Energy & Carbon Emission Report

For the

Sustainability & Energy Design

At

Spencer Place North Development
Dublin 1

For

Spencer Place Development Company Limited

09/08/2019 Rev: 4

ISO 9001 CERTIFICATION EUROPE
OHSAS 18001 CERTIFICATION EUROPE
ISO 14001 CERTIFICATION EUROPE
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Document History

Revision No.	Description	Prepared By	Reviewed By	Date
Rev 0	Planning Stage – Lifecycle Report	EN	AOD	08/10/2018
1	Planning Stage	EN	KW	25/10/2018
2	Planning Stage	EN	AOD	08/02/2019
3	Planning Stage	EN	KW	24/07/2019
4	Planning Stage	EN	AOD	09/08/2019

Contents

1. Introduction

The proposed development, located at Spencer Place North, Spencer Dock, Dublin 1 includes a shared accommodation and residential development.

The site is bound by Sheriff Street Upper to the North, Mayor Street to the South, New Wapping Street to the East and a development site to the West.

The application site is currently under construction for planning application reference Reg. Ref. 2896/18 as amended by Re. REF DSDZ42479/18 for 349 no. residential units and an aparthotel scheme (102 no. units) over basement level. The development under construction has not been subject to an EIAR as it did not exceed the threshold as set out in schedule 5. The proposed development seeks alterations to this development currently under construction to provide for 464 no. residential apartment units and 200 no. shared accommodation bed spaces. The proposed footprint of the building and basement excavation remains the as per the permitted development on the site. Site utility services have been designed as per drawing no. SPN3-AXE-ZZ-ZZ-DR-E-60101.

It should be noted that the proposed development does not exceed the 500 no. units threshold for residential development, however considering the combination of both the shared accommodation (102 no. units) and the apartment units (464 no.).

The proposed development will increase the height of the permitted development increasing the maximum height of Block 1 from 7 no. storeys (27.5 m) to a maximum height of 13 no. storeys (46.8m) and increasing the maximum height of Block 2 (27.5m) to 11 no. storeys (40.5m). The proposed development will also include the provision of a link bridge between Block 1 and Block 2 at 6th floor level, landscaping, the provision of communal open space, revised under croft level, provision of roof terraces and all other associates site development works to facilitate the development.

Each Block has an under-croft basement car park.

The purpose of this report is to outline strategies taken through passive and active measures designed to reduce energy, carbon and cost. and shall be read in conjunction with the Development's Building Life Cycle Report.

2. Energy & Carbon Emissions

The sustainable design of proposed Development at Spencer Place North presents an opportunity to achieve that each building performs energy efficiently and meets the Nearly Zero Energy Building (NZEB) challenges. The following table outline a list of different elements taken through passive and active measures, which has been designed to reduce energy, carbon emission, and cost through buildings lifecycle.

<table>
<tr><th></th><th></th><th></th></tr>
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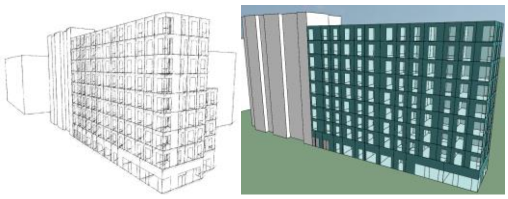
<td>Nearly Zero Energy Building (NZEB) means a building that has a very high energy performance and is designed to nearly zero or very low amount of energy required to be covered by energy from renewable sources produced on-site or nearby.

The NZEB compliance assessment is based on following different building regulation applies to the different building block identified in Spencer North

• Building Regulation 2017 Part L, Conversation of Fuel and Energy –Building other than Dwellings
• Building Regulation 2018 Part L, Conversation of Fuel and Energy –Dwellings (Public Consultation)

Where the different requirement is included the setting of minimum energy performance requirement for buildings to achieve Nearly Zero Energy Buildings (NZEB).



An NZEB assessment has been carried out on Block 2 shared accommodation energy model, achieving the following energy performance coefficient, carbon performance, and renewable energy ratio;

Shared accommodation (non-residential)

<table>
<tr><th>Metrics</th><th>Compliant</th><th>Result</th></tr>
<tr><td>MPEPC</td><td>1.0</td><td>0.98</td></tr>
<tr><td>MPEPC</td><td>1.15</td><td>1.01</td></tr>
<tr><td>RER</td><td>0.2</td><td>0.71</td></tr>
</table>

Apartment blocks (residential)

<table>
<tr><th>Metrics</th><th>Compliant</th><th>Result</th></tr>
<tr><td>MPEPC</td><td>0.30</td><td>0.294</td></tr>
<tr><td>MPEPC</td><td>0.35</td><td>0.251</td></tr>
<tr><td>RER</td><td>0.20</td><td>0.42</td></tr>
</table>
</td>
<td>Lower energy impact. Energy bill and carbon emission reduction

Compliant with current and future building regulation Part L (Public consultation)

Identify the best-fit energy efficient solution by the mean of selecting correct passive and active measure to reduce energy, carbon emission and cost.</td>
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Based on the NZEB assessment outcome, the following active and passive measure including low energy technologies that are being considered for the development in order to meet the requirements of Part L of the Building Regulations and meet NZEB standard.

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The construction u-values are being considered and design to meet or are lower than those required by Building Regulation Technical Guidance Documents Part L for Dwelling and Buildings other than Dwellings applied to residential and non-residential building block identified in Spencer North Block.
See below Table 1 list U-value set out for building:
<table>
<tr><td>Non-residential Building</td><td>Residential Building</td></tr>
<tr>
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<table>
<tr><th colspan="3">Table 1 Maximum elemental U-value [1] (W/m²K)</th></tr>
<tr><th>Column 1
Fabric Elements</th><th>Column 2
Area – weighted
Average Elemental U-Value (U_m)</th><th>Column 3 Average Elemental U-value Individual element or section of element</th></tr>
<tr><td>Roofs[2]
Pitched roof
- Insulation at ceiling
- Insulation on slope

Flat roof</td><td>

0.16
0.16

0.20</td><td>0.3</td></tr>
<tr><td>Walls[2]</td><td>0.21</td><td>0.6</td></tr>
<tr><td>Ground Floors[2,3]</td><td>0.21</td><td>0.6</td></tr>
<tr><td>Other exposed floors[2]</td><td>0.21</td><td>0.6</td></tr>
<tr><td>External personnel doors, windows[4] and rooflights[6]</td><td>1.6[5]</td><td>3.0</td></tr>
<tr><td>Curtain Walling</td><td>1.8</td><td>3.0</td></tr>
<tr><td>Vehicle access and similar large doors</td><td>1.5</td><td>3.0</td></tr>
<tr><td>High usage entrance door[7]</td><td>3.0</td><td>3.0</td></tr>
<tr><td>Swimming Pool Basin[8]</td><td>0.25</td><td>0.6</td></tr>
</table>
</td>
<td>
<table>
<tr><th colspan="3">Table 1 Maximum elemental U-value (W/m²K)[1, 2]</th></tr>
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Area-weighted Average Elemental U-Value (Um)</th><th>Column 3
Average Elemental U-value – individual element or section of element</th></tr>
<tr><td>Roofs

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<tr><td>Other exposed floors</td><td>~~0.21~~0.18</td><td>0.6</td></tr>
<tr><td>External doors, windows and rooflights</td><td>~~1.6~~ 1.4[4,5]</td><td>3.0</td></tr>
</table>
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</table>
The U-value requirement set out for dwelling building set out in the building regulation 2018 technical guidance Document L is still under public consultation and is lower than U-values requirement set out in the building regulation 2017.
A number of passive solar design has been considered including the window design option to maximising daylight and solar heat gains during winter to reduce the artificial lighting and space heating load, whilst minimising summer gains to reduce the cooling load.
The high-performance wall, roof and glazing is being considered and selected to minimise the heat transfer into the internal spaces. Aside from the reduction in heating and cooling energy consumption and carbon emissions, the reduction in loads results in reduced central plant capacity and size. This has the net effect of reducing embodied energy consumption associated with manufacture and transportation associated with the plant, as well as the reduced input from the national electricity grid (for cooling), and natural gas (for heating).
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<td>
Minimise heat losses through the building fabric thus lowering energy consumption and carbon emission
Minimise heat loss and gain impact on heating and cooling load requirement all-time during year, thus lowering energy and carbon footprint impact.
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<td>Airtightness construction, the building will be designed to ensure it is in compliant with the building regulation and achieving air tightness of 3.0 m3/(h.m2). It is technically feasible to reduce the air permeability between 2.5 to 1.5 m3/(h.m²), this can be achieved if the on-site inspection and quality control is in place to ensure the design intention is achieve in the place.</td>
<td>Minimise heat losses through the building fabric thus lowering energy consumption and carbon emission.</td>
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<td>
The limitation of thermal bridging will be achieved in according with guidance under section 1.3 within technical guidance Part L regulation. See below Table C2 on thermal

<table>
<tr><th>Junction</th><th>W/mK</th><th>W/mK</th></tr>
<tr><th>Type of junction</th><th>Involving metal cladding</th><th>Not involving metal-cladding</th></tr>
<tr><td>Roof to wall</td><td>0.28</td><td>0.12</td></tr>
<tr><td>Wall to ground floor</td><td>1.0</td><td>0.16</td></tr>
<tr><td>Wall to wall (corner)</td><td>0.2</td><td>0.09</td></tr>
<tr><td>Wall to floor (not ground floor)</td><td>0.0</td><td>0.07</td></tr>
<tr><td>Lintel above window or door</td><td>1.0</td><td>0.30</td></tr>
<tr><td>Sill below window</td><td>0.95</td><td>0.04</td></tr>
<tr><td>Jamb at window or door</td><td>0.95</td><td>0.05</td></tr>
</table>

On-site inspection and quality control will be carried to ensure continuity of insulation and to limit local thermal bridging at junction between construction element and other locations e.g. around windows, door and other wall openings.
</td>
<td>Minimise heat losses at junctions between construction element, thus lowering energy consumption and carbon emission</td>
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Provision of natural daylight in buildings creates a positive environment by providing connectivity with the outside world, and assisting in the well-being of the building inhabitants. Daylight also represents an energy source - reducing the reliance on artificial lighting. The provision of full-height glazing on the elevations maximise the use of natural daylight to enhance visual comfort, without compromising thermal performance.

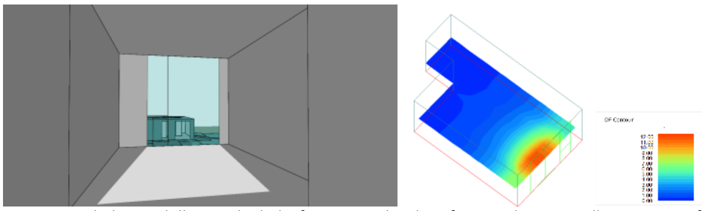

Figure: Daylight modelling & daylight factor result taken from radiance toolkit, IESVE software

Majority of lamps selection will be based LED type located externally, and internally in circulation spaces, bedroom, lobby, basement car-park, cores and reception. LED technology results in 30-35% reduction in electrical energy usage. Expected lamp life is 50,000-hours, compared to T5 lamps that require replacement and disposal (WEEE Directive 2006) after 12,000-hours.

Automatic daylight lighting control (automatic dimming) complete with combined PIR detection. Intelligent lighting controls in reception/hotel/Cafe allow electrical energy savings of up to 40%, as well as increasing the occupant exposure to natural daylight – thereby promoting a healthier work environment.
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<td>
Reducing lighting electricity energy consumption, thus reducing carbon emission footprint overall.

Enhance healthier working and leisure environment through the use of natural daylight

Minimise the personnel resource and time in controlling the lighting system, thus reducing cost.
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Exhaust Air Heat Pump
Exhaust Air Heat Pump in residential units will provide ventilation, heating and hot water to the apartment. Exhaust air heat pump is an energy recycling system, where it collects energy from warm inside air via the ventilation system and re-use it to heat up fresh air incoming and tap water and reduce electricity consumption by 50%.
</td>
<td>The lower capital cost in comparison to central plant installation. Heat pump provides 4 to 5 times more heat energy than the electricity consumed, comparing to other heat generator types. Lower energy and running cost.</td>
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</table>

	Hot Water appliances – Flow restrictor All hot water taps including the shower head fitting in the residential apartment are to be fitted with intelligent water flow regulators to all for full water flow until the discharge rate reaches six litres per minute, to allow for the conservation of water uses well as energy used to heat hot water.	Minimise hot water usage, thus reducing heating energy load and increasing heat pump operating performance and reducing the cost.
	Heat Recovery mechanical ventilation system The inclusion of heat recovery unit into the ventilation system allows for heat transfer between exhaust and supply air before the heating and cooling coils thus reducing heating and cooling load.	Reduction in energy consumption and carbon emission.
	Multi-purpose Chiller The shared accommodation will be provided with a roof-mounted multipurpose chiller that will provide heating and cooling medium to serve a central low hot water and chiller water before the Fan Coil Units. Heat pump technology is embedded inside the unit allow for heat rejection to be recover and reuse for heating and DHW, thus contributing to energy saving and carbon emission reduction.	Small footprint plant space. Heating output recovery to be reusable. Eliminate the need of boilers and its capital cost.
	Gas Fired Water Heaters The shared accommodation will be provided with gas fired water heaters that will provide heating to service hot water load. The gas fired water heaters will deliver a high level of fuel efficiency during operation comparing to a typical heating boiler.	High efficiencies
	District Heating Heating systems have been designed to facilitate integration of a future District Heating (DH) system. The design philosophy includes the following provisions for future connections: - Space allocations for future heat exchanging plant. - Centralised primary/secondary heating systems with low loss headers to facilitate integration of DH services. - Incoming pipework installed through the basement box wall to facilitate ease of future connection and to eliminate future builder's work. - Space allocation provision in service risers for future heating pipework. District heating offers many benefits and real cost-saving advantages. It will allow users to decide when, where and how much energy they need, ensuring maximum comfort, whilst providing hot water on demand.	A future district heating system comes from a sustainable and efficient process and eliminates any carbon emissions produced on site for heating.
	Central BMS – check metering (heating/cooling/power) of all individual floors and wings to monitor & optimise substantive energy use. The energy management system will continuously review and fine-tune the operational efficiencies and strategy for the various building services, significantly reducing clients' overall energy consumption and carbon footprint, and reducing energy costs by up to 25%	Continuously energy monitoring allows for further energy saving quantified through building lifecycle thus lowering overall cost and carbon footprint.