McElligott

CONSULTING ENGINEERS

Energy Statement
for
Fassaroe SHD
at
Fassaroe, Bray, Co. Wicklow

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Prepared By:	**Richard McElligott**
Email:	**richard@mcelligott.ie**
Tel:	**01 424 3014**
Website:	**www.mcelligott.ie**

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1. ENERGY STATEMENT

1.1 Introduction

Cosgrave Property Group are applying for planning to develop the lands in Fassaroe, to the West of junction 6 on the N11.

The development comprises the following building elements: houses, apartment buildings, a creche, Neighbourhood Centre with retail at ground floor and apartments above and a retail / café kiosk.

All of the units will be subject to the NZEB (Nearly Zero Energy Building) requirements of the updated Part L Regulations, from 2021 that are in effect. In terms of energy ratings all of the units on site will have a Building Energy Rating (BER) of A2 / A3.

The measure of compliance with Part L of the Regulations is demonstrated using the Dwelling Energy Assessment Procedure (DEAP) software. A revised version 4.2 of the software has now been issued which 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 the proposed apartments and houses at Fassaroe will have to use 30% of the energy that the equivalent unit, built to the prevailing 2005 standard would have used. The required renewables contribution in each unit is now a percentage, 20%, of the overall energy density that the dwelling requires. This compares with a previously required flat rate of 10 kWh/m^2 per year but based on the simulations run to date this appears to be working out to the same level.

The primary aim of Part L 2021 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.

2. BUILDING FABRIC

The intended building fabric elements that are the benchmark targets across the site, used in the construction of the dwellings 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 target development air tightness for Fassaroe is to achieve an air tightness level of 3 air changes an hour or better. The current Part L Regulations has a backstop value of 5 air changes an hour. Based on previous project experience of comparable building fabrics and construction details with Cosgrave Property Group we expect this figure will be exceeded within all the house/ apartment types proposed. It is proposed to provide heat recovery ventilation systems in all of the houses and apartments. Based on the target fabric values above further gains in thermal performance become quite marginal below this level.

The approved construction details, from the Dept of Environment and Cosgrave's own suite of thermally modelled junctions, will achieve a minimal thermal bridging factor of 0.08. The net benefits of these fabric and air tightness levels is that the heat losses associated with the apartments will be below 25% of the total thermal demand. For the houses the thermal demand is higher due to surface area but still less than needed for sanitary hot water generation.

Passive Solar

The apartment component of the Fassaroe scheme has good exposure to daylight and this feeds in to the setting out and extent of the windows to be provided. There are a number of conflicting aspects to daylight have been balanced by the architect. Adequate daylight needs to penetrate the apartment to support the wellness of the environment and this needs to be balanced against the U values impact of 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 it can lead to prolong period of overheating internally. The quality and performance of the glass has been looked at to optimise its performance against daylight and excess thermal gain. As part of the detail design process a TM 59 solar overheating calculation will be done.

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 and will be provided in the scheme. An LED light source will last at least twice as long as a low energy bulb and use about a quarter 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). The heat controls to be provided will show the prevailing temperature allow time scheduling and be web enabled to facilitate remote access.

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 rate 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 the 2019 revision of the Part L Regulations this fixed deliverable now requires 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 renewable solutions to be adopted on site are:

- Solar Photovoltaic (PV)
- Combined Heat and Power
- Heat pumps

4. WINDOWS

PVC framing is proposed at Fassaroe for its energy efficiency and low maintenance characteristics compared with aluminium 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. At Fassaroe the main trafficked areas will be along the main spine road and the link road to the recycling centre, adjacent to Apartment Blocks 1 to 3. While the glass specified across the site is a separate component to the frame, uPVC will facilitate less sound transfer into apartments and houses 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

A significant component to developing the setting out of largescale 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 net result of this is the ESB will require a series of sub-stations through the Fassaroe scheme and these will need to have an adjoining switch room to provide the isolation and distribution needed to serve the scheme. On the site plan submitted with this

application the architects, MCORM, have indicated where proposed sub stations will be required. The final site network and sub stations will be dictated by the ESB

The sub-station needs to be located 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.

6. PROPOSED SYSTEMS OUTLINE.

	Measure Proposed	Description	Benefit
	Space Heating	For the houses and apartments on the scheme of the proposed low energy solutions will involve the use of best available technology and this will be one or a combination of the following: • Connected to a centralised district heating, beneath the apartments. The primary heat input will come from air to water heat pumps and the secondary heat input from CHP engines and backup boilers will be the final contributor to the system. If the site has a private district heating system this allows for a future waste heat solution to be exploited across the scheme • Incorporate larger Combined Heat and Power (CHP) engines into the district heating scheme. Units would be sized to achieve a balance between heat demand to the apartments and houses with the extent of electricity that can be used efficiently on site by Landlord services and car charging. • Within the apartments install local exhaust air heat pumps for the generation of HWS. This is the majority energy consumer in the apartments as space heating losses have almost been designed	The district heating plant to be installed will be the most efficient of its type at this scale. 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. On site generation of electricity is more efficient than pulling off the grid and would lower the MIC needed off the ESB. The local exhaust air heat pump would have the lowest operating cost, negligible transmission losses and can be incorporated

	out.	fully within each unit.
Measure Proposed	**Description**	**Benefit**
Heat Recovery Ventilation	With the current best practise building methodology to be used at Fassaroe, all the units are targetting 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) philosophy is to ensure a supply of fresh air 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 or house it serves and will be independently commissioned as per the current Part F Regulations.	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 Fassaroe units will be at the top end of this scale.

Measure Proposed	Description	Benefit
Heat pumps	Air to water heat pumps are being considered for the houses and this technology has gained significant traction in the last 8 years in the Irish market. Heat pump operation would be optimised 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.
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 Car Charging Strategy document by McElligott Consulting Engineers provided with the application.	Please refer to the separate Car Charging Strategy document by McElligott Consulting Engineers provided with the application. .