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PARK SHOPPING CENTRE RE-DEVELOPMENT SUSTAINABILITY AND ENERGY REPORT

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PARK SHOPPING CENTRE RE-DEVELOPMENT

SUSTAINABILITY AND ENERGY REPORT

FOR PLANNING

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1.0 Introduction

J.V. Tierney & Co. were commissioned by DMOD Architects to prepare an energy and sustainability for planning for the proposed re-development of the Park Shopping Centre in Prussia Street. The proposed re-development will consist of:

(1) Demolition of the existing Park Shopping Centre and nos. 42-45 Prussia Street, Dublin7 and creation of portal openings in the former boundary wall (Protected Structure);

(2) Construction of a new mixed use District Centre, Student Residential Housing and Build-to-Rent Housing development in 2 buildings, a South Building and a North Building, separated by a new pedestrian and bicycle street connecting Prussia Street with the emerging Grangegorman SDZ campus. The buildings will range in height from 3-5 storeys on Prussia Street to 6-storeys (South building) and 8-storeys (North Building) towards to GDA campus.

(3) District Centre development accommodating: -

• Part-licensed supermarket, 11 no. retail/non-retail service units and 2 no. licensed café/restaurant units at ground floor;

• Two vehicular entrances from Prussia Street to provide access for deliveries and services (South entrance) and to provide access to undercroft parking and van deliveries (North entrance);

• Standing areas for deliveries and waste collection in designated service yards (South Building) and for car parking for 111 no. cars, light van deliveries and bicycle parking (North Building);

• All associated ancillary facilities, landscaping and boundary treatments including acoustic attenuation measures where required

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(5) Build-to-rent residential accommodation overhead the supermarket with lift and stair access from Prussia Street, comprising 29 no. apartments with balconies (28 no. 2 bedroom and 1 no. 3 bedroom units) and 3 no. 2 bedroom townhouses, laundry room, lounge/games room, bicycle store, waste store and podium garden with conservatory allotments.

6) The proposed new street will connect to the Grangegorman SDZ campus via a portal connection through a former boundary wall

7) The development includes art display along the new street, landscaping, boundary treatments, signage, plant and substations, and all associated site works and services.

The sustainable and energy strategy for the Park Shopping Centre development site will employ an approach that will demonstrate how each building (Non-Domestic and Domestic) can achieve NZEB compliance based on the Part L 2017 & 2019 Building Regulations. Part L sets out the definition of a Near Zero Energy Building (NZEB):

"Nearly Zero Energy Building means a building that has a very high energy performance, as determined in accordance with Annex I to Directive 2010/31/EU of the European Parliament and the Council of 19 May 2010 on the energy performance of buildings (recast)(O.J. No. L 153, 18.6.2010, page 13). 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 strategy to sustainable and energy design for the re- development at the Park Shopping Centre in Dublin 7 will use efficient passive and active measures coupled with the appropriate renewable technology to deliver a robust, cost effective, energy efficient and healthy environment within the development site. The re-development at the Park Shopping Centre provides an opportunity to create environmentally sound and energy efficient buildings by using an integrated approach to design, planning and construction. Sustainable development promotes resource conservation of our limited natural resources while catering for climate change impacts.

The design strategies employed will include a whole life cycle approach (See Figure 1) to management and planning, energy efficiency with specific focus on reducing the carbon footprint through a design that meets the requirements of the Near Zero Energy Building (NZEB) standard, material selection, waste management, improved transportation and non-polluting modes of transport and enhancing the ecological value of the site.

There are several increasingly significant drivers for sustainable and energy efficient design; -

- The rapidly increasing costs required to provide services, such as energy and water.
- Stricter energy and carbon emissions targets set under the Building Regulations through the introduction of the NZEB Standard now and into the future.
- The desire to provide energy efficient building development to demonstrate energy awareness, low carbon design and efficiency of use.
- Inclusion of building lifecycle considerations especially in new residential developments
- DCC Development Plan 2016 -2022 objectives regarding Climate Change and Energy Efficiency
- The Government's plan to continue to decarbonise the build environment.

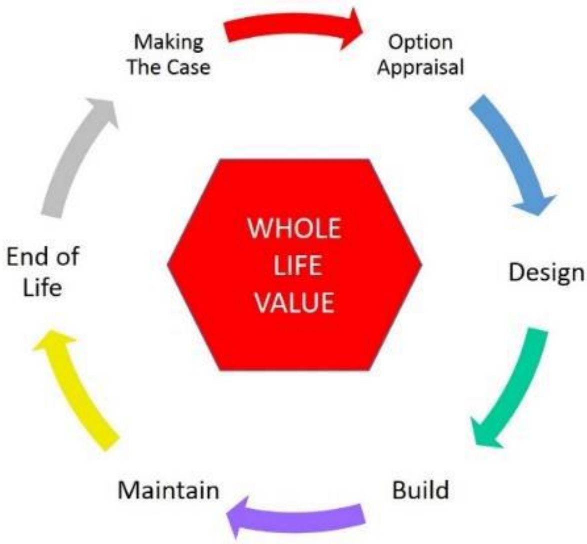

Figure 1 Whole Life Cycle

2 Sustainability Strategy Approach

In developing the vision for the 'Sustainable and Energy Strategy' for the development at the Park Shopping Centre, the incorporation of sustainable strategies into the project deliverables will encourage the commitment to sustainable design at a very early stage with the Client and Design Team to ensure a 'best in class' development. This approach will ensure that the development meets the principles of the Government's 'National Climate Change Policy', DCC Development Plan 2016 -2022 objectives regarding Climate Change and Energy Efficiency and that it exceeds the requirements of the Building Regulations Part L 2017 and 2019 and maximises the reduction in Carbon Dioxide (CO_2) emissions thus demonstrating the Client's commitment to Climate Change.

The sustainable strategy will seek to incorporate appropriate and effective economic and environmental measures. In this respect, consideration will be given to the following:

- Development of a flexible design to enhance the buildings longevity.
- Maximising the use of passive design measures such as the building façade to take advantage of the site constraints/orientation, use of enhanced fabric u-values in excess of Part L 2017 and 2019 with the delivery of an excellent air permeability rate.
- Targeting natural daylight factors that meet CIBSE recommendations. Good natural daylight creates a positive living environment and contributes to the well-being of the occupants. The provision of high-performance glazing on the elevations that maximises the use of natural daylight that will enhance the visual comfort of the occupants.
- Carrying out Façade studies in conjunction with the Architect using computer modelling techniques to maximise the daylight factors, ventilation and solar benefits specific to the Park Shopping Centre site.

- Extend the sustainable approach from the Building to the Site throughout the construction and handover process.
- Reduce Reuse and Recycle throughout the design, construction and operational phases of the development.
- Use of Dynamic Thermal and Energy Simulation techniques to confirm a low energy and carbon footprint design for the development.
- Energy efficient M&E systems and plant- HVAC, Lighting (LED efficiency), Triple E registered products, etc. that minimises the consumption of energy and maximises the air quality within the building:

    - Efficient use of natural light to offset the use of artificial light.
    - Use of High efficiency light fittings, LED lights, etc. for dimming, presence detection, daylighting.
    - Lighting Management Plan that uses daylight control in the non-residential spaces and automatic presence detection in areas which are intermittently occupied e.g. Landlord and common areas.
    - High efficiency modular heating plant via two plantrooms powered by a gas fired CHP/Boiler combination.
    - Use of renewable technologies to off-set Primary Energy consumption and carbon emissions where economically and technically feasible. For example, the introduction of a PV Panel Array at roof level would assist in reducing the developments impact on the carbon footprint by minimizing the reliance on fossil fuels. This will also assist in meeting the 'Vision for Dublin' that all new buildings as outlined in the DCC Development Plan 2016 -2022. The design also caters for a district heating supply from the GDA Grangegorman campus, when available and will connect into the two plantrooms.

- Incorporation of the above design measures to maximise the building energy ratings (BER) for the building and set a target of an 'A Rated' building. This will demonstrate that the building has been designed to ensure energy efficiency and provide the user with a degree of certainty over their energy and carbon footprint.

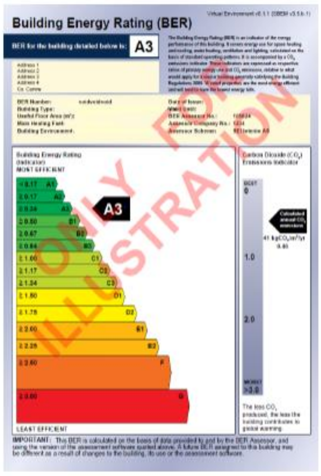

Figure 2 Example BER Certificate

- An integrated Water Management and Conservation approach that incorporates the use of low water consumption equipment to ensure the minimal use of potable water, efficient sanitary appliances (low water WC cisterns, automatic flushing controls, push spray taps), water consumption and leak detection in the Student Accommodation building linked to a Building Management System (BMS).
- Encouraging the use of public transport by using the principles of environmental assessment methodologies to reduce the reliance on cars and encourage a shift to more carbon lowering modes of transport.
- Whole life cycle approach to the selection of materials used in the building with specific regard to the impact on the carbon footprint.

Figure 3

The additional investment required to deliver a sustainable design in line with the Dublin County Council Development Plan 2016 – 2022 will add long term value for the building occupiers. These benefits will require less energy due to the achievement of the Part L 2017 and 2019 standards, less services and therefore less resources to operate than is required for existing developments and will make the building more energy and environmentally efficient and will ensure that it is a more sustainable building into the future.

This Report was prepared by:

Signed: Rory Burke

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Chartered Engineer
Director
J.V. Tierney & Co.

Date: 26th February 2021

APPENDIX 1: Energy Approach

Introduction

This report outlines a preliminary design stage assessment for the Park Shopping Centre re-development in Dublin 7. A sustainable energy approach to buildings offers an opportunity to create environmentally sound and energy efficient buildings by using an integrated approach to design, planning and construction. Sustainable development promotes resource conservation of our limited natural resources, which includes energy efficiency, renewable energy, water conservation, waste minimisation and also considers the environmental impact of the operation of a building for its entire “life-cycle”.

The process to maximise the environmental performance of the Park Shopping Centre development project is driven by a holistic and fully coordinated approach in order to achieve sustainable and flexible facilities. The buildings are designed to exceed the provisions of the Building Regulations Part L 2017 & 2019 (See Figure 4) and will offer a sustainable and adaptable design to meet future provisions to these standards.

The proposed Park Shopping centre development will be designed to surpass current ‘Best Practice for low energy design as outlined in CIBSE TM46:2008 - Energy Benchmarks, which is the Government benchmark for Display Energy Certification applicable to buildings. The buildings will accommodate a mix of uses and varied quantities of users and the building services systems will be quick responding and flexible to adapt to these needs.

Figure 4: Building Design Standards

The strategy approach to the design of the facilities is firstly to maximise the passive measures of the building (insulation, solar gains, daylight, etc) and then apply the most efficient active measures (Boiler, lighting controls and power density, etc) and only then apply renewable technologies that are deemed environmentally and economically viable.

The following key elements will be included in the design parameters:

- Maximise the passive elements of the design in the first instance by:
  - Specifying building fabric insulation u-values better than the Part L 2017 & 2019 standards.
  - Targeting the air permeability to be < $3m^3/m^2/hr$ @ 50Pa
  - Using dynamic thermal modelling to optimise the façade using differing glazing u-values, light transmittance and solar gain ('g' values).
  - Ensuring particular detailing of linear thermal bridging.
  - Ensuring the maximum number of spaces are naturally ventilated.
- Maximising the Active elements of the design by:
  - Specifying lighting designs that deliver > 90 lumen/ circuit watt
  - Specifying lighting systems with occupancy and daylight controls
  - Specifying high efficiency Heating systems
  - Minimise the specific fan power where applicable.

Where renewable technology is employed, it will target the highest primary energy factor and technologies such as Solar PV, Heat pumps and CHP, District Heating, etc.

Renewable Options to be Considered

The following renewable energy sources will be considered during the detailed design stages to assist in reducing the carbon footprint if deemed economically and technically feasible.

	Feasibility			
Technology	H	M	L	Comments
Ground Source Heat Pumps (GSHP) Closed Loop 	√			GSHP technology uses seasonal differences between ground and air temperatures to provide heating in winter and cooling in summer. GSHP provide low temperature heating and high temperature cooling suitable for underfloor heating or chilled beams. Site restrictions would be a consideration with vertical boreholes been most practical but also more capital intensive. Impact on the Primary Energy factor can be significant with Heat Pumps but additional capital and area required is a constraint.

Table 1: GSHP Feasibility

	Feasibility			
Technology	H	M	L	Comments
Air Source Heat Pump (ASHP) 	√			ASHP technology uses seasonal differences between external air temperatures and refrigerant temperatures to provide heating in winter and cooling in summer. As most of the energy is taken from the air they produce less greenhouse gas than a conventional heating system over the heating season. Most efficient when used as a pre-heat mechanism as the COP remains high and therefore has a major impact on the energy efficiency criteria.

Table 2: ASHP Feasibility

	Feasibility			
Technology	H	M	L	Comments
Combined Heat & Power (CHP) 	√			Combined heat and power (CHP) refers to the local simultaneous generation of electricity and heat. CHP works best in areas that have a constant "round the clock" demands for heat. CHP systems typically run on oil or gas with biomass also used. Key to a CHP installation is to ensure that the demand load for heating and electricity usage are utilized, i.e. to size the unit correctly on a base load basis.

	Feasibility			
Technology	H	M	L	Comments
Wind Power 			√	Micro wind turbines can be fitted to roofs but do not supply much energy. Full scale turbines need open space and are capital intensive but deliver large energy savings. There is considerable health and safety issues associated with wind turbines. Good impact from a Primary Energy perspective.

Table 3: CHP & Wind Power Feasibility

	Feasibility			
Technology	H	M	L	Comments
Solar Photovoltaic 	√			Solar PV collectors absorb the sun's energy and converts it into electricity. PV Panels can be discrete roof-mounted units or embedded in conventional facades, etc. The ideal location for locating the PV system is facing a southerly direction. Good impact from a Primary Energy perspective.

Table 4: Solar PV Feasibility

	Feasibility			
Technology	H	M	L	Comments
Solar Thermal 			√	Solar collectors absorb the sun's energy and provide energy for space heating and hot water generation. The ideal location for locating the solar system is southerly direction. Solar systems are usually designed to meet only a portion of the heating load. Available roof area is better utilised with PV Panels as has higher Primary Energy impact.
	Feasibility			
Technology	H	M	L	Comments
Biomass Heating 			√	Biomass boilers combust wood chips or pellets and is considered carbon neutral. The technology requires significant plant space and ongoing maintenance. The impact on the Primary Energy factor is not significant.

Table 5: Solar Thermal & Biomass Heating Feasibility

Part L Energy Building Procedure

The performance of buildings to achieve Part L compliance should be checked using the current NEAP and DEAP methodologies. In order to assess whether a building achieves the Part L performance it is necessary to first calculate the performance of the building being designed in SBEM v5.5h using the parameters from TGD Part L 2017 for the non-domestic buildings and DEAP V4.2 for the domestic buildings and then compare the performance to that of the same building modelled using its actual performance specification. The actual building performance should be equal to or better than that of the building modelled with the Part L 2017 and 2019 Performance Specification.

Non-Domestic Energy Assessment Procedure (NEAP)

The Non-Domestic Energy Assessment Procedure (NEAP) is the methodology for demonstrating compliance with specific aspects of Part L of the Building Regulations. NEAP is also used to generate the Building Energy Rating (BER) and advisory report for new and existing non-domestic buildings.

NEAP calculates the energy consumption and CO_2 emissions associated with a standardised use of a building. The energy consumption is expressed in terms of kilowatt hours per square meter floor area per year (kWh/m^2/yr) and the CO_2 emissions expressed in terms of kilograms of CO_2 per square meter floor per year (kg CO_2/m^2/yr).

NEAP allows the calculation to be carried out by approved software packages or by the default calculation tool, Simplified Building Energy Model (SBEM), which is based on CEN standards and has been developed by BRE on behalf of the UK Department of Communities and Local Government.

SBEM, accompanied by a basic user interface, iSBEM, calculated monthly energy use and CO_2 emissions based on building geometry, construction, use and HVAC and lighting equipment. The purpose of SBEM and its interface iSBEM is to produce consistent and reliable evaluations of energy use in non-domestic buildings for Building Regulations compliance and Building Energy Rating purposes. Although SBEM may assist in the design process, it is not primarily a design tool.

(source: www.seai.ie).

Domestic Energy Assessment Procedure (DEAP)

The Dwelling Energy Assessment Procedure (DEAP) is the methodology for demonstrating compliance with specific aspects of Part L 2019 of the Building Regulations. DEAP is also used to generate the Building Energy Rating (BER) and advisory report for new and existing domestic buildings. DEAP calculates the energy consumption and CO2 emissions associated with a standardised use of a building. The energy consumption is expressed in terms of kilowatt hours per square meter floor area per year (kWh/m2/yr) and the CO2 emissions expressed in terms of kilograms of CO2 per square meter floor per year (kg CO2/m2/yr).