McElligott

CONSULTING ENGINEERS

Energy, Utilities and Telecommunications Statement
for
Carrickmines Great SHD
at
Glenamuck Road South, Dublin 18

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Prepared By:	**Richard McElligott**
Email:	**richard@mcelligott.ie**
Tel:	**01 426 0099**
Website:	**www.mcelligott.ie**

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1. ENERGY STATEMENT

1.1 Introduction

Grafton Issuer DAC are applying for planning permission for a Strategic Housing Development on a site at Carrickmines Great, Glenamuck Road South, Dublin 18. The site is located to the immediate east and to be accessed through Cairnbrook residential estate. The proposal consists of the demolition of existing buildings on site and the provision of 167 no. residential units (comprising of 69 no. houses and 98 no. apartments), a childcare facility, open space, roads infrastructure and all associated development

All of the apartments and houses will be subject to the NZEB requirements of the 2019 Part L Regulations, that will be in effect. In terms of energy ratings all of the units on site will have a BER rating of A2 / A3. With the fabric performance of the materials to be used in construction there are no more energy reductions gains to be achieved.

The majority of the thermal energy used within the residential units will be for the generation of HWS for sanitary purposes and a number of solutions are being considered. The benefits of each system is outlined later in this report.

The measure of compliance with Part L of the Regulations is demonstrated using the DEAP software. A revised version 4.2 of the software has now been issued and this will formally allow assessors to confirm the NZEB standard has been achieved. Carbon generation and energy consumption figures for all new dwellings have been revised downwards with the net result that these apartments and houses will have to use 30% of the energy that the equivalent unit, built to the prevailing 2005 standard would have used. The renewables contribution in each house is now a percentage, 20%, of the overall energy density that the dwelling requires. This is rather than the previous flat rate of 10 kWh/m^2 per year.

The primary aim of Part L 2019 is to further reduce the energy used in homes. After transport, the residential sector is the biggest energy sector in the country. In 1990 domestic units accounted for 31% of the energy demand in the country but by 2016 this had dropped to 23% and over the next 10 years between new builds and deep retro fits this figure could drop by the same again. This report also provides details on the utilities infrastructure which exists in the area and to be provided for the development and includes a section in respect to potential impacts on telecommunications channels.

2. BUILDING FABRIC

The building fabric elements that will be used in the construction of the apartments and houses will achieve the following performance

- Walls 0.18W/m^{2}K
- Roof 0.16 W/m^{2}K
- Windows 1.4 W/m^{2}K
- Floors 0.16 W/m^{2}K

The specified air tightness for the dwellings is to achieve an air tightness level of 3 air changes an hour or better. With the heat recovery ventilation systems to be fitted in each unit the gains in thermal performance become quiet marginal below this level. In a similar vein the approved construction details will achieve a minimal thermal bridging factor of 0.08. The net impact of these combined criteria is that the heat losses associated with the apartments will be below 25% of the total thermal demand. For the houses, with their larger external element the space heating demand will be circa 35% of the overall heat pump output.

Passive Solar

The proposed scheme in Carrickmines Great has good exposure to daylight and this feeds into the setting out and extent of the windows to be provided. There are a number of competing aspects to daylight that needs to be balanced by the architect. Adequate daylight needs to penetrate the apartments to support the wellness of the environment and this needs to be balanced against the U value impact of the glazed elements on the openings. At the same time there is a growing awareness of the level of solar gain that windows allow into the space and while solar gain is welcome in reducing the energy needed for space heating, during the summer can lead to prolong period of overheating internally. The quality and performance of the glass will be looked at the optimise its performance against these different variables. Please refer to the specific and more detailed Daylight and Sunlight Assessment, provided with this application, for further details.

Lighting

Currently there is a bias, encouraged by the DEAP software to fit low energy bulbs, but this is revised in the new 4.2 version to reward the installation of LED light fittings. This is one of the more accessible routes to gaining NZEB compliance. An LED light source will last at least twice as long as a low energy bulb and use about half of the energy. Another advantage of the LED bulbs is that their low energy demand correlates with less heat rejected to the space and adding to the potential of overheating.

Space Heating and Controls

Demand associated with space heating is now a minor aspect of energy demand, especially in apartments. In order to effectively and accurately manage these losses while still maintaining comfort conditions it is necessary to have accurate and fast acting heating controls. The controls will be at a level to get the highest DEAP rating (time and temperature control) and we expect with the systems to be used on site that this will be achieved on a room by room basis.

3. Renewable Energy

Since 2008 and the introduction of the European Performance of Building Directive it has been mandated that each dwelling unit must generate a portion of their energy demand. From that time to this the proportion of energy to be delivered has been at a fixed rated of 10 kWh/m^2 per year. For the standard of build and resulting energy rating this equated to about 10 to 15% of the DEAP assessed energy demand of the house. In 2019 this fixed deliverable now represents over 20% of the energy needed in a dwelling. With this in mind the new NZEB Regulations issued are calling up a percentage of the primary energy used in a dwelling and this will reward the better built houses.

In reality designers and builders will still need to over supply the renewable energy contribution in order to meet the Energy Performance Criteria of 0.3 as compliance hinges around either the ability to generate hot water (for sanitary purposes) using a heat pump with a related COP of over 230% or providing sufficient photovoltaic capacity to lower the imported energy into the unit. A summary of the various renewable solutions available is:

- Solar Thermal
- Solar Photovoltaic (PV)
- Wind power
- Combined Heat and Power
- Heat pumps

4. WINDOWS

When assessing the energy efficiency of a window the frame has a bigger impact on the U value than the glass, effectively it is the weakest link in the thermal performance of the overall assembly. PVC framing material performs better than aluminium, having improved insulation qualities. At the point of manufacture the embodied energy of uPVC is 80 MJ/kg whereas the equivalent aluminium figure is 170 MJ/kg, a reduction of over 50%.

Both aluminium and u PVC windows have similar U values but on a like for like basis uPVC is better, this is related to the previous point about energy efficiency performance. A typical uPVC window will have a U value of 1.2 W/mK and its aluminium equivalent will be 1.33 W/mK. Another consideration is the impact of the window system on the overall building is sound. uPVC frames have a better noise attenuation property than aluminium. While there is no pronounced local variable at play in Carrickmines Great such as an airport or busy road, the party walls in the apartments and houses need to comply with acoustic criteria in Part E of the Building Regulations and it makes sense that the windows should contribute to the quiet ambience within. uPVC frames will facilitate less sound transfer into the apartment than the equivalent aluminium frame.

The lifespan of both aluminium and PVC is similar at circa 35 years. Aluminium frames depend on their paint cover, minimum of 70 microns, for protection whereas the PVC frame material is designed to be exposed and does not require an outer protective layer.

There is an initial cost differential between aluminium and PVC windows. The aluminium units are more costly but this is compounded over the lifetime of the units. It is important, especially this close to the coast, that the paint on the aluminium frames is kept intact and the colour as initially selected. Realistically the frames will have to be painted every 10 years. This maintenance cost is not associated with the PVC frames. PVC is genuinely maintenance free and the colour of the frames is ingrained through the material.

5. UTILITY INFRASTRUCTURE

ESB

A significant component to setting out of large scale residential schemes is accommodating the requirements of the ESB. There are a number of ESB parameters which are well established and influence the initial site development in tandem with this there are two other aspects that directly impact the sub-station configuration. Over the last couple of years the ESB have adjusted and settled upon how they want electrical meters located and isolated. Basements are not acceptable and it is not always possible to accommodate the meter clusters adjacent to the Core entrances in a manner that meets all the criteria (clearances, throwback distances, fire man's isolation, etc.).

More fundamentally the ESB are planning their sub stations to accommodate the electrical loads and profiles associated with new schemes. With electric car charging the associated power demand is greater than the internal domestic load and with the majority of cars being charged at night the profile is much less diversified. The design of the ESB network on to and around the development is by the ESB and for planning stage we have made an estimate of the likely requirements that they will seek.

Based on the number of units and associated electrical load the ESB will require a single sub-station housing for Carrickmines Great and this will need to have an adjoining switch room to provide the isolation and distribution needed to serve the scheme.

The sub-station needs to be adjacent to a carriageway to allow the ESB to drive up to it in the event there was a catastrophic transformer failure. Incorporating the sub station into the building is not viable as it would have a very adverse impact on the elevation, sterilise a corresponding footprint below it in the basement and unsettle occupier of units adjoining it.

At the northern end of the site the layout of the scheme has a single detached house allowed for. The design and set out of this unit is influenced by existing overhead ESB lines. For technical and safety reasons the ESB seek a clear area away from the edge of the high voltage lines. For this development ESB networks have indicated that an 18m wayleave is required from the centreline of the overhead 110 kVa transmission lines.

EIR

The site location is adjacent to existing EIR services infrastructure and will provide communications to the development (ie. broadband, phone, TV etc.). A specific site services design layout has been prepared by our office (drawing 22018-E-002) and allows for the provision of 2No 100mm EIR ducts on to the scheme and the subsequent networking around the site. EIR will confirm this with a final design drawing. EIR services comprise of chambers and ducting. All chambers shall be suitably traffic rated for the area in which they are being installed. A 36mm EIR duct shall be provided from the nearest chamber to the houses. EIR Services shall terminate within the EIR ETU box positioned on the external party walls of each single dwelling. An EIR cabinet shall be provided within each apartment block and services shall be distributed to each apartment from this location.

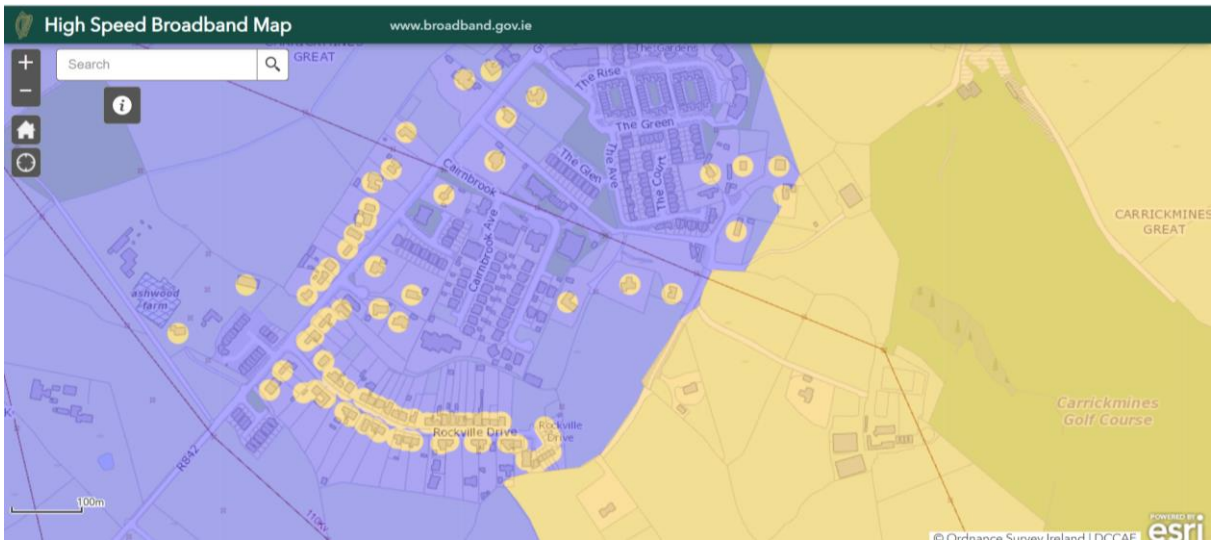
VIRGIN MEDIA

Virgin media services provide communications to the development (ie. broadband, phone, TV etc.). A specific site services design layout has been prepared by our office (drawing 22018-E-003) and allows for the provision of 2No 110mm Virgin Media ducts on to the scheme and the subsequent networking around the site. Virgin Media will confirm this with a final design drawing. VM services comprise of chambers, Node cabinets and ducting. Node cabinets are required to amplify the signal within the development. Each node pillar requires a 15amp LV supply.

All chambers shall be suitably traffic rated for the area in which they are being installed. A 50mm VM duct shall be provided from the nearest chamber to the the houses, a maximum of 10No dwellings per chamber. VM Services shall terminate within the VM ETU box positioned on the external party walls of each dwelling. A virgin media cabinet shall be provided within each apartment block and services shall be distributed to each apartment from this location

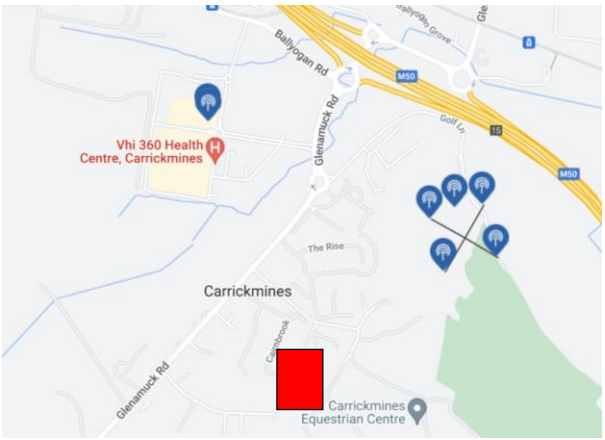
6. TELECOMMUNICATION INFRASTRUCTURE

The subject site is located in a well developed suburban area with excellent telecommunication links. It has been confirmed that Eir can provide a 100Mbps network to the site and Virgin have a fibre backbone in the area. In tandem with the utility provider confirmations the National Highspeed Broadband map confirms the space is zoned "Blue" for high speed internet availability.



National High Speed Broadband map of the high speed broadband local to the site

The proposed apartment blocks are a maximum of 5 storeys in height and while these are below the threshold for tall building (6 storeys and above) it is prudent to review the impact of the buildings on the local mobile phone nodes. The map extracts below, from the National Com Reg map, are a national database of all the mobile mast nodes and their associated operator. There is mobile phone network infrastructure to the East and West of the site.



- Mobile phone mast

- Site location

There are two mobile mast clusters adjacent to the site. To the north west of the site, in the retail park, is a Meteor mast and to the north east is a group of 5 cells operated by Three, Meteor and Vodafone.

In reviewing the mobile phone network, relative to the site location, size of the apartment blocks and nearest masts further up the Glenamuck Road the proposed development will not impact on the operation of the masts adjacent to the M50.

7. ELECTRIC CAR CHARGING STRATEGY:

Currently providing EV charging solutions to individual apartment dwellers with basement or surface parking areas is difficult as the car parking space is not in immediate proximity to the apartments metered supply. For this reason the EV charging point needs to be powered from an alternative source other that the individual apartments metered supply. An individual apartment dweller may also not hold two separate electricity supply accounts, this is due to the fact the ESB will only issue one MPRN per address. The only alternative viable option is to supply the EV charging point from a 3rd party (charging provider or landlord) supply. The houses will have parking on their curtilage and provision will be made to allow an EV charging point tie back into the metered supply to the house.

Due to the fact the EV charging points are not tied to any apartment meters, an interface system such as “Go Charge” will need to be implemented in order to manage usage and payment for use of any given charging point.

The proposed strategy will be that each EV customer wishing to avail of the on site car charging points will need to register with “Go Charge”. Once the customer has an active account, they will be able to avail of any of the charge points open to the public by simply using an app on their phone to enable the charge point to activate.

The developer will provide car charging points at the outset for 20% of spaces as per the Development Plan Section 12.4.11. Each of these enabled spaces will be equipped with one fully functional EV Charging Point, with ducting provided to all car parking spaces across the communal residential parking. New dwellings with in-curtilage car parking will have appropriate infrastructure installed to enable installation at a later stage of a recharging point for EVs, by the home occupier.

The remaining 80% of the communal car park spaces will be ducted to facilitate the expansion of the EV charge network on site. Where a resident wishes to install a charge point at their designated parking space, they can apply to the SEAI for the prevailing grant, this can be passed to the owner’s management company (OMC), who will then install the infrastructure required to complete the installation and setup of the EV charging point for the customer. The financial arrangement associated with this will be defined by the OMC on a non profit basis.

8. PROPOSED SYSTEMS OUTLINE.

Measure Proposed	Description	Benefit
Space Heating	For the apartments on the scheme there are a number of low energy solutions being assessed and will be either: • Connected to a centralised district heating. The primary heat input will come from air to water heat pumps and the secondary heat input from backup boilers. • Install local exhaust air heat pumps for the generation of HWS. This is the majority energy burden in the apartments as space heating losses have almost been designed out. • Incorporate CHP engines into the district heating scheme. Units would be sized to achieve a balance between heat demand to the apartments and the extent of electricity that can be used efficiently on site by Landlord services and car charging.	The district heating plant to be installed will be the most efficient of its type. The heat load can be diversified and therefore lower installed capacity provide. This means the heating plant is better able to modulate to the load and operate at maximum efficiency. Gas distribution is removed from the apartments and there is no carbon monoxide risk to the occupants. The local exhaust air heat pump would have the lowest operating cost, negligible transmission losses and can be incorporated fully within each unit. On site generation of electricity is more efficient than pulling off the grid and would lower the MIC needed off the ESB.

Measure Proposed	Description	Benefit
Heat Recovery Ventilation	With the current best practise building methodology to be used at Carrickmines Great, the units will achieve an air tightness level of $3m^3/m^2.hr$ or better. While this is advantageous for limiting heat loss it is still important to ensure a supply of fresh air and removal of stale and humid air. The heat recovery ventilation (HRV) unit does this by extracting air from the “wet” rooms and supplying fresh air to the living spaces via a ducting network. Each system is dedicated to the apartment it serves.	Ventilation has a significant bearing on well being and the sustained ventilation rates delivered by a HRV system give quantifiable air flow rates to rooms and this ensures humidity is controlled and carbon dioxide levels are low. The most obvious benefit is that the outgoing stale air heats up the incoming fresh air, reducing the heat load of the apartment. The importance of controlled ventilation by mechanical systems is now being reflected in the proposed new Part F Regulations but the solution proposed for the Carrickmines Great units will be at the top end of this scale.

Measure Proposed	Description	Benefit
Heat pumps	Air to water heat pumps are being considered and they have gained significant traction in the last 8 years in the Irish market. Heat pump operation would be optimise to improve seasonal efficiency and selected to have generate HWS at the top end of the scale to ensure NZEB targets are met.	As heat pumps are an all electrical solution they can utilise the sustainable electrical energy delivered to the grid by wind power. Occupiers are advised to have their heat pumps on standby all of the time, trickle charging the house, and this allows them to use electricity at night, when at a lower rate and may otherwise go to waste.
CHP	If the whole of the scheme is to be connected to a district heating solution the network would be strengthened by the addition of a Combine Heat and Power unit. This is like a local power station and burns gas to run the engine that generates heat and electrical energy. The heat output is delivered into the district heating network and holds out the boilers from running. The electrical output is used to drive the district heating system and other landlord loads. This local CHP	The proposed condensing CHP units will ensure the maximum efficiency is extracted from the gas consumed. As the power off the CHP will run the district heating system and landlord loads, this offsets a considerable demand off the electrical grid and lowers the management running costs.

		has a marginal efficiency improvement over a remote (large scale) power station and this margin in deemed a renewable and when multiplied by the run hours gives a total renewable contribution to the system.	
E Car charging		The adoption of electric cars is now in the main stream and with the proximity of this site to work and leisure destinations the occupiers are more likely to opt for electric cars. Please refer to the separate outline issued with this package on the e car charging strategy	Please refer to the separate outline issued with this package on the e car charging strategy .