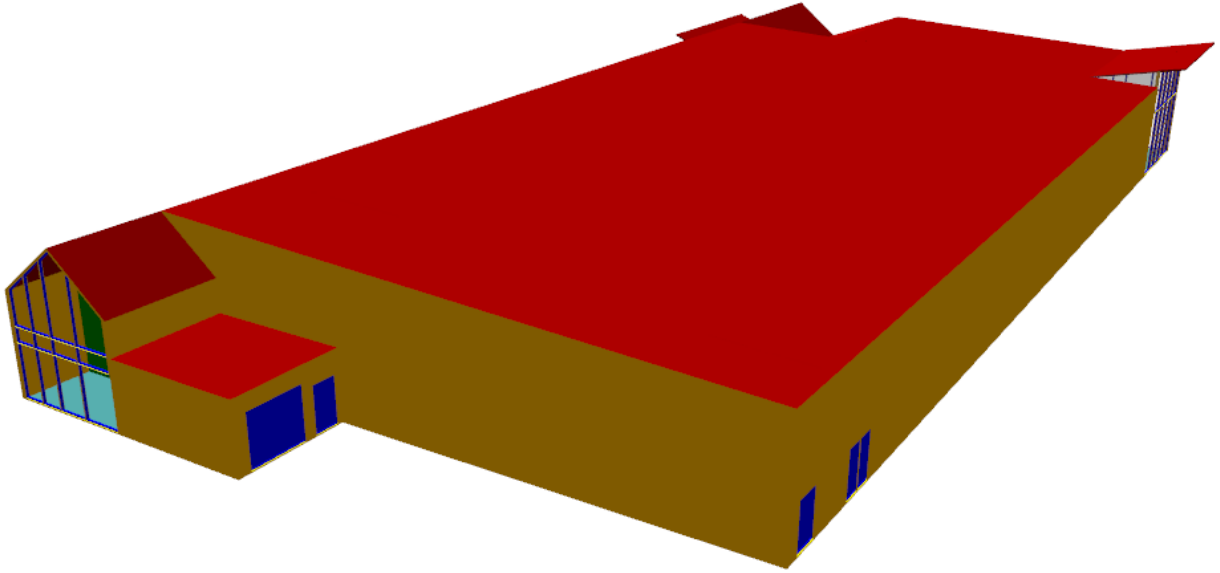


Figure 3 - North View

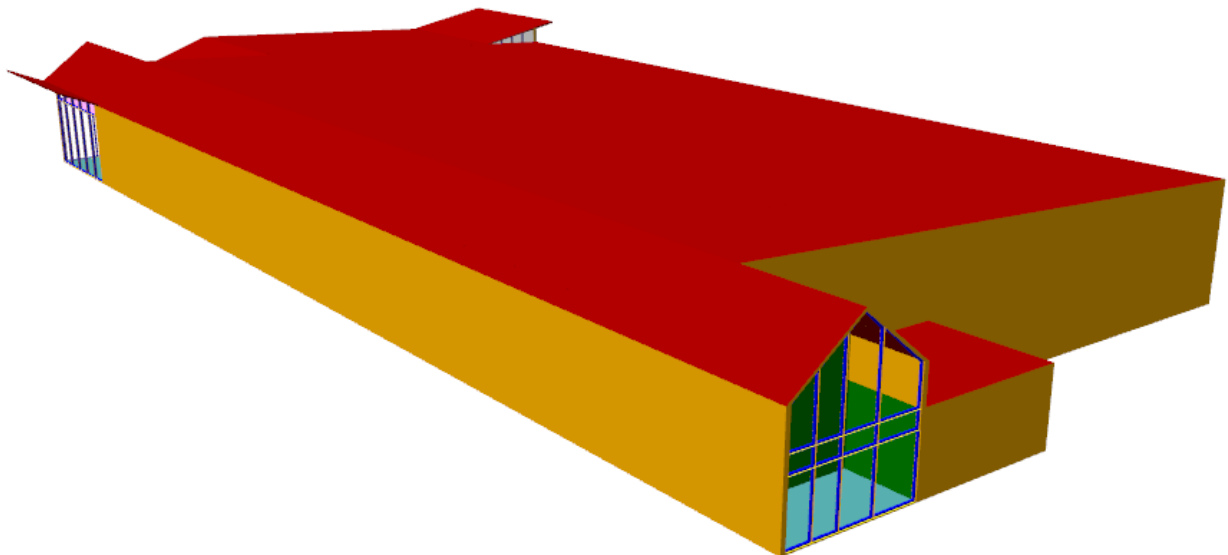


Figure 4 - East View

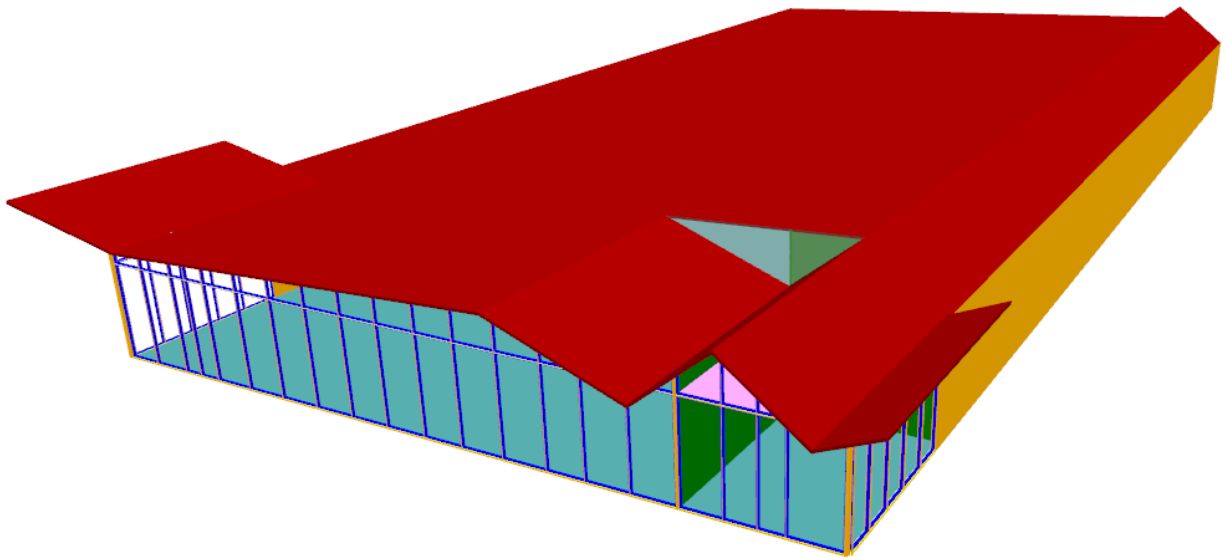


Figure 5 - South View

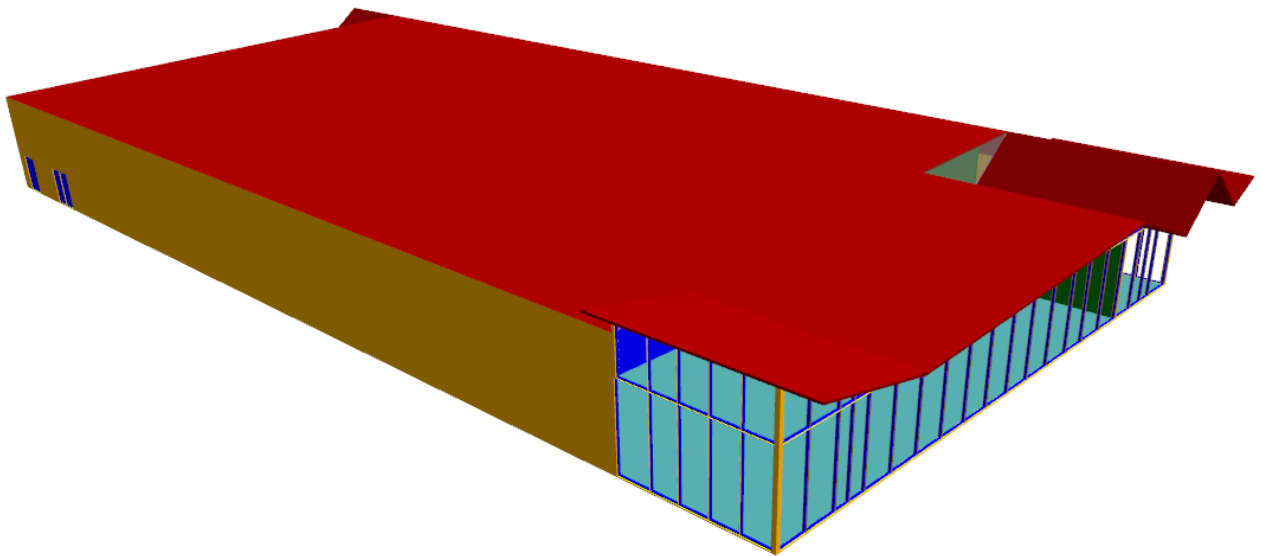


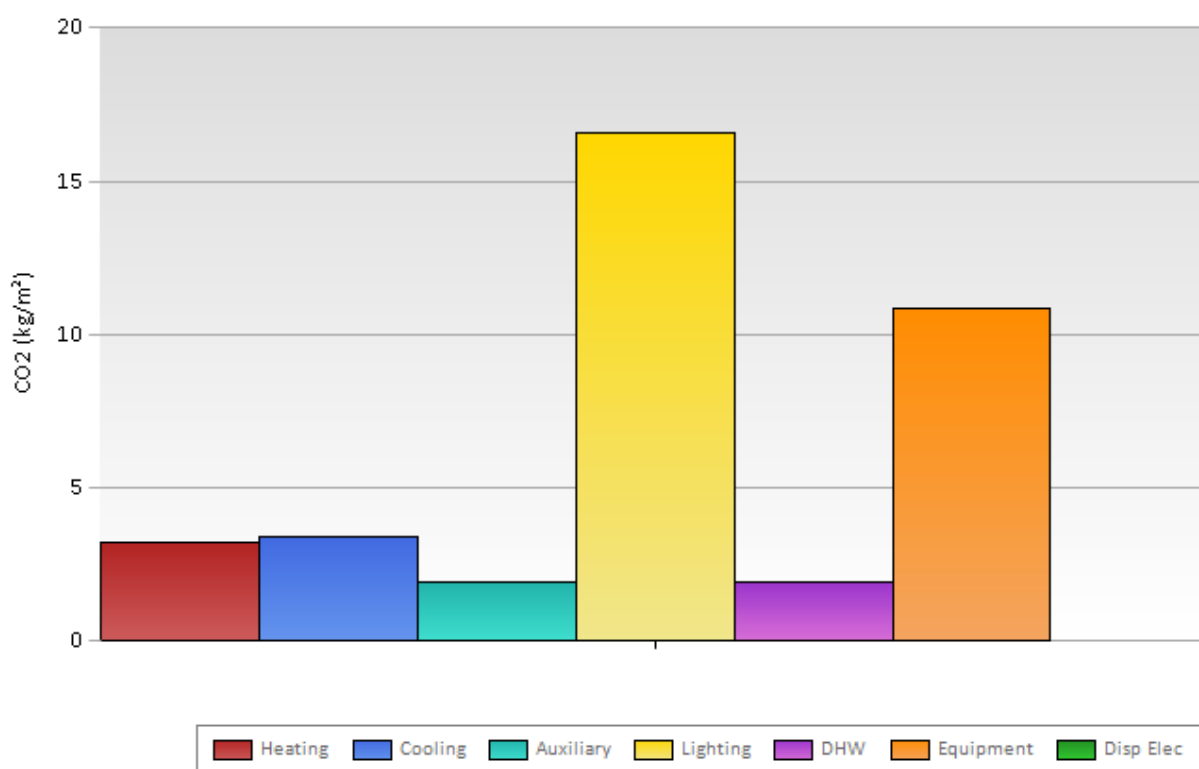
Figure 6 - West View

7.00 'PART L' – BASELINE PREDICTED ENERGY USAGE

The baseline against which each step of the energy hierarchy will be compared is the 'yard stick' determined by the Part L 2013 notional building.

The following section details the carbon emissions and annual energy consumption of the notional building. This offers a baseline for comparison which will be bettered by the actual design proposals put forward in this report.

7.01 Annual Carbon Dioxide Emissions of the Baseline Building

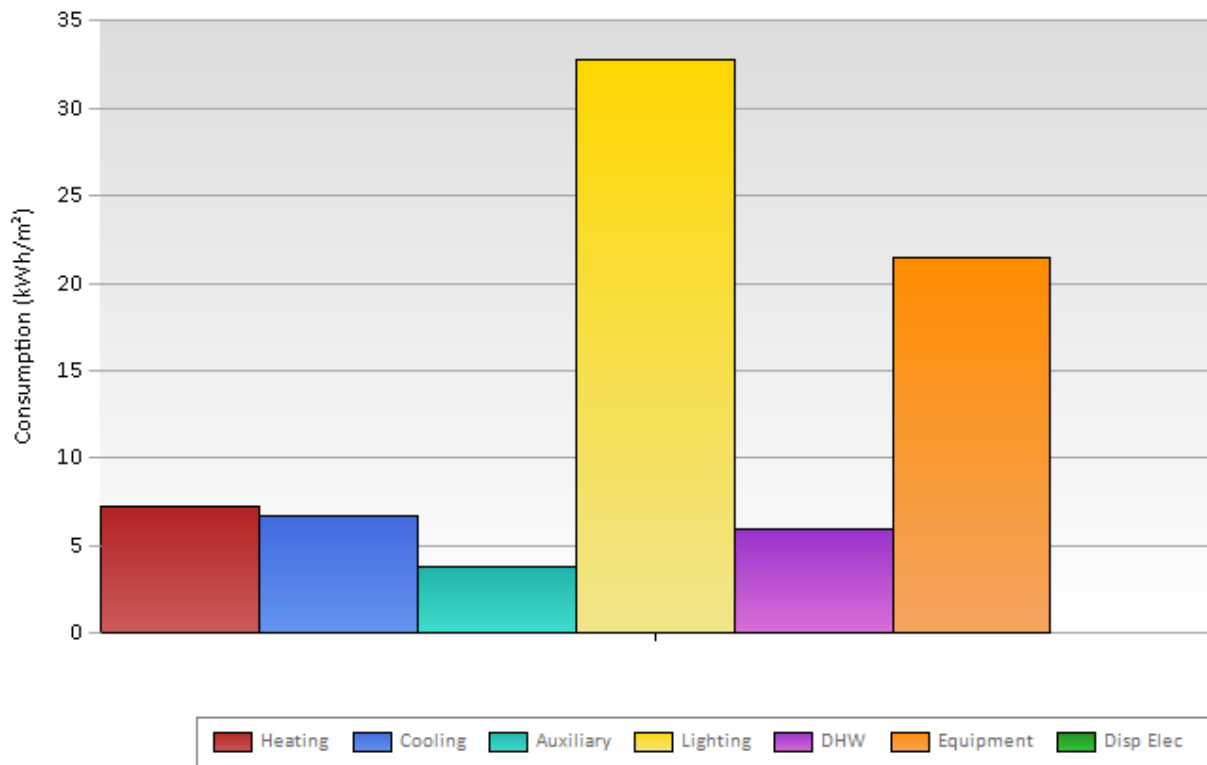


	Heating	Cooling	Auxiliary	Lighting	DHW	Equipment	Displaced Electricity
CO2 (kg/m²)	3.17	3.38	1.93	16.60	1.89	10.87	0.00

Figure 7 - Annual Carbon Emissions - Baseline

Fig 7 above shows an annual baseline CO₂ emissions rate of 51,323.91kgCO₂/year of regulated emissions and 72,009.52kgCO₂/year inclusive of unregulated emissions.

7.02 Annual Energy Consumption of the Baseline Building



	Heating	Cooling	Auxiliary	Lighting	DHW	Equipment	Displaced Electricity
Consumption (kWh/m²)	7.24	6.68	3.80	32.80	5.94	21.48	0.00

Figure 8 - Annual Energy Consumption - Baseline

Figure 8 above shows an annual baseline energy consumption rate of 107,443.38kWh/year of regulated energy and 148,319.82kWh/year inclusive of unregulated emissions.

8.00 'BE LEAN' – PASSIVE & ACTIVE DESIGN STRATEGIES

This section of the report describes the passive and active energy reduction features which have been considered and incorporated into the design. These constitute the 'Lean' measures, and the associated BRUKL output document can be found in Appendix A of this report.

8.01 Orientation and Site Location

The proposed Lidl store is located on Mauldeth Road West, Chorlton.

The store is orientated with a heavily glazed façade facing South-West. The emphasis on the southern orientation offers the advantage of natural daylighting contributions within the store. It could, however, lead to excessive levels of solar gains within the store, which, if left unmanaged could lead to overheating or excessive mechanical cooling loads and associated emissions. The design team will ensure solar gains are managed by offering enhanced fabric specifications, glazing performance and solar shading through overhangs. This reduces the dependency on electric lighting through the natural contribution towards internal lighting levels, whilst ensuring mechanical cooling loads are minimised.

The site receives little over shading or overlooking offering privacy to the store and maintained privacy to the residential houses surrounding the site. The development has good local transport links and is near residential properties, ensuring transport associated carbon emissions can be reduced.

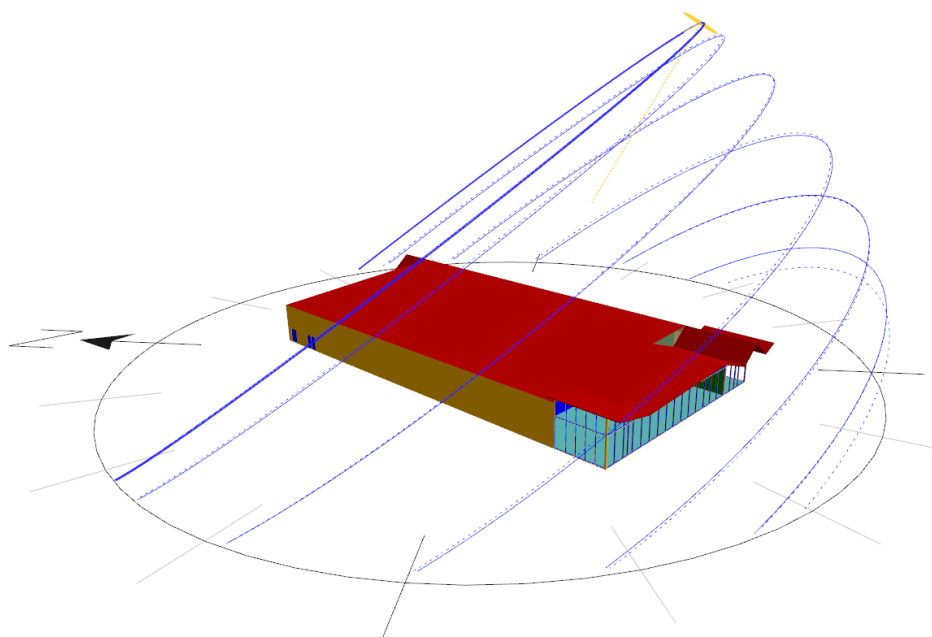


Figure 9 - Orientation & Sun Path Image

8.02 Fabric Performance and Thermal Mass

Focusing on the fabric thermal performance, ensures the building has reduced conductive heat loss during winter months and reduced conductive heat gains during summer months. This allows the internal environmental conditions to be better managed with reduced reliance on mechanical systems. This will in turn reduce energy demand, running cost and emissions whilst offering enhanced occupancy satisfaction.

With enhanced glazing properties, solar penetration is controlled reducing the potential for excess solar gains, as well as excessive levels of heat loss during winter months. Lidl have specified a high-performance glazing system which significantly betters the minimum standards of Part L2A to minimise the heat loss and enhance the insulation properties, whilst minimising solar gains to avoid overheating. Automatic internal sun blinds will also be installed, to mitigate against the solar penetration and potential glare risk within the checkout zone.

The following table details the anticipated fabric efficiency standards to be incorporated into the design. They have been set and compared against the minimum standards of Part L2A for reference purposes and to demonstrate Lidl's intent to exceed minimum standards.

Exposed element	Part L2A Minimum Standards	Lidl Store Proposed U-values	Improvement over Part L2A
Roofs	0.25 W/m ² K	0.19 W/m ² K	26.92%
Walls	0.35 W/m ² K	0.25 W/m ² K	28.57%
Ground Floors	0.25 W/m ² K	0.25 W/m ² K	0.00%
Windows	2.20 W/m ² K	1.70 W/m ² K (g-value = 0.4)	22.72%
Vehicle access and similar large doors	1.50 W/m ² K	1.50 W/m ² K	0.00%
Pedestrian doors	2.2 W/m ² K	2.2 W/m ² K	0.00%
High usage entrance door	3.5 W/m ² K	1.7 W/m ² K	51.43%
Air Tightness Testing	10 m ³ /(h.m ²)@50Pa	4 m ³ /(h.m ²)@50Pa	60.00%

Figure 10 - U-value Comparison

As can be seen in the table above, the targeted 'U' values demonstrate a significant betterment over the minimum standards as detailed in the *Approved Document Part L2A, Table 3, Limiting Fabric Parameters* of the Building Regulations. This demonstrates Lidl's commitment to going above and beyond to ensure a sustainable development.

8.03 Thermal Mass

The concrete floor slab of the proposed Lidl Store has been specified to give a relatively high thermal mass which will assist in reducing internal temperature fluctuations due to external temperature variations, to give a more easily controlled environment inside the building. The building would be considered to have low to medium thermal mass.

8.04 Heating System

For the 'Be Lean' Stage, we have assumed the store will be served by a natural gas-fired boiler with a notional efficiency of 91%, which is the minimum efficiency standard stated in the Non-domestic Building Services Compliance Guide 2013 Edition.

8.05 Natural Ventilation

Due to the deep floor plans, a natural ventilation strategy has not been adopted to the Sales Area. However, the mechanical ventilation strategy allows heat to be recovered from the stale air when it is extracted, thus tempering the fresh incoming air to reduce the heating coil loads. This is not something usually achievable with naturally ventilated strategies so advantages over passive strategies can be gained.

8.06 Mechanical Ventilation

The Sales Area will be heated, cooled, and ventilated through the incorporation of a centralised air handling unit with heat recovery, with an efficiency of more than 80%. Energy efficient EC fans will be specified to reduce auxiliary loads and staged direct-expansion (DX) heating and cooling changeover coils, fed via Air Source Heat Pumps (an LZC technology) will provide the air distribution, heating, and cooling requirements.

All toilets shall be provided with extract ventilation. This will comprise of a mix between extract only, and mechanical ventilation with heat recovery (MVHR) units. Where extract only fans are provided, infra-red motion detectors will be installed ensuring they operate only when occupancy is detected. This reduces running time and ensures the fans are only used when necessary.

Where mechanical supply and extract is required, a MVHR unit will be installed. This ensures any fresh air entering the space is pre-treated by extracted air bringing it closer to the internal design temperature. This reduces the load on the heating/cooling system whilst still maintaining the necessary fresh air rates. This will also be controlled by PIR occupancy detectors.

8.06.1 Low Energy Fans

Low energy fans will be used with specific fan powers as good as or better than the limiting efficiencies detailed in the Non-Domestic Building Services Compliance Guide (2013).

8.06.2 Variable Speed Drives

Variable speed drives will be used to ensure fans operate no faster than required, thereby reducing energy consumption.

8.07 Sub-Metering

Separate sub-metering will be installed. This has obvious financial and sustainable benefits, allowing for financial verification with regards to consumption vs cost as well as allowing for consumption figures to be monitored and any out-of-range values easily identified, and energy wastage eliminated.

8.08 Low Energy Lighting and Controls

A high proportion of glazing will significantly reduce the dependences and output requirements on electric lighting offering reduced energy demand and carbon emissions and enhanced occupancy comfort.

LED lamps will be provided throughout, both for internal spaces and the external car park. LED lamps have a very low energy consumption and have a life expectancy exceeding that of conventional light bulbs. This reduces both energy use and waste.

Infra-red motion sensor will be provided throughout the Warehouse and all Side Rooms, so that lights are only turned on when the rooms are occupied.

8.09 Building Energy Management System

A full building management system will be incorporated to ensure plant is controlled and operated efficiently.

8.10 Building Energy Performance

All the above systems will be designed in accordance with the 'Non-Domestic Building Services Compliance Guide', CIBSE recommendations and relevant British Standards. The incorporation of 'Good Practice' engineering design coupled with the provision of renewable systems (described below) will ensure that an energy efficient store is achieved, minimising the energy consumption and associated CO2 emissions through its life cycle.

8.11 Water Efficiency

Water is becoming an increasingly scarce resource, with new development generating a growing demand. To meet increased demand new water sources and associated infrastructure need to be in place.

Main cold-water consumption for the store will be reduced through water efficiency.

This will be achieved through the provision of efficient water fittings throughout the store, including services valves complete with flow restrictors, (also helping to reduce hot water demand), dual flush toilets, and low water consumption appliances where provided, as outlined below:

Fittings	Flow rate
Wash Hand Basin	0.049 litres/second
Sink (Kitchenette)	0.08 litres/second
Sink (Bakery, Sluice, Cleaners)	0.12 litres/second
Urinal	2 litres/bowl/hour
WC	4 litres
Dishwasher	12 litres/cycle

The store will incorporate water efficient fittings in line with equivalent BREEAM standards to reduce water consumption.

The incoming mains cold water supply will be separately metered, using a smart meter to allow Lidl and the local water authority to easily monitor water consumption. There will also be a water sub-meter in the utility room, which will be connected to the store building management system and will record and monitor store consumption.

9.00 'BE CLEAN' – DECENTRALISED LOW CARBON TECHNOLOGIES

A low or zero carbon technology is defined as something which either; produces energy through an endless, renewable source with low or zero carbon emission throughout its operation, or one in which uses a specific energy source i.e., electricity and provides a significantly higher output to input ratio.

Detailed below are the types of low or zero carbon technologies considered for implementation on this development. A series of centralised and decentralised systems have been analysed and viability stated to offer justification for use or omission.

9.01 Combined Heat and Power (CHP)

Combined Heat and Power (CHP) is the on-site generation of electricity and the recovery of the normally wasted heat produced during this process.

- The operation of CHP plant can offer significant CO₂ emission rate reductions when compared to conventional methods of energy generation and use.
- Most large conventional power stations currently generate electricity at 30-50% efficiency (due to waste heat and transmission/distribution loss).
- 'Good quality' CHP schemes achieve overall efficiencies of 70-85% by making use of waste heat and eliminating transmission losses.

The efficient use of CHP typically depends on finding a use for the heat generated by the process. Issues to consider include:

- If heat is not used, then the system is effectively just an electricity generator and electricity will be greener and cheaper if sourced from the national grid.
- If excess electricity is generated on site this can be exported (sold) back to the grid whereas excess heat needs to be rejected (wasted). Exported electricity can count towards reducing the site's CO₂ emissions.
- Exported electricity will typically not be financially attractive as exports tend to coincide with low demand periods on the national grid. The cost of producing the electricity on site can be less than the prices received for the exported electricity.

9.01.1 Viability

The introduction of a CHP unit will reduce running costs and carbon dioxide emissions associated with the operation of the building when compared to employing a conventional generator and/or boiler. However, the CHP plant should always operate as the lead heat source to maximise savings.

CHP systems require steady, constant loads all year round for best performance, with high running hours. This type of running schedule will usually be found in applications with high domestic hot water loads such as hotels, hospitals, care homes etc. Food retail stores have an inherently low hot water demand and therefore a CHP plant would not be deemed viable due to the lengthy amount of the year where the CHP engine would be sitting idle due to lack of thermal demand.

It can therefore be concluded that the possibility of introducing a combined heat and power system is both un-sustainable and un-economically viable on this project.

9.02 Decentralised Energy Networks (DEN)

9.02.1 Heat Density

Based on the heat density map below from The Department for Business, Energy and Industrial Strategy, the surrounding area has a moderate heat density surrounding the site and associated with the surrounding area. Much of the associated heat density is residential. The low heat density associated with commercial or industrial units renders the possibilities of introducing a district heating network to the area low due to the high cost and low return potential.

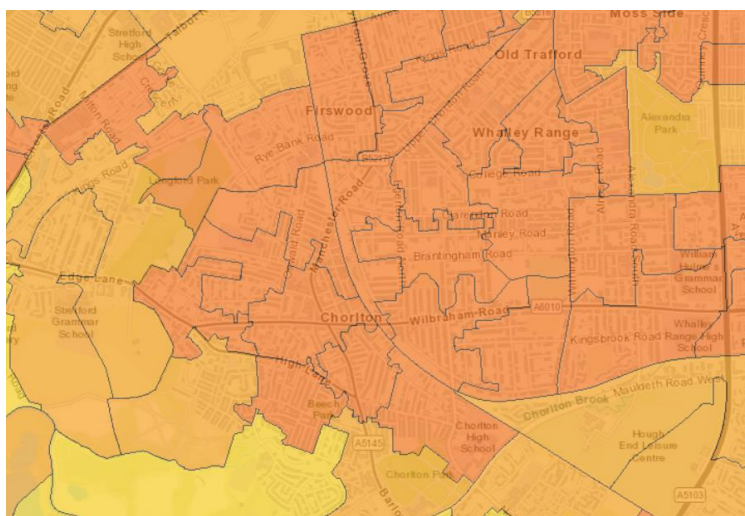


Figure 11 -The Department for Business, Energy & Industrial Strategy Heat Density Map

9.02.2 Existing Networks

The below map from The Department for Business, Energy and Industrial Strategy shows there are no current district heating schemes within the area.

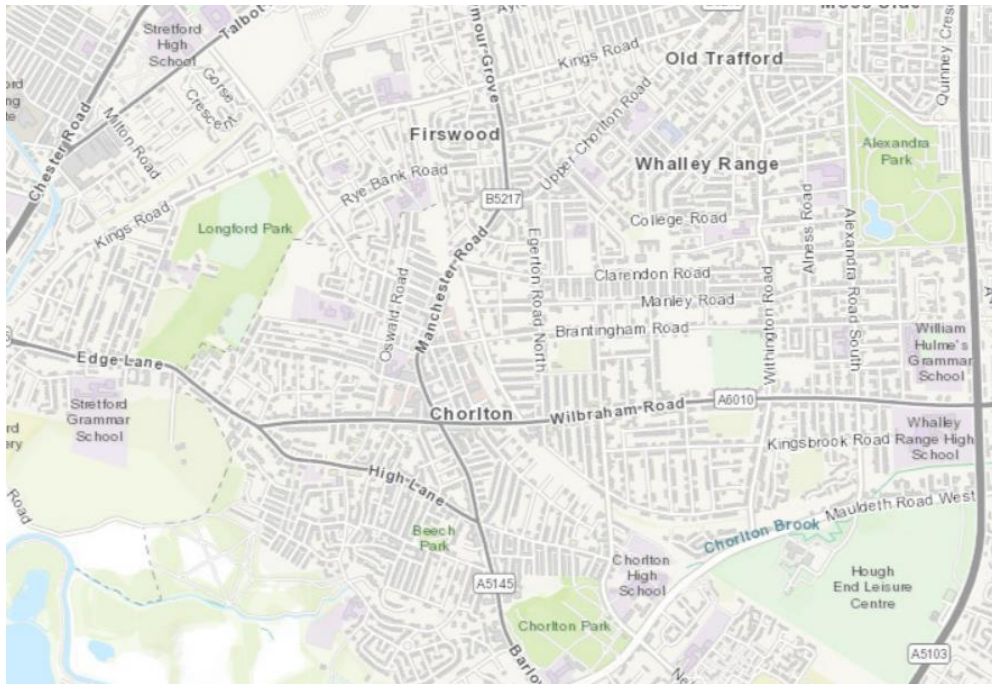


Figure 12 - The Department for Business, Energy & Industrial Strategy Current District Heating Schemes

9.02.3 Viability

As detailed in the above Heat Map, there are no current district heating networks, so the building services design strategy cannot be focused on the connection to a decentralised system.

10.00 'BE GREEN' – LOW OR ZERO CARBON TECHNOLOGIES

A low or zero carbon technology is defined as something which either; produces energy through an endless, renewable source with low or zero carbon emission throughout its operation, or one which uses a specific energy source i.e., electricity and provides a significantly higher output to input ratio.

Due to the unviable incorporation of Combined Heat and Power (CHP), and current lack of existing district heating networks, the development will be required to incorporate “Individual building renewable systems” to ensure compliance with local and national planning requirements.

10.01 Biomass Boiler

Biomass in the form of logs, wood chips and wood pellets are classified as a low carbon source of energy because the carbon dioxide emitted when the biomass is burned has been taken out of the atmosphere by the growing plants, even allowing for emissions of carbon dioxide in planting, harvesting, processing, and transporting the fuel. Replacing fossil fuel with biomass fuel will typically reduce net CO₂ emissions by over 90%.

Wood fuel efficiencies vary enormously due to several factors including the moisture content of the fuel. Fuels with high moisture content requires more energy to be combusted as it must first dry out before it can be converted to energy. This emphasises the need for good quality onsite storage facilities and a good quality fuel supply.

Wood fuels also have varying calorific value. A high calorific value refers to the amount of energy the wood contains compared to waste products such as bark, which can form ash as a by-product.

Biomass boilers are unsuitable for applications that have large fluctuations in thermal loads, unless a large heat sink or buffer vessel is used.

Unlike most other renewable energy sources, biomass can be stored and used on demand to give controllable energy. It is therefore free from the problem of intermittency, which affects both solar and wind technologies. However, unlike wind and solar, biomass energy is not “free” and so a reliable, sustainably managed, and cost-effective source of biomass needs to be secured.

10.01.1 Fuel delivery & fuel storage:

Fuel storage and regular supply is key for efficient running of Biomass boilers. Biomass fuel will absorb moisture if exposed to it and can biodegrade if not kept dry, therefore, the store must be well maintained to prevent contact between moisture and pellets. The storage facility must also allow for easy access to ensure deliveries can be made efficiently. A larger storage facility will allow for less frequent deliveries and more reserve in case of delays. The National Biofuel Supply Database shows there are several suppliers within a reasonable radius of the site.

10.01.2 Viability

This technology can provide the development with significant savings for a relatively low cost however, an overriding reason against using a biomass system is the space restrictions on this site and the lack of available space for the storage and delivery of the fuel. In addition to this, the high NO_x emissions, and particle content of the exhaust gases from typical small-scale biomass units may raise objections from the Environmental Agency and planning department.

Considering this, biomass boilers are considered not to be a viable option for the proposed development.

10.02 Solar Thermal

Solar thermal collectors utilise solar radiation to heat water for use in water heating of a building. The radiation is converted using a solar collector, of which there are two main types available: Flat Plate and Evacuated Tube collectors. Evacuated tube systems occupy a smaller area and are more efficient, but also generally more expensive. Flat plate systems are cheaper to install but generally less efficient.

The solar coverage indicates the percentage of the annual domestic hot water energy requirement that can be covered by a solar water heating system. The higher the solar coverage, the more conventional energy usage can be offset, but this can cause excess heat generation in the peak summer months and generally lower the average collector efficiency. Therefore, solar coverages of 40-70% are recommended for domestic applications and up to 40% in non-domestic buildings.

Solar thermal systems in the UK normally operate with a backup fuel source, such as gas or electricity. The solar system pre-heats the water up to a maximum hot water temperature. If there is not enough solar power available to fully meet the required hot water load, then the backup fuel system fires up to meet this short fall.

The optimum orientation for a solar collector in the UK is a south facing surface, tilted at an angle of 30° from the horizontal.

For the solar water heating system to run safely and efficiently, a series of temperature sensors are connected to a digital solar controller to switch the system on or off according to the solar energy available.

10.02.1 Viability

Solar thermal panels are suited to buildings with a high and consistent hot water demand. Lidl Stores inherently have a low hot water demand and therefore, a solar thermal array would not be deemed viable or cost effective.

10.03 Air Source Heat Pump (ASHP)

Air source heat pumps exchange heat between the outside air and a building to provide space heating in winter and cooling in the summer months. The efficiency of these systems is inherently linked to the ambient air temperatures. Air source heat pumps operate best in environments with long, mild, mid-season periods, as the heating efficiency drops at lower ambient temperature in winter.

Unlike some other sources of renewable energy, heat pumps do require electricity to pump and compress refrigerants through the system. However, heat pumps supply more energy than they consume, by extracting heat from their surroundings. Heat pump systems can supply as much as 4kW of thermal energy for just 1kW of electrical energy input, which is why they are recognised as a renewable technology under the Renewable Energy Directive 2009/28/EU.

10.03.1 Viability

ASHP's have been deemed a suitable way of offering space heating to the Sales Area, Warehouse and Side Rooms.

The Sales Area will be conditioned using an internal centralised intelligent AHU, with staged direct expansion heating and cooling changeover coils, fed via a two pipe VRF system.

For the Warehouse and Side Rooms, a three pipe VRF system with heat recovery capabilities will be utilised, which will work with ceiling mounted cassettes, or wall mounted units.

- Seasonal Coefficient of Performance: ≥3.5

- Seasonal Energy Efficiency Ratio: ≥ 4.5

The efficiencies detailed above exceed minimum national standards, ensuring the heating and cooling provided is of the highest standards available on the market for the selected type of Air Source Heat Pump.

10.04 Photovoltaics (PV)

Photovoltaic solar cells convert solar energy directly into electricity. The cells consist of two layers of silicon with a chemical layer between. The incoming solar energy charges the electrons held within the chemical. The energised electrons move through the cell into a wire creating an electrical current.

A range of Photovoltaic products and colours are available, varying in efficiency and cost. These include Monocrystalline, Polycrystalline, Thin Film and Hybrid Panels. Hybrid Panels are the most energy efficient and Thin Film the least.

All the above technologies can be installed in roof and wall mounted arrays or as integrated building members, giving the additional benefit of offsetting the cost of other construction materials, such as weatherproof roof membranes or integrated into glazed wall constructions.

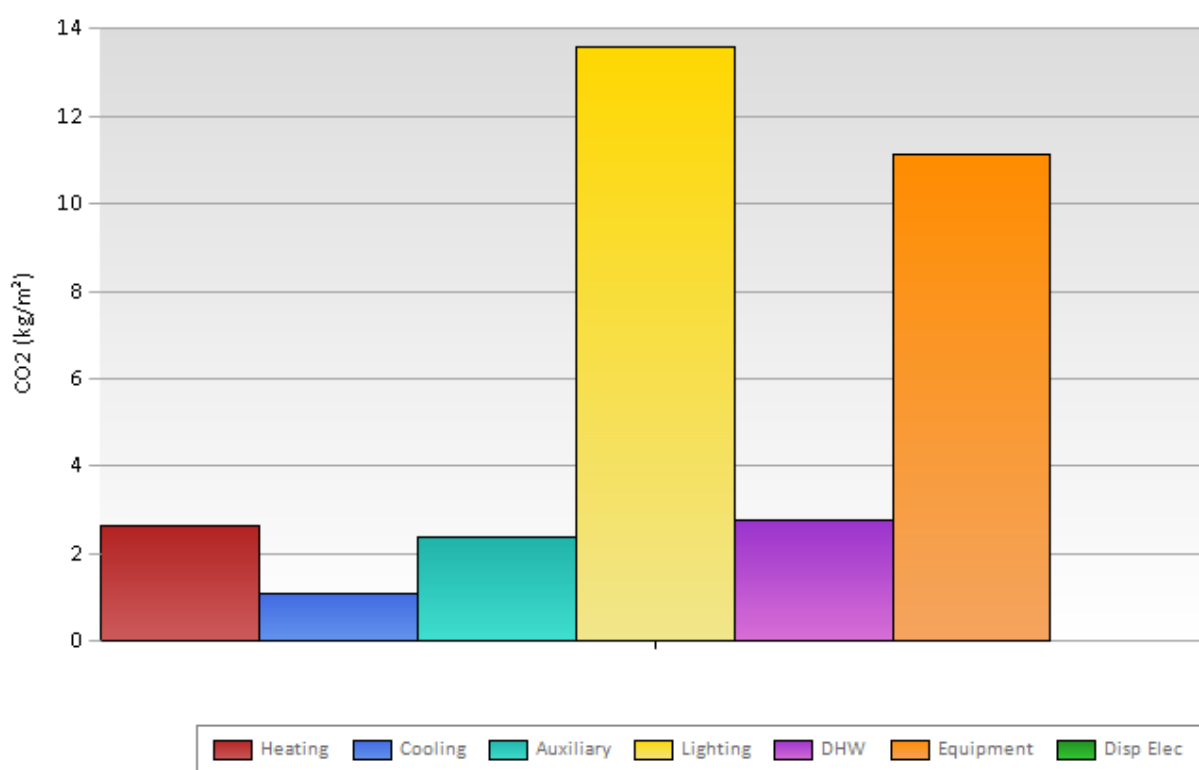
10.04.1 Viability

Photovoltaic panels have not been deemed necessary on this store and as such, have been discounted from the building services design strategy.

11.00 'BE LEAN', 'BE CLEAN' AND 'BE GREEN' – PREDICTED ENERGY USAGE

The following section details the predicted annual carbon emissions and energy consumption based on the TAS model of the building once all passive and active design strategies detailed in section 8.00, 9.00, 10.00, 11.00 and 12.00 have been allowed for.

11.01 Predicted Annual Carbon Emissions of the Actual Building

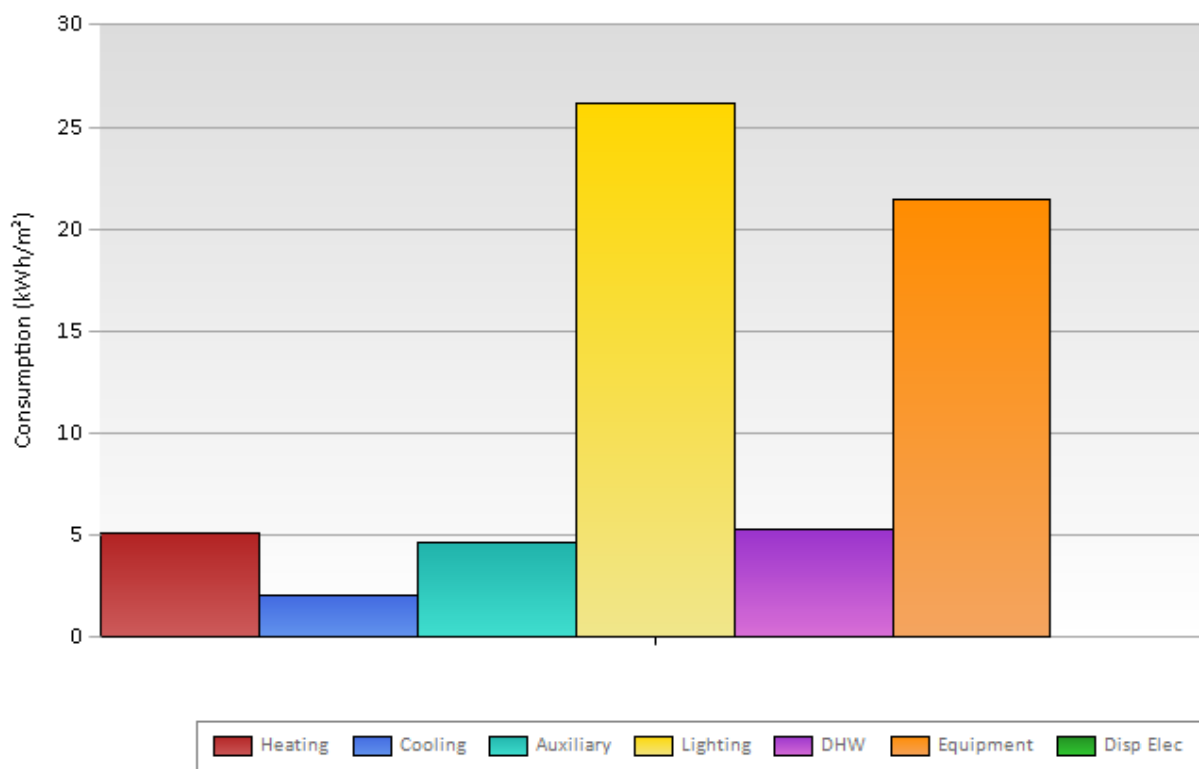


	Heating	Cooling	Auxiliary	Lighting	DHW	Equipment	Displaced Electricity
CO2 (kg/m²)	2.62	1.07	2.38	13.59	2.74	11.15	0.00

Figure 13 - Annual Carbon Dioxide Emissions - Be Green

Figure 17 shows an annual CO₂ emissions rate of 42,627.20kgCO₂/year of regulated emissions and 63,845.65kgCO₂/year inclusive of unregulated emissions. This represents a **16.94%** and **11.34%** carbon dioxide reduction respectively over the 2013 baseline detailed within section 7.0.

11.02 Predicted Annual Energy Consumption of the Actual Building



	Heating	Cooling	Auxiliary	Lighting	DHW	Equipment	Displaced Electricity
Consumption (kWh/m²)	5.05	2.07	4.58	26.18	5.28	21.48	0.00

Figure 14 - Annual Energy Consumption - Be Green

Figure 18 above shows an annual energy consumption requirement of 82,133.48kWh/year of regulated energy and 123,009.92kWh/year inclusive of unregulated energy. This shows an annual energy consumption reduction of **23.56%** and **17.06%** respectively over the 2013 baseline detailed within section 7.0.

12.00 CONCLUSION

The energy statement has demonstrated the proposed Lidl store located at Mauldeth Road West, Chorlton will:

Incorporate passive design strategies to take advantage of:

- Natural daylighting through careful building and glazing orientation. This will offer a reduced dependency on electric lighting through the contribution of natural lighting to achieve the required Lux levels.
- Enhanced fabric efficiencies and thermal mass have been allowed for to help stabilise any temperature fluctuations within the building reducing heat gains and/or losses.

Incorporate active design strategies to reduce energy consumption by:

- Introduce heat recovery ventilation to pre-heat incoming fresh air. This will reduce the energy loads associated with fresh air heat loss/gains.
- Introduce separate sub-metering to allow for all energy consumed to be monitored and any discrepancies easily identified and fixed thus minimising wasted energy.
- Low energy lighting will be installed with suitable controls to ensure lights are not left on unnecessarily. Suitable controls will eliminate human error.
- Building energy management system (BEMS) will be designed and installed to manage all systems effectively, ensuring their efficiencies are maintained and achieved.

The Part L 2013 baseline annual carbon emissions and energy consumption has been calculated as follows:

- Regulated Annual Carbon Dioxide Emissions: **51,323.91kgCO₂/annum.**
- Regulated Annual Energy Consumption: **72,009.52kWh/annum.**

Combined Heat and Power and De-centralised Energy Network (DEN) solutions have been reviewed and discounted as they are considered to be unviable for this store due to:

- Unsuitable energy consumption profiles for CHP (require high DWS consumption).
- No suitable De-centralised Energy Networks (DEN) in the vicinity of the development.

Alternative Low or Zero Carbon (LZC) technologies have been analysed with the following deemed to be both viable and advisable:

- Air Source Heat Pumps, or Aero-thermal Heat Pumps.

The 'Be Green' actual building annual carbon emissions and energy consumption has been calculated as follows:

- Regulated Annual Carbon Dioxide Emissions: **42,627.20kgCO₂/annum.**
- Regulated Annual Energy Consumption: **82,133.48kWh/annum.**

These show a **16.94%** carbon dioxide reduction and a **23.56%** energy reduction, when assessed to Part L2A 2013 Building Regulations and accounting for the proposed passive, active and LZC strategies.

APPENDIX A – ‘BE GREEN’ BRUKL OUTPUT DOCUMENT

Project name

Lidl Chorlton - Be Green**As designed****Date:** Mon Jan 16 08:59:53 2023**Administrative information****Building Details****Address:** Lidl Store, Chorlton, ,**Certification tool****Calculation engine:** TAS**Calculation engine version:** "v9.5.4"**Interface to calculation engine:** TAS**Interface to calculation engine version:** v9.5.4**BRUKL compliance check version:** v5.6.b.0**Certifier details****Name:** Andrew Parry**Telephone number:** 01924 265757**Address:** RCM Business Centres, Dewsbury Road, Ossett, Wakefield, WF5 9ND**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	27
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	27
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	22.4
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	0.25	0.25	External Wall
Floor	0.25	0.25	0.25	Ground Floor
Roof	0.25	0.19	0.19	Roof
Windows***, roof windows, and rooflights	2.2	1.28	1.28	High Level Glazing-exposed
Personnel doors	2.2	2.09	2.2	Solid Door
Vehicle access & similar large doors	1.5	1.5	1.5	Roller Shutter
High usage entrance doors	3.5	1.7	1.7	Main Entrance Door - Door
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	4

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

1- VRF with Mech. Vent. - Sales Floor (2 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.36	7	-	1.91	0.83
Standard value	2.5*	2.6	N/A	1.6^	0.65
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.					
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

2- VRF with Mech. Vent. (DRS - Store 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.33	6.29	-	1.15	0.81
Standard value	2.5*	2.6	N/A	1.6^	0.5
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.					
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

3- VRF with Mech. Vent. (3 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.33	6.29	-	1.19	0.81
Standard value	2.5*	2.6	N/A	1.6^	0.5
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.					
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

4- VRF with Nat. Vent. (2 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.33	6.29	-	-	-
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.					

5- Mechanical Ventilation (3 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	0.6	0.81
Standard value	N/A	N/A	N/A	1.5^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

6- Mechanical Ventilation (Entrance Lobby - Circulation 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	0.58	0.81
Standard value	N/A	N/A	N/A	1.5^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

7- Extract Only (2 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	0.5	-
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

1- 30 Litre Sluice

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0
Standard value	N/A	N/A
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.		

2- 15 Litre Bakery

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.03
Standard value	0.9*	N/A
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.		

3- 15 Litre Staff Room

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.02
Standard value	0.9*	N/A
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.		

4- Instantaneous Electric

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	1	N/A

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			
Entrance Lobby - Circulation 1	-	-	-	0.6	-	-	-	-	-		-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Bakery - EatDrink 1	-	-	-	0.5	-	-	-	-	-	-	N/A
Staff Room - FoodPrep 1	-	-	-	1.2	-	-	-	-	-	-	N/A
Cash Office - Office 1	-	-	-	1.2	-	-	-	-	-	-	N/A
Meeting Room - Office 2	-	-	-	1.2	-	-	-	-	-	-	N/A
Lidl Sales Floor (PEC) - RetWareSales-1	-	-	-	1.9	-	-	-	-	-	-	N/A
Lidl Sales Floor (No PEC) - RetWareSales 2	-	-	-	1.9	-	-	-	-	-	-	N/A
DRS - Store 1	-	-	-	1.2	-	-	-	-	-	-	N/A
Cloakroom - Store 4	-	-	-	0.6	-	-	-	-	-	-	N/A
Customer WC - Toilet 1	-	-	-	0.5	-	-	-	-	-	-	N/A
Staff WC 1 - Toilet 2	-	-	-	0.6	-	-	-	-	-	-	N/A
Staff WC 2 - Toilet 3	-	-	-	0.6	-	-	-	-	-	-	N/A

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
IT Room - 24HrMisc		140	-	-	76
Entrance Lobby - Circulation 1		-	105	-	144
Cash Office Lobby - Circulation 2		-	140	-	17
GF Stairwell - Circulation 3		-	105	-	93
Admin Corridor - Circulation 5		-	105	-	93
Bakery - EatDrink 1		-	125	22	508
Staff Room - FoodPrep 1		-	450	-	42
Cash Office - Office 1		140	-	-	94
Meeting Room - Office 2		140	-	-	104
Lidl Sales Floor (PEC) - RetWareSales 1		-	150	99	1644
Lidl Sales Floor (No PEC) - RetWareSales 2		-	160	99	10137
DRS - Store 1		170	-	-	264
BOH Warehouse - Store 2		160	-	-	520
Utility - Store 3		140	-	-	73
Cloakroom - Store 4		105	-	-	59
Customer WC - Toilet 1		-	110	-	47
Staff WC 1 - Toilet 2		-	110	-	23
Staff WC 2 - Toilet 3		-	110	-	22

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?
IT Room - 24HrMisc	N/A	N/A
Bakery - EatDrink 1	NO (-99%)	NO
Staff Room - FoodPrep 1	N/A	N/A
Cash Office - Office 1	N/A	N/A
Meeting Room - Office 2	N/A	N/A
Lidl Sales Floor (PEC) - RetWareSales 1	YES (+94%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Lidl Sales Floor (No PEC) - RetWareSales 2	NO (-95%)	NO
DRS - Store 1	NO (-77%)	NO
BOH Warehouse - Store 2	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?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	1903	1903
External area [m ²]	4961	4961
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	4	6
Average conductance [W/K]	1478	1542
Average U-value [W/m ² K]	0.3	0.31
Alpha value* [%]	3.91	3.91

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

Building Use

% Area	Building Type
99	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 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	5.05	7.24
Cooling	2.07	6.68
Auxiliary	4.58	3.8
Lighting	26.18	32.8
Hot water	5.28	5.94
Equipment*	21.48	21.48
TOTAL **	43.14	56.46

* 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	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]	106.24	141.84
Primary energy* [kWh/m ²]	132.45	152.81
Total emissions [kg/m ²]	22.4	27

* 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] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
Actual	13	61.2	0.8	2.4	5.6	4.36	7	4.36	7	
Notional	24	108.7	2.8	8.4	4.4	2.43	3.6	----	----	
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
Actual	62.2	43.8	4	1.9	6.5	4.33	6.29	4.33	6.29	
Notional	61	85.4	7	6.6	5.2	2.43	3.6	----	----	
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
Actual	269.3	57.7	17.3	2.6	0	4.33	6.29	4.33	6.29	
Notional	134.5	59.1	15.4	4.6	0	2.43	3.6	----	----	
[ST] No Heating or Cooling										
Actual	76	0	21.1	0	2.7	1	0	1	0	
Notional	78.4	0	26.6	0	8.3	0.82	0	----	----	
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
Actual	186.9	0	51.9	0	8.9	1	0	1	0	
Notional	154.5	0	52.4	0	7.1	0.82	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	0.25	External Wall
Floor	0.2	0.25	Ground Floor
Roof	0.15	0.19	Roof
Windows, roof windows, and rooflights	1.5	1.28	High Level Glazing
Personnel doors	1.5	1.7	Stairwell Door - Door
Vehicle access & similar large doors	1.5	1.5	Roller Shutter
High usage entrance doors	1.5	1.7	Main Entrance Door - Door
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	4