PROJECT:	**ST. LAURENCE'S PARK**
SUBJECT:	**ENERGY REPORT**
REFERENCE:	**18044**
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Revision History

Revision	Date	By	Checked	Approved
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1.0 EXECUTIVE SUMMARY

The purpose of this report is to outline the fabric and services specification strategy for the proposed development at St. Laurence's Park, to demonstrate compliance with Part L of the building regulations.

The proposed development comprises of:

- 88 dwellings across 3no. blocks.
- Library

The proposed development will be designed to meet Approved Document Part L 2017 & 2019 nearly Zero Energy Buildings Standard (nZEB) for both non-residential and residential buildings.

The report will outline target U-Values of each fabric element, air permeability and the strategy for the space heating, hot water and ventilation.

Please note the specification and efficiencies outlined within this report are based on calculations and design information available at the time of writing. This analysis will be developed further at the next stage.

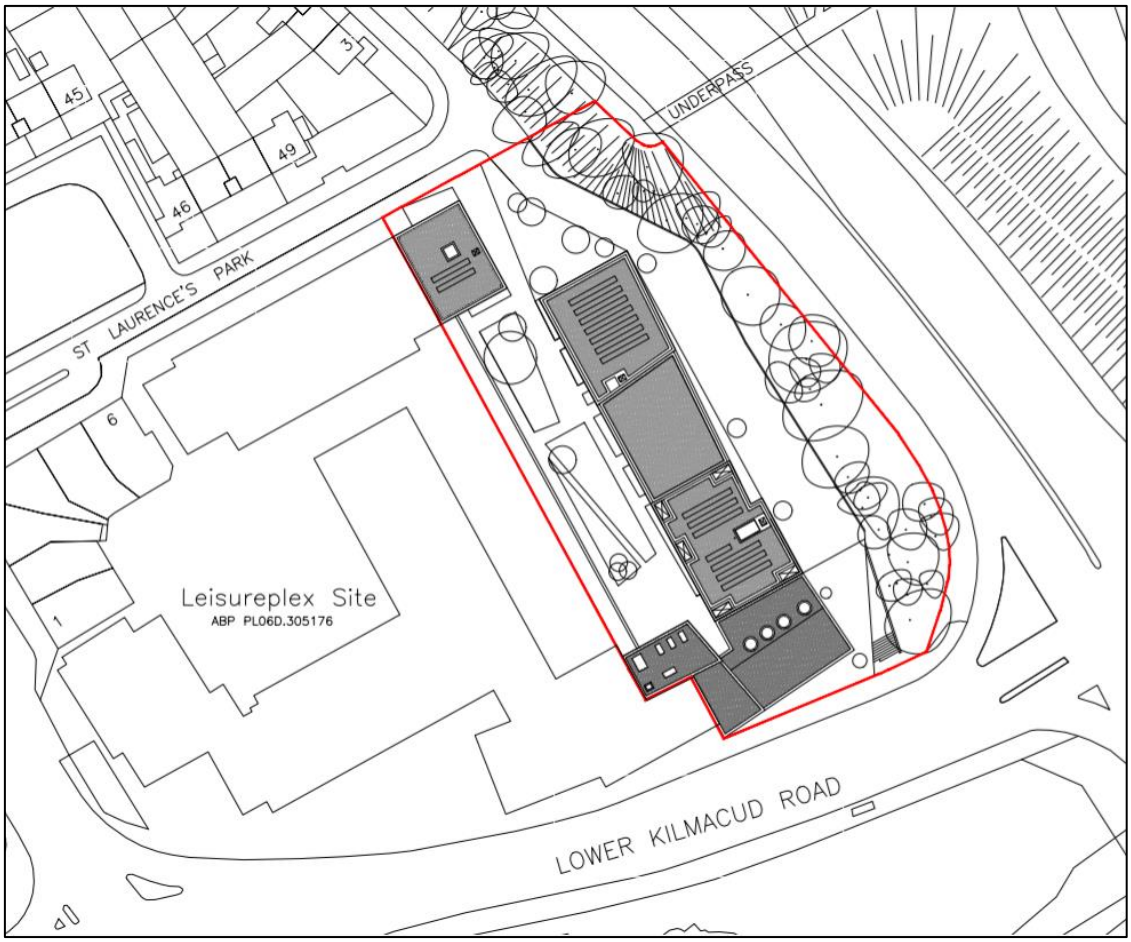

Figure 1: Site Plan – ABK Architects

2.0 ASSESSMENT CRITERIA

Technical Guidance Document Part L Conservation of Fuel and Energy – Dwellings 2019, has been issued by the Department of Housing, Planning and Local Government. This document became the regulatory standard for all new dwellings from 1st November 2019, to achieve Nearly Zero Energy Building standard (NZEB).

A Nearly Zero-Energy Building means a building that has a very high energy performance, as determined in accordance with Annex I of the EU Energy Performance of Buildings Directive Recast. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby.

The NZEB standard for dwellings requires an overall improved energy performance for the fabric, services and lighting specification. The standard requires a Carbon Performance Coefficient level of <0.35 and an Energy Performance Coefficient level of <0.30. The NZEB also introduced a mandatory requirement for renewable energy sources, providing 20% of the primary energy use, known as the renewable energy ratio or (RER).

Renewable Energy Ratio is the ratio of the primary energy from renewable energy technologies to total primary energy, as defined and calculated in DEAP. Renewable energy technologies means technology, products or equipment that supply energy derived from renewable energy sources, e.g. solar thermal systems, solar photovoltaic systems, biomass systems, systems using biofuels, heat pumps, aerogenerators and other small scale renewable systems.

A DEAP analysis has been completed for the proposed dwellings at St. Laurence's Park development, to demonstrate it will achieve compliance with Part L 2019 Building Regulations.

The library is required to achieve compliance with Technical Guidance Document Part L 2017 Conservation of Fuel and Energy – Buildings other than dwellings. This document became the regulatory standard for all non-residential buildings from 1st January 2019, to achieve Nearly Zero Energy Building standard (NZEB).

The NZEB standard for non-residential buildings requires an overall improved energy performance for the fabric, services and lighting specification. The standard requires a Carbon Performance Coefficient level of <1.15 and an Energy Performance Coefficient level of <1.00. The NZEB also introduced a mandatory requirement for renewable energy sources, providing 20% of the primary energy use, known as the renewable energy ratio or (RER). Alternatively, 10% renewable energy is acceptable, provided that the energy demand is significantly reduced via passive means.

A NEAP analysis has been completed for the Library to demonstrate it will achieve compliance with Part L 2017 Building Regulations.

3.0 ENERGY STRATEGY

3.1 Dwellings

The design of the proposed St. Laurence's Park development, will incorporate the principles of the energy hierarchy. The energy hierarchy consists of three key principles:

1. **Be Lean**
2. **Be Clean**
3. **Be Green**

The Be Lean stage encourages a passive strategy whereby space heating, cooling and lighting energy demand is minimised through a fabric first approach. A carefully designed fabric first approach will ensure a robust, efficient and sustainable design throughout the lifetime of the building, which is affordable to the council. Furthermore, it reduces the reliance on technologies, which overtime will require maintenance or replacing.

The Be Clean stage encourages that energy supplied to the development, such as heating or domestic hot water is delivered efficiently through communal or highly efficient systems.

The Be Green stage ties in with the Renewable Energy Ratio requirement of Part L 2019, whereby any remaining requirements are addressed through on-site renewable energy.

Fabric Specification

The table below outlines the target u-values for St. Laurence's Park required to achieve compliance with Part L 2019 (NZEB). The values are compared with the Part L 2019 limiting values for new build developments.

	Proposed Fabric Design	Part L 2019 Limiting Values
Ground Floor / Exposed Floor	0.107 – 0.174 W/m^{2}K	0.18 W/m^{2}K
External Walls	0.107 – 0.165 W/m^{2}K	0.18 W/m^{2}K
External Roof	0.106 – 0.190 W/m^{2}K	0.20 W/m^{2}K
Glazed Areas	0.74 W/m^{2}K	1.40 W/m^{2}K
	G Value = 0.50	N/A
Air Permeability	0.6 m^3/h.m^3 at 50 Pa	5.0 m^3/h.m^3 at 50 Pa
Thermal Bridging	Y-Factor 0.08	Default y-value of 0.15

Table 1: Proposed Fabric Specification

To ensure energy use is minimised from the outset, where feasible the proposed development has been designed with regard to the principles of passive design including; orientation, location of openings, local shading to maximise the potential for solar gain and limit overheating.

The fabric specification has been optimised in order to strike a balance between maximising natural daylight benefits to reduce the use of artificial lighting, the provision of solar gains to reduce space heating demands during the winter months, whilst limiting summertime solar gains to reduce space cooling demands. This can be exhibited in the design window U-Value of 0.74 W/m^2K and the g-value of 0.50.

Thermal Bridging

Heat loss via thermal bridging is a critical aspect of the energy performance, for the purposes of the Provisional BER analysis an indicative Y-Factor of 0.08 W/mK has been used. However, at detail design stage individual Y-Factor calculations will be carried out for each dwelling. Where architectural details are bespoke, a specific thermal modelling calculation will be carried out to ensure the Psi Value (Ψ) is within acceptable parameters.

Air Permeability

Convective losses through drafts and junctions are another main source of heat loss within a dwelling. This is referred to as Air Permeability or Infiltration. Part L 2019 outlines that an air permeability level of 5.00 m^3 (m^2.hr) @ 50 Pa represents a reasonable upper limit for air permeability. Therefore the dwellings at the proposed St. Laurence's Park development are designed with an air permeability of 0.60 m^3 (m^2.hr) @ 50 Pa.

Thermal Comfort

Incremental changes to construction regulations and methodologies have introduced; greater thermal standards, high proportions of glazing, lightweight construction and inadequate ventilation strategies. This has led to an increasing number of occupants experiencing overheating. The dwellings at St. Laurence's Park have been designed to achieve thermal comfort in accordance with CIBSE Technical Memorandum 59 (2017). This has been achieved through; reduced glazing solar transmission to control excessive solar gains, balconies for shading, openable windows for purge ventilation and exhaust air heat pump system with an attached mechanical ventilation with a supply air module to provide adequate ventilation.

Space Heating and Domestic Hot Water

A feasibility study was carried out to determine the most appropriate energy strategy for the development. It was determined that a high efficient Exhaust Air to Water Heat Pump, will be used to efficiently provide the space heating and domestic hot water requirements. The Exhaust Air to Water Heat Pump will have an E TOL COP of 2.30 – 3.10 and will address the renewable energy ratio requirement of Part L. Additionally this solution addresses both of the Be Clean and Be Green stages of the Energy Hierarchy.

Ventilation

In order to ensure a consist supply of fresh air, maintain thermal comfort and minimise the space heating demand, exhaust air heat pump system with an attached supply air module has been proposed within each of the apartments. This system will be designed in accordance with Part F 2019.

Lighting

The design intent is to achieve good levels of natural daylighting within each of the habitable spaces of the apartments, in order to minimise artificial lighting requirements. Energy efficient lighting is proposed in all areas throughout each dwelling.

Results

The table below outlines the results for the sample dwellings at St Laurence's Park. Based on the specification outlined above, the units achieve compliance with Part L 2019 (NZEB).

Block	Level	Type	CPC	EPC	RER
A	Ground	1C	0.235	0.242	0.331
A	Top	1B	0.265	0.271	0.327
B	Duplex	4B	0.238	0.249	0.240
B	Mid Floor	1A	0.274	0.280	0.331
B	Top	2C	0.240	0.247	0.291
C	Mid Floor	1H	0.269	0.271	0.349

Table 2: Summary of Results – Dwellings

3.2 Library

The table below outlines the target u-values for the Library at St. Laurence's Park required to achieve compliance with Part L 2017 (NZEB). The values are compared with the Part L 2017 limiting values for new build developments.

	Proposed Fabric Design	Part L 2017 Limiting Values
Ground Floor	0.174 W/m^{2}K	0.21 W/m^{2}K
External Walls	0.165 W/m^{2}K	0.21 W/m^{2}K
External Roof	0.190 W/m^{2}K	0.20 W/m^{2}K
Glazed Areas	0.74 W/m^{2}K	1.60 W/m^{2}K
	G Value = 0.50	N/A
Air Permeability	≤1.00 m^3/h.m^3 at 50 Pa	5.0 m^3/h.m^3 at 50 Pa

Table 3: Proposed Fabric Specification

The heating and cooling for the library will be provided by an electrically driven VRF heat pump, producing both LPHW and CHW. The LPHW and CPW will be distributed to ceiling mounted fan coil units (FCU) in all occupied zones. Ventilation (tempered air only) is to be provided via a roof mounted AHU and ducted into each space via the rear of the FCU. The following system efficiencies have been selected and must be verified by the M&E engineers. Any deviation from the below efficiencies, must be verified by the energy assessor.

Effective Heat Generating Seasonal Efficiency	4.70
Generator Seasonal Energy Efficiency (SEER)	4.50
Generator Nominal Energy Efficiency Ratio (EER)	4.20
Ductwork Leakage Test Classification	Class A
Air Handling Unit Leakage Test CEN Classification	Class L3
Specific Fan Power	≤1.50 W/l/s

Table 4: Proposed Fabric Services

The HVAC system controls shall be achieved via room mounted temperature sensors and a central time programmer. The HVAC system is to be separately sub-metered.

The DHW will be provided via stand-alone electric under-sink heaters. The provisional storage volume per under-sink heater is 10 litres with 50mm of factor fitted insulation.

All lighting throughout the library must be LED based and a full lighting design its to be carried out. The rate of energy consumption for lighting is to be less than or equal to 7 W/m2.

Lighting controls shall be achieved via both local manual switching and photoelectric (switching) control. Occupancy sensing has been assumed as Auto-on-dimmed. The lighting system is to be separately sub-metered.

The renewable energy ratio determined for this building is 12%, this is achieved via the Air Source Heat Pumps providing space heating and cooling. The results are shown in the table below.

Carbon Performance Coefficient (CPC)	Energy Performance Coefficient (EPC)	Renewable Energy Ratio (RER)
0.82	0.80	0.12

Table 5: Summary of Results – Library