HAYES HIGGINS PARTNERSHIP

Project Managers
Chartered Civil, Structural, Fire
& Building Services Engineers

CONSULTANCY SERVICES
FOR
KILKENNY COUNTY COUNCIL

CROKER HILL HOUSING
CROKERS HILL,
KENNYSWELL ROAD,
KILKENNY.

(Delivery of Housing Units at Croker's Hill)

BUILDING REGULATIONS Part-L COMPLIANCE REPORT

vanDijk Architects

HAYES HIGGINS PARTNERSHIP

MGS

18ME002 **July 2019**

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1. INTRODUCTION

Hayes Higgins Partnership have been appointed as building services consultants, as part of a larger Design Team by Kilkenny County Council. The development will provide a diverse range of housing types to support varying needs/aspirations of people hoping to live there. The development will consist of 6 No. blocks (3 of which are apartment blocks and 3 are blocks of houses) with a total of 86 dwelling units. These include a group home, houses, duplexes, apartments and a community facility on an area of approximately 2.22Ha. The 86 dwelling units specifically comprises of: 1 five-bedroom terraced house; 4 four bedroomed terraced houses; 19 three bedroomed terraced houses; 9 three bedroomed duplex apartments; 2 four bedroomed duplex apartments; 14 one bedroomed apartments; 28 two bedroomed apartments; 8 three bedroomed apartments and 1 No. five bedroomed group home.

This report sets out to demonstrate a number of methodologies in Energy Efficiency, Conservation and Renewable Technologies that will be employed, in part or in combination with each other, for this development. These techniques or a combination of same, will be employed to achieve compliance with the Building Regulations Part L for both Domestic & Non-Domestic Elements of the Development.

The Building Regulations reference documents applicable shall be;

> 'Part L and European Union (Energy Performance of Buildings) (No. 2) Regulations 2019 Technical Guidance Document - Conservation of Fuel and Energy – Dwellings'
> and
> 'Building Regulations 2017 Technical Guidance Document L - Buildings other than Dwellings - Conservation of Fuel and Energy'.

2. GENERAL INFORMATION

2.1. Site

The proposed site, with an area of circa. 2.22 Hectares, lies to the west of Kilkenny City Centre. It is located within easy walking distance of the city centre, positioned less than 1km (by foot) west of the Courthouse. 1.5km to Kilkenny Castle and Park, 950m to St.Canice's Cathedral, 2km south of St.Lukes General Hospital and less than 1km from Kilkenny Garda Station.

O.S. Map reference:	**OS 4766-8 (1:1000) & 4766-A (1:2500)**
Co-ordinates:	**52.653593, -7.266411**
Ownership of site:	**Kilkenny County Council**
Size of Site:	**2.3 Ha site**

2.2. Design Requirement

Development of a housing scheme on a well-located greenfield site of circa. 2.22 hectares within walking distance of all amenities in Kilkenny City.

The intention is to develop a sustainable community by providing accommodation suitable for a variety of housing applicants / existing tenants with a range of needs, at all stages of life. It is intended to cater for a good proportion of elderly and mobility impaired applicants in particular.

2.3. Site Drainage & Service Utilities

Service Utilities:

Natural Gas is available in Kilkenny City.

3 Phase ESB supply on site. Overhead lines will need relocation.

Foul Water Drainage:

Breagagh Valley Sewer to the rear of the site (see drawing).

Surface Water Drainage:

Attenuation will be required. Discharge to Breagagh River to the rear may be possible.

Implications for current development and particular restrictions on possible location:

Wayleaves may be required for foul and surface water connections. These should be identified at the earliest opportunity.

Moving the Existing ESB lines has been investigated and will be fully detailed following the planning process, in conjunction with ESB Networks.

Engagement with Irish Water is underway and detailed in separately prepared reports by others.

3. ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE

The EU Directive on the Energy Performance of Buildings (EPBD) contains a range of provisions aimed at improving energy performance of residential and non-residential buildings, both new-build and existing. This Directive was adopted into Irish law as Regulation in 2006.
The EPBD obliges specific forms of information and advice on energy performance to be provided to building purchasers, tenants and users. This information and advice, provides consumers with information regarding the energy performance of a building and enables them to take this into consideration in any decisions on property transactions.

As part of the Directive, a Building Energy Rating (BER) certificate, which is effectively an energy label, will be required at the point of sale or rental of a building, or on completion of a new building. As such the Dwellings Energy Assessment Procedure (DEAP) was created a base procedure in which the BER can be calculated. The Dwelling Energy Assessment Procedure (DEAP), which is the Irish official procedure for calculating and assessing the energy performance of dwellings. The procedure takes account of the energy required for space heating, ventilation, water heating and lighting, less savings from energy generation technologies. For standardized occupancy, it calculates annual values of delivered energy consumption, primary energy consumption, carbon dioxide emissions and costs, both totals and per square meter of total floor area of the dwelling.

The report sets out to demonstrate a number of methodologies in Energy Efficiency, Conservation and Renewable Technologies that will be employed in part or in combination with each other for this development. These techniques or a combination of same, will be employed to achieve compliance with the Building regulations Part L.
TGD Part L 2019 has been published, and now requires all new dwellings to be constructed to a Near Zero Energy (NZEB) standard. NZEB requires “that, the nearly zero or very low amount of energy required is covered to a very significant extent by energy from renewable sources including energy from renewable sources produced on-site or nearby”.

The introduction of a Renewable Energy Ratio (RER) of 20% is replacing the requirement to meet the input from renewable technologies of 10kWh/m^2 thermal or 4kWh/m^2 electrical. The 20% requirement means at least 20% of the calculated energy consumed within the dwelling as calculated by DEAP, is to be renewable. If your energy consumption increases, so does the amount of renewables required and vice versa.

4. STRUCTURE AND BUILDING ELEMENTS

While the construction works will incur an initial investment, the lifetime running cost of the building must be considered to reduce water, fuel and electrical energy consumption. To that end methods will be explored to further improve the building's energy rating and reduce the carbon emissions. This includes decreasing the thermal conductivity (heat losses) of the building fabric, take advantage of passive solar gain to reduce the heating demand in the space and increase day lighting to reduce artificial lighting. Natural ventilation may be employed or if deemed as a requirement mechanical ventilation and heat recovery techniques will be employed to recover energy in the exhausted air.

4.1. Maximum Fabric 'U' Values proposed for the development

Walls	0.18 W/m^{2}K
Windows (frame factor of 0.7 or better)	1.6 W/m^{2}K (solar fraction (g factor) of 0.6
Roof	0.16 W/m^{2}K
Doors	1.6 W/m^{2}K
Ground Floor slab	0.18 W/m^{2}K
Thermal Bridging Factor	0.15 W/m^{2}K

4.2. Air Permeability (Air Tightness against infiltration)

One of the most significant heat loss factors in any buildings is through controlled and uncontrolled ventilation through the introduction of ambient/outside air into the heated space. The dwellings are to be constructed with a high degree of air tightness to a possible value of 3m^3/m^2/hr or 0.15 Air Changes with a permeability test conducted for each individual dwelling, post construction to demonstrate this level in accordance with the TGD's.

4.3. Site Constraints for Renewables

The site sits on a North-South axis, with the front boundary being south facing. The housing unit blocks are positioned across the site from East to West, however the front façade of individual units vary in their orientation from North/South to East/West and some units having a South West / North East facing front façade. The Maximum Thermal Conductivity values for the element's to be employed in the building model, are as outlined in the Table at 4.1 above. Priority will be given to the best orientation in order to maximise PV output. This will for the most part involve South, West & East facing PV on Roofs. Where a flat roof with little over shading is present, the PV Panels (for Renewable Contributions) will be positioned directly south for the best electrical production.

5. POSSIBLE BUILDING SERVICES COMBINATIONS (M&E)

Use of energy efficient technologies such as Heat Pumps, high efficiency Boiler plant, Photovoltaics (PV), whole-house Mechanical Extract and Mechanical Heat Recovery (MVHR) ventilation will be considered.
In addition, temperature and zone controls on the heating system provided, will be used to reduce fuel and electricity demand within each house type / unit space.

Figure 1: Typical Photovoltaic Arrangement

Once the energy consumption has been reduced, a portion of the remaining electrical and thermal (hot water & heating) demand will be met by renewable sources. Not all renewables may be suitable for adoption into the proposed development, but it is intended to evaluate effectiveness of technologies such as heat pumps, solar panels (thermal) and on-site electricity generation from photovoltaic panels.

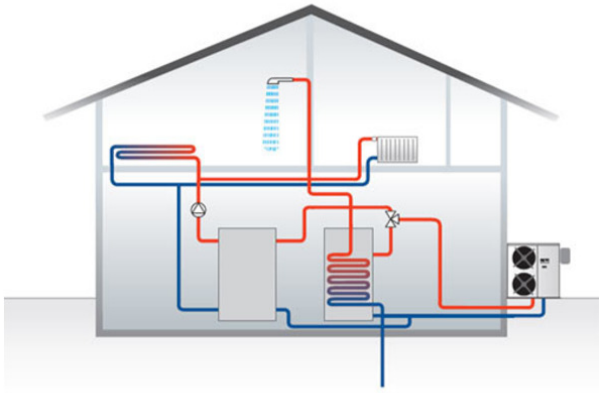
The on-site generation of electricity will supplement the electrical requirement for lighting, motors, etc & reduce the electrical demand required from the grid. Applying this to each dwelling would considerably reduce the demand from the grid and consequently reduce losses and emissions from power stations.

If PV are installed, then where there is little demand, excess electricity from the panels, can be diverted via. an immersion element in the hot water cylinder. It is our intention that should this technology be employed it will result in the dwellings being 'future proofed' for the eventuality that an individual unit or the overall development would require it.

5.1. Heating Systems

The Heating System may consist of an air to water heat pump serving radiators and hot water. Air to Water Heat pumps take advantage of this by transferring the heat/energy from the outside air. Through compression, heat pumps can utilise heat at low temperature and release it at a higher temperature. Current heat pump technologies look similar to and can perform the same functions as a conventional gas or oil boiler, i.e. space heating and sanitary hot water production. For every unit of electricity used to operate the heat pump, up to four to five units of heat are generated. Therefore, for every unit of electricity used to generate the heat, 4-5 (400-500%) units of heat are produced. Efficiencies in order of 600% may also be achieved depending on ambient conditions.

Figure 2: Typical Air Source HP arrangement



Natural Gas is also present in the local vicinity and the use of natural gas for heat generation purposes will be explored. A Gas Fired Condensing Boiler serving the Heating and Hot Water systems within individual dwellings could be adopted. The boiler will be required to operate at a minimum efficiency of 90% and include weather compensation. A central time clock and separate time and temperature controls to each zone is to provided (e.g. via 3-port valves). Such zones will consist of

- Living Areas
- Bedrooms
- Domestic Hot water

The employment of Gas maybe such that additional renewable technologies will have to be considered to offset this as the heating source initially. . It would be proposed to install PV Panels to contribute to the Renewable Energy Requirement.

5.2. Water Heating

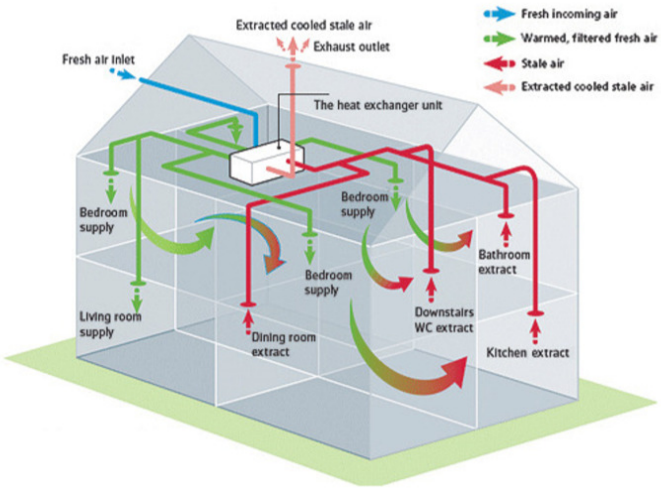
The Hot Water will be generated via. Gas, Solar or Electrical generation with integrated timeclock control and as such heats the water on demand. Where Heat pumps and/or PV are considered, then hot water may also be generated via. an immersion element. The immersion will be required where the heat pump is not capable heating the hot water up to 60^{o}C alone and bring it to the required temperature during the legionella cycle.

5.3. Mechanical Ventilation System

It is proposed to utilise mechanical extract ventilation from wet areas e.g. toilets, utility rooms in accordance with Part F, with mechanical supplied air provided to habitable spaces e.g. bedrooms, circulation and living spaces where Heat Recovery Ventilation systems are present.
Whole house Mechanical Ventilation provides continuous extract from wet rooms only. Supply air to the habitable spaces would be provided via window openings/wall vents. The Specific Fan Power will be no greater than 0.4 w/l/s.

Heat recovery ventilation provides a continuous supply of fresh air to the dwelling through special air valves or grilles located in each habitable room thereby eliminating the number of opening required in the structure. Continuous extract is also provided with the outgoing stale air and from wet areas with the exhausted air pre heating the incoming fresh air via a heat exchanger in the unit. 90% of the heat can be recovered through this process that would otherwise be wasted. This has the impact of significantly reducing the heating demand to a greater extent than the electrical power to operate the unit. Mechanical heat recovery ventilation specification with fan power not greater than 0.4 w/l/s and an efficiency of 94% or greater. Any proposed Mechanical Heat Recovery Ventilation System will have an inbuild summer by-pass present. The Extract hood will not be connected to the system and is to exhaust separately.

Figure 3: Typical MVHR Arrangement



As noted previously, the employment of MVHR or centralized ventilation systems in tandem with a stove is not recommended under TGD Part F.

5.4. Lighting

Internal Lighting:

All internal lighting will be energy efficient with provision made for low energy lamps such as Light Emitting Diodes (LEDs) which use 80% less electricity and last up to 10 times longer than ordinary light-bulbs in the dwellings.

External Lighting:

See Separate Site Lighting Report for Lux Level Calculations completed using 'Lighting Reality' design software. LED Pole-mounted light fittings are proposed.

End of Report

ISSUE REGISTRATION:

Project: Croker's Hill, Kennyswell Road, Kilkenny.
(Provision of Housing Units for Kilkenny County Council)

Project No: 18ME002

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R1	25.07.19	BUILDING REGULATIONS Part-L COMPLIANCE REPORT	E.D.	A.W.

This document considers the particular instructions and requirements of our Client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Hayes Higgins Partnership
The Arches
Gashouse Lane
Kilkenny
Ireland
Telephone (056) 7764710
Facsimile (056) 7723223