PROGRESSIVE ENGINEERING

PROJECT TITLE:	Parklands Pointe – Phase 2
CLIENT:	Harcourt Developments
DOCUMENT TITLE:	Climate Action & Energy Efficiency Report
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01	Planning Application	16/05/2024	V. Kumar	G. Murphy	T. McDonnell

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1 INTRODUCTION

The intention of this report is to identify energy efficiency strategies associated with the design, construction and building services of the proposed residential development at Parklands Pointe, Saggart, Co. Dublin.

Proposed Development

The proposed development will consist of modifications to the development permitted under Reg. Ref. SHD ABP-305563-19 which comprised 488no. apartments and 1,985sq.m of non-residential floorspace within 5no. blocks (Blocks A to E) ranging in height from 5 to 9 storeys. The proposed modifications relate to the previously permitted 5 storey Blocks C, D & E only and consist of an additional storey on each block and reconfiguration of the previously permitted floor levels to provide an additional 86no. apartment units and a total of 396no. apartments and 752sq.m of non-residential floorspace in lieu of the previously permitted 310no. apartments and 896sq.m of non-residential floorspace. Overall, the permitted Blocks A & B and the modified Blocks C, D & E will accommodate 574no. apartments and 1,841sq.m of non-residential floorspace. The modified blocks will consist of: - Block C: 6-storey block accommodating 129no. units (26no. 1 bed units, 84no. 2 bed units and 19no. 3 bed units) with 3no. retail/ commercial units (555sq.m) and a licensed café/ bar/ restaurant unit (197sq.m) at ground floor level fronting onto the permitted local square; Block D:- 6-storey block accommodating 140no. units (32no. 1 bed units, 90no. 2 bed units and 18no. 3 bed units), Block E: 6-storey block accommodating 127no. units (48no. 1 bed units, 65no. 2 bed units and 14no. 3 bed units) and all associated communal amenity spaces and private amenity spaces comprising terraces/ balconies. Permission is also sought for extension and modifications to the permitted single level basement below Blocks C, D and E to accommodate 332no. car parking spaces, cycle parking spaces, bulky item and bin storage areas with 2no. vehicular accesses provided from Parklands Parade. The modified ground level areas adjoining Blocks C, D and E include 10no. car parking spaces, cycle parking, public lighting, ESB substations, boundary treatments, hard and soft landscaping, surface water drainage infrastructure and all associated site development and infrastructure works. No modifications are proposed to the permitted Blocks A & B or the separate basement level area relating to Blocks A & B. The application is a Large-Scale Residential Development and may be inspected online at: www.parklands-lrd1.ie

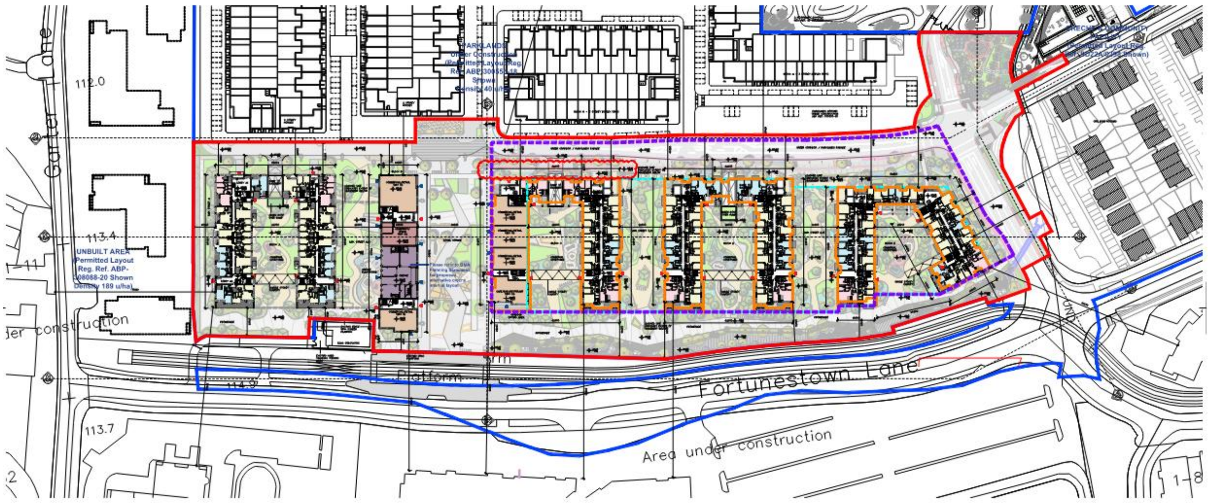

Figure 1 - Proposed Site Layout

2 TGD PART L – THE REQUIREMENTS

Technical Guidance Document Part L (Conservation of Fuel and Energy) of the Building Regulations sets the energy and carbon performance requirements to achieve Nearly Zero Energy Buildings performance as required by the EU Energy performance in Buildings Directive 2010/31/EU of 19 May 2010 and amending directive 2018/844 of May 2018.

2.1 Building other than Dwellings

TGD Part L 2022 Conservation of Fuel and Energy – Buildings other than Dwellings.

L1

A building shall be designed and constructed so as to ensure that the energy performance of the building is such as to limit the amount of energy required for the operation of the building and the amount of Carbon Dioxide (CO2) emissions associated with this energy use insofar as is reasonably practicable.

L5

For new buildings other than dwellings, the requirements of L1 shall be met by:

(a) providing that the energy performance of the building is such as to limit the calculated primary energy consumption and related Carbon Dioxide (CO2) emissions to a Nearly Zero Energy Building level insofar as is reasonably practicable, when both energy consumption and Carbon Dioxide emissions are calculated using the Non-domestic Energy Assessment Procedure (NEAP) published by Sustainable Energy Authority of Ireland;

(b) providing that, the nearly zero or very low amount of energy required is covered to a very significant extent by energy from renewable sources produced on-site or nearby;

(c) limiting the heat loss and, where appropriate, availing of the heat gains through the fabric of the building;

(d) providing and commissioning energy efficient space heating and cooling systems, heating and cooling equipment, water heating systems, and ventilation systems, with effective controls;

(e) ensuring that the building is appropriately designed to limit need for cooling and, where air-conditioning or mechanical ventilation is installed, that installed systems are energy efficient, appropriately sized and adequately controlled;

(f) limiting the heat loss from pipes, ducts and vessels used for the transport or storage of heated water or air;

(g) limiting the heat gains by chilled water and refrigerant vessels, and by pipes and ducts that serve air-conditioning systems;

(h) providing energy efficient artificial lighting systems and adequate control of these systems; and

(i) providing to the building owner sufficient information about the building, the fixed building services, controls and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and energy than is reasonable.

Regulation 5

(a) A new building shall, where technically and economically feasible, be equipped with self-regulating devices for the separate regulation of the temperature in each room or, where justified, in a designated heated zone of the building unit.

(e) A new building, which has more than 10 car parking spaces, shall have installed at least one recharging point and ducting infrastructure (consisting of conduits for electric cables) for at least one in every 5 car parking spaces to enable the subsequent installation of recharging points for electric vehicles.

Regulation 3

The minimum levels of energy from renewable sources, referred to in Article 15(4) of the Directive, may be fulfilled through efficient district heating and cooling using a significant share of renewable energy and waste heat and cold.

3 THE ENERGY HIERARCHY PLAN

The energy hierarchy plan has been adopted for this development. Its aim is to reduce energy before it can be consumed. This can be achieved by implementing passive design strategies across the development, such as maximising the building fabric performance, building orientation, HVAC systems, and Lighting design. The key steps in the Energy Hierarchy Plan are outlined as follows:

- **BE LEAN** - The first step of this plan is the most important, its aim is to first reduce energy demand by improving the building's thermal envelope, increasing air tightness, improving thermal transmittance, and applying passive design techniques.
- **BE CLEAN** - The second step is to utilise energy in the most efficient way through the selection and installation of energy efficient plant and equipment.
- **BE GREEN** - The final step is to introduce energy from renewable sources to reduce the burden on fossil fuels.

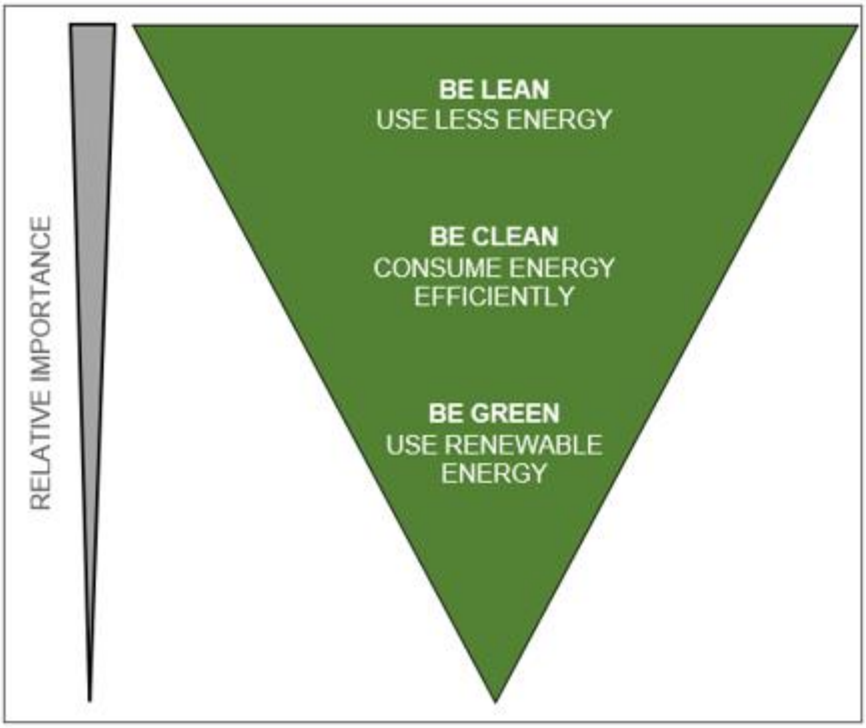

Figure 2 - Energy Hierarchy Plan

3.1 Be Lean – Use Less Energy

The design team will aim to improve upon the building fabric performance's set out in *TGD Part L 2021* as much as technically, functionally, and economically feasible. This will help reduce heat losses and optimise solar gain through the building envelope, in turn reducing energy consumption and carbon emissions.

3.1.1 High Performance U-Values

To limit heat loss through the façade, careful consideration will be shown when designing the external envelope. The specification of the insulation utilised, and the continuity of insulation are crucial. Insulation slows the rate at which heat is lost to the outdoors.

The maximum average elemental U-values from Part L 2021 are outlined in Table 1 below.

Table 1 - Maximum Building fabric U-values

Fabric Element	Dwellings TGD Part L (2021)	Buildings other than Dwellings TGD Part L (2021)
	Maximum Average Elemental U-Value (W/m^2.K)	Maximum Average Elemental U-Value (W/m^2.K)
Ground floor	U-Value = 0.18	U-Value = 0.21
Exposed floor	U-Value = 0.18	U-Value = 0.21
Wall (External)	U-Value = 0.18	U-Value = 0.21
Roof (pitched)	U-Value = 0.16	U-Value = 0.16
Flat roof	U-Value = 0.20	U-Value = 0.20
Windows and glazed doors	U-Value = 1.40	U-Value = 1.60
Curtain walling	-	U-Value = 0.18
Opaque doors	U-Value = 1.40	U-Value = 1.60
Vehicle access and similar large doors	-	U-Value = 1.50
High usage entrance doors	-	U-Value = 3.00
Swimming pool basin	-	U-Value = 0.25
Thermal bridging factor	0.08 W/m2k	0.08 W/m2k
Internal heat capacity	-	-
Air permeability	5m3/(hr.m2) @50pa	5m3/(hr.m2) @50pa

3.1.2 Air Tightness

One major contributing factor to unnecessary heat loss is infiltration. Infiltration is the air leakage of external air into a building due to the pressure difference associated with internal and external temperatures.

Under the TGD Part L 2021 (Dwellings & Buildings other than Dwellings) a performance level of 5 m3/hr/m2 @ 50 Pa represents a reasonable upper limit for air permeability. By reducing the number of infiltration/ external air changes per hour, the buildings energy demand and carbon emissions will reduce as the buildings ability to retain conditioned fresh air has increased i.e., the HVAC equipment will not be required as often.

A design air permeability target of 5**m3/m2/hr** has been identified for the dwellings in this site. The air permeability testing will be carried out in accordance with BS EN 13829:2001 ‘Determination of air permeability of buildings, fan pressurisation method’ and CIBSE TM23: 2000 ‘Testing buildings for air leakage”.

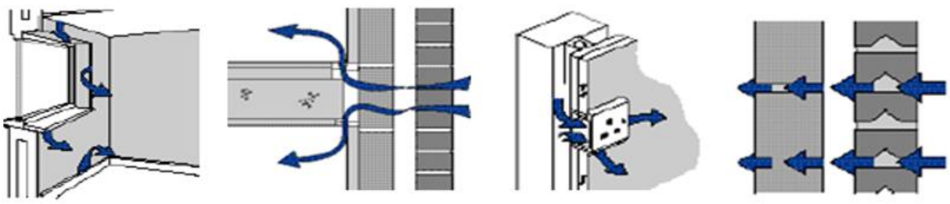

Figure 3 - Typical Air Leakage Paths

3.1.3 Thermal Transmittance

Thermal bridges occur at junctions between elements of the building fabric and are typically defined as areas where heat can escape the building fabric due to a lack of continuity of the insulation in the adjoin elements.

Careful design and detailing of the way insulation is installed at these junctions can reduce the rate at which the heat escapes. Standard good practice details are available and are known as Acceptable Construction Details (ACDs). Adherence to these details is known to reduce the rate at which heat is lost.

The rate at which heat is lost is quantified by the Thermal Bridging Factor of the dwelling and measured in W/m2K. The Thermal Bridging Factor is used in the overall dwelling Part L calculation, this value can be entered in three different ways:

- 0.15W/m2K Used where the ACDs are not adhered to
- 0.08W/m2K Used where the ACDs are fully adhered to
- <0.08 W/m2K Used where the thermal details are thermally modelled and considered.

It is intended that the ACDs will be adhered where suitable benchmarks exist and/or that thermal modelling will be carried out for any non-standard junction details within proposed development. It is intended to achieve a thermal bridging factor of 0.08 W/m2k.

Figure 4 below shows thermal images of typical details where thermal bridging occurs.

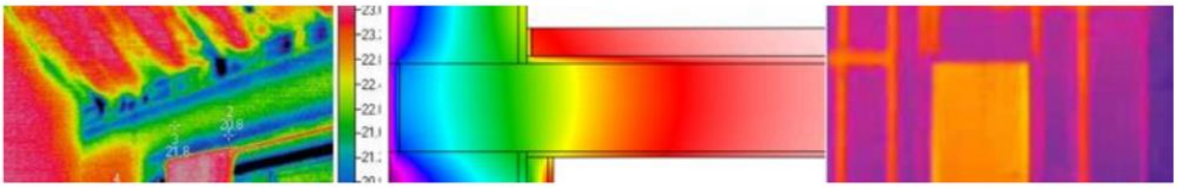

Figure 4 - Typical Thermal Bridging Junctions

3.2 Be Clean – Consume Energy Efficiently

To maximise the effectiveness of enhancing the building fabric, it is important to improve the overall energy efficiency of the development, plant will be selected based on performance and energy efficiency.

Space Heating plant options are as follows:

- Air source heat pumps, or
- Electric panel heaters

Hot Water plant option are as follows:

- Air source heat pumps, or
- Hot water heat pump

Ventilation plant options are as follows:

- Mechanical ventilation and heat recovery, or
- Continuous mechanical extract ventilation

It is intended to utilize Variable Speed Drives (VSDs) for all fans and pumps servicing the HVAC systems. Standard fans and pumps operate at a constant speed to meet maximum demand even when a reduced demand is required. VSDs can ramp up and down depending on the buildings demand, reducing energy consumption.

3.2.1 Lighting

The Lighting design intent is to introduce artificial lighting in all applicable areas. Energy efficient light fittings will be installed throughout.

3.3 Be Green – Use Renewable Technologies

The following renewable technologies will be considered for implementation, as far as is practical and feasibly possible.

3.3.1 Air Source Heat Pumps

Heat pumps convert energy from the external air to provide space heating and domestic hot water services to a building. The air source heat pump is located externally, open to air. It uses electricity to operate a fan to draw air across a heat exchanger containing a refrigerant, this process turns the refrigerant from liquid to gas. This gas passes through a compressor, the increased gas pressure adds more heat to the system. The hot gases pass into a second heat exchanger where it transfers the heat to the space heating or domestic hot water system. As this happens the refrigerant condenses back into a liquid where the cycle starts again.

Heat pumps can provide renewable (thermal) energy through their operational efficiencies. They can produce four to six times the amount of energy that is put into the system, reducing the demand and energy requirements.

Figure 5 below shows the operational processes of an air source heat pump.

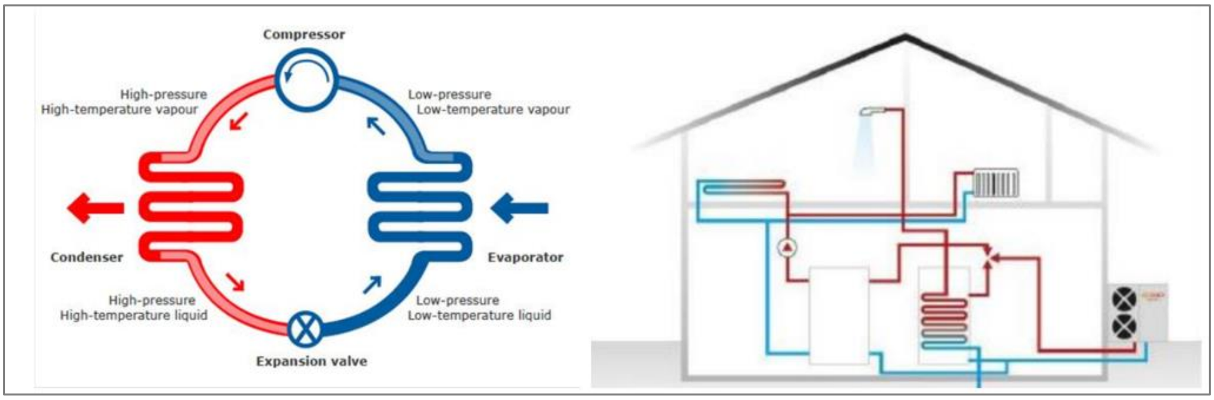

Figure 5 - Heat Pump Operational Diagram

3.3.2 Hot Water Heat Pump

Hot water heat pumps produce hot water very efficiently as it extracts heat from external air supplied via insulated ductwork. Unlike standard air-to-water heat pumps, this heat pump only provides domestic hot water for showers and sinks. Space heating is generally provided using direct acting electric radiators.

Hot water heat pumps can have a seasonal efficiency greater the 300%.

3.3.3 Solar Photovoltaics

Photovoltaic (PV) will be considered for areas that require an additional renewable energy contribution to meet TGD Part L.

PV panels convert the solar radiation into electricity, which can be connected to the mains supply of a building. Panels are typically arranged in arrays on a building roof, with the produced electricity fed directly into the building. Figure 6 below shows a diagram of how a PV system works.

The sun (1) provides solar radiation through sunlight that hits the PV cells (2), converting the solar energy into DC electricity. DC electricity passes through an inverter (3) which converts the electricity to AC making it ready to use. The current is then fed through a meter (4) before passing through the consumer unit. The dwelling will automatically use the PVs energy to power appliances (5), any electricity that is not used can be exported back to the national grid (6).

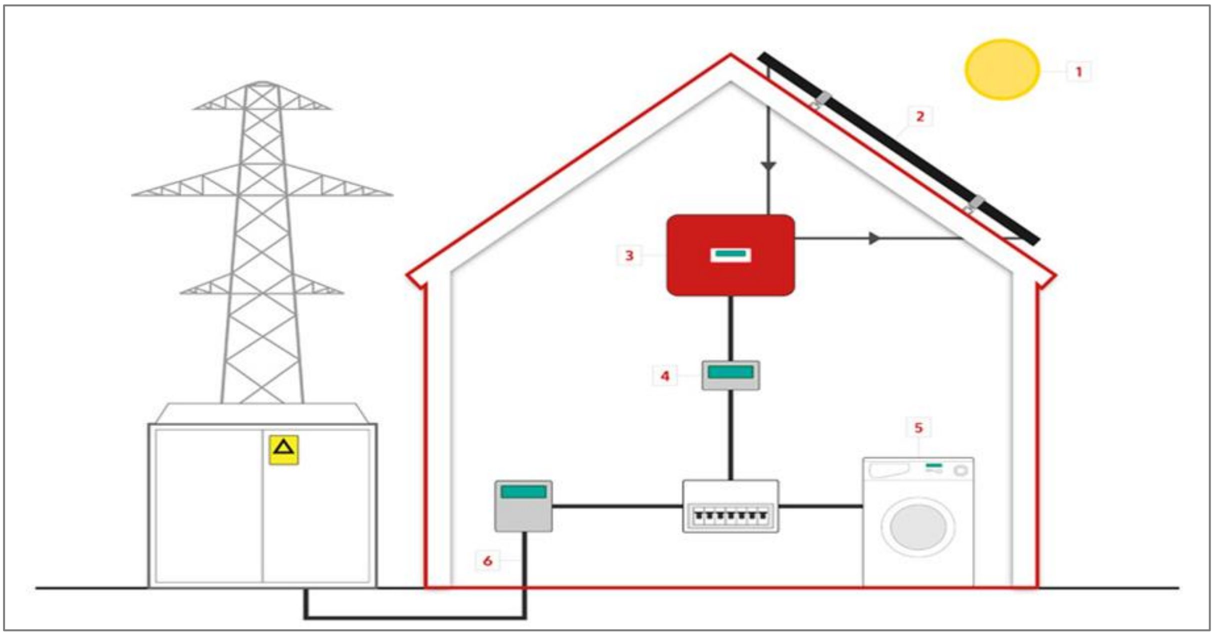

Figure 6 - Solar PV Diagram

4 DEVELOPING THE ENERGY PERFORMANCE STRATEGY

Works will be conducted in the detailed design stage to provide a coordinated energy strategy for the development. The proposed strategy will help to reduce energy consumption, carbon emissions and annual running costs throughout the development.

Dynamic Thermal Energy Modelling is intended to be used as the design progresses to enhance thermal comfort and wellbeing throughout the development. It is intended to perform provisional BER and compliance calculations and overheating risk assessments in the detailed design phase to ensure Part L compliance and best practice design.

4.1 NEAP (Buildings other than dwellings)

NEAP calculations calculate the BER and demonstrates Part L compliance. NEAP considers space heating and cooling, water heating, ventilation, and lighting to calculate the energy consumption and carbon dioxide emissions in a building. It also determines the building energy rating (BER) of each building.

4.2 Environmental Assessment Methodologies

Addressing operational energy use in a manner set out in the preceding sections of this report is a vital component of any construction project however consideration must also be given to other aspects of sustainable design such as water use, material selection and minimising pollutants.

Various assessment methodologies have been developed by organisations such as the Building Research Establishment (BREEAM Methodology) and the US Green Building Council (LEED Certification) to measure the performance of various environmental and sustainable aspects of the design, construction and operation of proposed developments.

4.3 Embodied Carbon

Recent advances in the energy efficiency of buildings have reduced operational energy use to such an extent that the life cycle carbon emissions of a building are influenced more by the carbon that is embodied in the materials and processes used during the construction than it is by the carbon emitted as a result of energy used in the buildings operation. As such, the embodied carbon of a building must now be considered if a construction project is to be considered low carbon or “net-zero” carbon.

Addressing the embodied carbon requires that all the key building element categories (substructure, structure, façade, MEP services) are assessed to identify the optimal solutions in terms of embodied carbon and assess them through a multidisciplinary and holistic approach, considering implications in different areas such as efficiency, cost, programme etc.

The process of design and of material and product selection must include an analysis of the final embodied carbon and comparison with benchmarks to identify the areas that need to be optimised. This process allows the building designers and procurement managers to focus on how to eliminate the impact of the key identified hotspots, through comparative assessments and specification of products that demonstrate low embodied carbon and facilitate the production of the final embodied carbon assessment at the end of the detailed design to identify the expected impact of the Development.

4.3.1 Overheating Risk/ Thermal Comfort Assessment

It is intended to preform dynamic thermal modelling during early detailed design, using the building energy simulation software, IESVE, to analyse selected worst case dwellings for overheating risk, and to propose design changes to mitigate that risk, if required.

CIBSE TM59 sets the design performance guidelines for overheating risk in residential building. CIBSE TM52 sets the design recommendations for reguratrly occupied spaces in commercial buildings.

Figure 7 below represents the factors which affect thermal comfort.

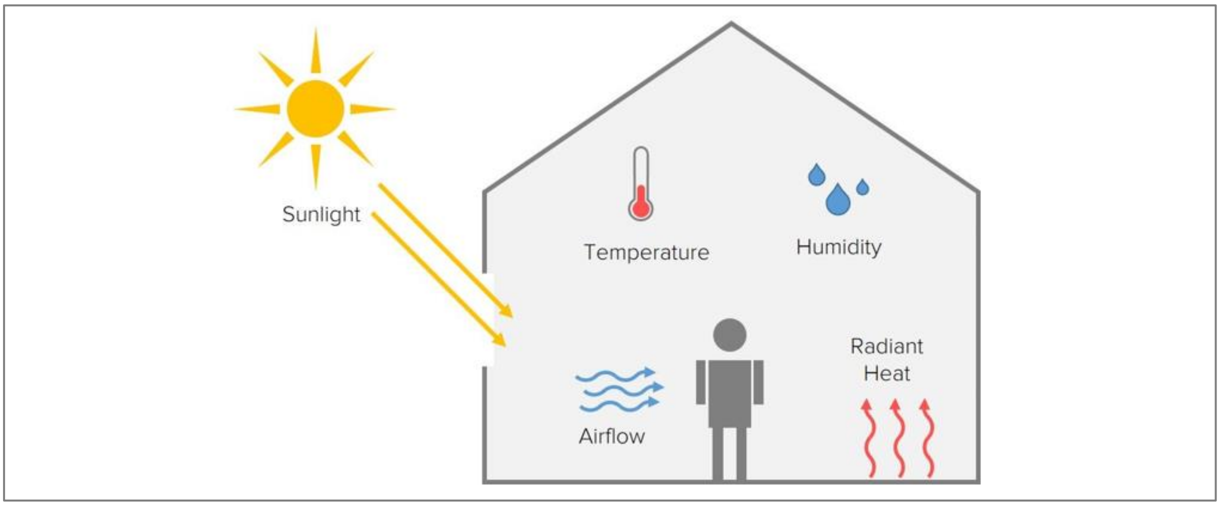

Figure 7 - Factor Influencing Thermal Comfort

5 LOCATION AND TRANSPORT

The site is in a peripheral location with good established transport links both to the city centre and to relevant educational buildings & hospitals.

The site is located approximately 12 minute / 4.9km drive to Tallaght hospital – The Luas Red line is just beside the site with the stop Saggart. The closest bus stop is 200m from the site entrance with Bus routes 69 & W62 available with Dublin bus and go ahead ireland. TUD TDC is located approximately 6 minutes / 4.2km cycle. The main road N7 is approximately 1km from the site.

These changes will incorporate improved cycle facilities and support alternative means of transport.

As the proposed site is 15minute walk / 1.1km from Citywest Shopping centre, clients will benefit from a wide variety of amenities, including supermarket, restaurants and gym that are available within a short walk.

Figure 8 below shows the proposed developments proximity to local amenities and public transport.

Figure 8 - Proximity to Amenities and Public Transport

6 CONCLUSION

A holistic sustainable approach will be adopted by the design team for the proposed development. It is intended to identify several energy efficiencies measures through the development of the energy strategy, to minimise the energy consumption and carbon emissions of this development. These energy efficiency measures will be based on the Hierarchy Plan, Be Lean, Be Clean, Be Green.

Be Lean

- High performance U-values.
- Improved air tightness.
- Improved thermal transmittance and thermal bridging design.

Be Clean

- High efficiency space and water heating will be specified.
- Low energy lighting system will be installed.
- VSD's will be used were appropriate.

Be Green

- Renewable energy technologies such as heat pumps or solar PV will be considered for implementation.

This report confirms that energy and sustainability has been a key focus in the design to date and will continue to be a key factor throughout the detailed design of the development.

EDC