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Residential Development at 348 Harold's Cross Road

Energy Statement Report

ENERGY USE AND RATING (BER) ANALYSIS PROPOSED DEVELOPMENT

Former Harolds Cross Motors
348 Harolds Cross Road
Dublin 6W

AAI Kenilworth Ltd / Shipset-Barry

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A	Planning
C	Concept
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1 Introduction

1.1 Report purpose.

This report gives information on the projects energy status and carbon dioxide emissions, the statutory compliance requirements and energy/CO2 reduction achievements based on the proposed building / construction specifications.

1.2 Instruction.

DKPartnership (DKP) have been commissioned by AAI Kenilworth Ltd to carry out the analysis and report for the proposed development at the former Kenilworth Motors, 348 Harold's Cross Road, Dublin 6W.

1.3 Development detail.

The development is a shared living accommodation building and consists of 201 bed spaces set out over 174 bedrooms with shared kitchen/living facilities, communal facilities, a gym, and supporting uses.
The development of 6687sqm is set out in one main 'L' shaped building in plan, with ground floor and lower ground floor consisting of communal facilities with bedroom accommodation over. This building is 4 storeys with an additional penthouse over with recesses at more prominent locations.
The development has no parking and is serviced by bus route and accommodates 210 bike spaces on site. 2 car share spaces are provided on site. Delivery and servicing are provided for on a widened Laundry lane.

1.4 Policy and building regulation requirements.

The project is subject to the following statutory and policy energy usage and CO2 emission target requirements :
a) TGD Part L 2017
b) Dublin City Council development plan 2016-2022

1.5 Approach.

The energy usage and carbon emissions are calculated using the NEAP software and approached using the basic DKP energy reduction steps in the following order :
a) Reduce energy usage
b) Produce energy efficiently
c) Provide on-site energy

2 Executive summary

2.1 Analysis conducted.

In this report the primary energy usage and carbon dioxide emissions have been analysed to provide an energy efficient building in compliance with the current standards and regulations.

2.2 Policy and building regulation compliance.

With the proposed building specifications / design parameters as detailed in section 5 the building complies to both Part L 2017 and to the Dublin City development plan which has been achieved on the basis of compliance to the Part L 2017 the latter being more onerous then the DCC policy standards.
The building is deemed a "Nearly Zero Energy Building" (NZEB) in accordance to the EU Energy performance of Buildings Directive Recast 2013/31/EU.

2.3 Calculation results.

The calculation results using the Part L / building parameters proposed are shown in table 2.1.
To achieve compliance the proposed dwelling has to exceed the "reference" building calculation results.
The reference building is the same building but with pre-fixed Part L and building services parameters set out under part L 2017.

Element		REQUIREMENT	/ M2	ACHIEVED	/ M2	MP PC
Primary energy	kg/yr	822,820	64	701,250	54	0.79
Carbon dioxide	kg/yr	159.230	12	131.710	10	0.81
Renewable energy (pe)	kWh/yr	76,202	7	122,660	12	19.8%

Table 2.1

2.4 Policy and building regulation compliance overview.

Dublin City Council requires new developments to incorporate sustainable design and construction measures.
The table below summarises the requirements of Part L and DCC with the general achievements ;

POLICY/REGULATION	REQUIREMENT	ACHIEVEMENTS
Building regulations	To achieve a primary energy usage equal or less then the Part L 2017 reference building. MPEPC=1.0	A MPEPC of 0.79 was achieved representing a 21% betterment on the minimum requirement or reference building.
	To achieve carbon dioxide emissions equal or less then 1.15 times the Part L 2017 reference building. MPCPC=1.15	A MPCPC of 0.81 was achieved representing a 26% betterment on the minimum requirement or reference building.
	An overall (primary energy) contribution of renewable energy of : 20% if the MPEPC=1.0, 10% if the MPEPC<=0.9	An overall contribution of (primary energy) renewable energy of 19.8% was achieved with the proposed PV panel array.
Dublin City Council	New commercial / public developments to have at least a 33% primary energy reduction over the current Part L 2008 by 2022	Achieved by means of complying to part L 2017

2.5 Conclusion.

From the calculation result we note the following
The achieved MPEPC (primary energy) of 0.79 is in excess of the minimum Part L 2017 requirement of 1.00
The achieved MPCPC (carbon dioxide) of 0.81 is in excess of the minimum Part L 2017 requirement of 1.15
The achieved renewable energy contribution of 19.8% is in excess of the Part L 2017 requirement of 10%
All the building and building services minimum parameters have been complied with.
We conclude therefore that the new development with the proposed reduction measures and renewable energy complies with the part L 2017 building regulations and the DCC development plan..

3 Geographical overview

3.1 Project overview.

Image 1, the (google maps) site map below is a basic overview of the site with proposed development embedded in the area site map.

Image 1

4 Approach and methodology

4.1 General approach.

The target of the building's energy usage and carbon dioxide emissions is to comply to the current building regulations and to design the building and building services in line with the "Nearly Zero Energy Building" energy policy adapted in Part L 2017.

4.2 Building regulations requirements.

a) Current Part L : 2017.
b) Dublin City Council policy requirements. The DCC development plan 2016-2022 does not refer to any specific dwelling or commercial building requirements other then referring to the implementation of the forthcoming 'Climate Change Strategy for Dublin and Climate Change Action Plan for Dublin City and the National Energy Efficiency Plan (NEEAP) which sets out a policy road map to 2020 setting a higher target of 33% energy reductions in commercial building and the public sector by 2022. For buildings it refers to the relevant Irish Building Regulations.

4.3 Reduction methodology.

For this energy statement all the energy and CO2 data given are the project totals of the complete development. the following 3 basic steps are used as the methodology to arrive at the NZEB development :

1) Step 1 - Reduce energy usage
2) Step 2 - Provide energy efficiently
3) Step 3 - Produce on-site energy

4.4 Building minimum elemental parameters.

The following are the reference building minimum target values to achieve compliance ;

ITEN	UNIT	PART L 2017
Primary energy	MPEPC	1.00 - 60% reduction
Carbon emissions	MPCPC	1.15 - 51% reduction
Renewable energy	RER (%)	10% / 20% contribution
External walls	U (W/m2K)	0.21
Curtain walling	U (W/m2K)	1.80
Windows/glazing	U (W/m2K)	1.60 0.5 / 0.7 solar / light transmittance,
Flat roof	U (W/m2K)	0.20
Ground floor	U (W/m2K)	0.21
Cold bridging	U (W/m2K)	(0.12)
Air tightness	M3/m2*h	3.0
Lighting energy	W/m2	(65)
Heat energy efficiency	%	(91%) (300% heat-pump)
Cooling energy efficiency	%	(450% / 360%)
Pumped circulation	W/l/s	(Variable speed)
HRU/MVHR	W/l/s	(1.8)
Single extract units	W/l/s	(0.3)

4.5 Reduction targets.

The following are the reference building or target values.

ITEM	UNIT	AMOUNT	FRACTION	PART L / BER REFERENCE
Primary energy	kWh/yr	822,820	1.00	MP EPC BER label A3
Carbon dioxide	kg/yr	159.230	1.15	MP CPC
Renewable energy (pe)	kWh/yr	76,202	10%	MP EPC <=0.9
Renewable energy (pe)	kWh/yr	152.330	20%	MP EPC 1.0

4.6 Reduction hierarchy

The following is the DKP energy reduction hierarchy applied ;

1) Step 1 - Reduce energy usage
2) Step 2 – Produce energy efficiently
3) Step 3 – Provide on-site energy.

1) Reducing energy usage.

Energy use reduction is mainly achieved by reducing the actual heat loss of the building by :

a - Lowering the heat loss through the floors, walls, roof by increasing the thermal resistance of the elements.
b - Lowering the heat loss through the glazed elements by using windows with a higher thermal resistance.
c - Lowing the heat loss by using insulated construction joints.
d - Increasing the air tightness to minimise the involuntary air infiltration rate.
e - Using an ideal building mass to lower the impacts of temperature fluctuations.

Proposed : The following façade and general building parameters are applied for heat loss reduction..

Ground floors :	U<=0.110 W/m2K
External walls :	U<= 0.130 W/m2K
Party walls :	U<= 0.000 W/m2K
Roof :	U<= 0.095 W/m2K
Window & frame :	U<=1.0 W/m2/K, Solar transmittance <=0.50, Light transmittance >=0.65
External door & frame :	U<=1.0 W/m2K
Cold bridging :	U<= 0.08 W/m2K approved construction joints applied.
Thermal mass :	>= TP250 medium heavy. Concrete (solid) walls, floors,
Ventilation 75% :	Humidity (demand) controlled natural ventilation with intermitted extract ventilation
Ventilation 25% :	MHRV, temperature recovery efficiency >=90%, SPF <= 1.2 W/l/s.
Air tightness :	<= 3.0 m3/m2*h
Low energy lighting.	100% LED + partial occupational controls.

2) Provide energy efficiently.

This means producing or delivering the required energy for the building as efficient as possible by using ;

a - City district heating networks.
b - City district CHP heating net works.
c - On site communal heating with CHP
d - On site communal heating with heat pumps.
e - On site communal heating with condensing boilers.
f - Individual condensing gas boilers
g - Individual heat pumps
h – A combination of f and g

There are also other possible sources like geothermal heat or waste heat recovery from incineration or other industrial processes to be considered.
As there are no City heating net works in close vicinity to the project site a local on-site energy source is to be applied. CHP is not efficient as the projects base load is not sufficient to maintain viability on a CHP plant. Geothermal heat or waste heat from any other sources are not present or viable. The project, as it is relatively dense, would be suited to a communal heating system fed by mains gas condensing boilers.

Proposed :

Communal heating 60% main gas condensing boilers	Seasonal efficiency >=93.0%,
Communal heating 40% air source heat-pump	Seasonal efficiency >=375%

3) Renewable energy.
This means producing on-site renewable energy by using ;
a - Thermal solar panels for hot water and/or space heating.
b – Photovoltaic (PV) panels for electrical energy for all electrical requirements.
c - Wind mill(s) for electrical energy for all electrical requirements.
d - Biomass (wood, pellet, chip) plant for hot water and/or space heating.
e - Incinerator(s) for waste heat production

Given the configuration of the development and the urban location wind power has not been considered.
Biomass, although theoretically a good renewable option, has given issue's in other project's with similar use due to maintenance problems with the actual plant giving rise to complaints from occupants./users.

Proposed :
Proposed are 180 no 1 x 1.6m PV panels with a panel output of 360 Wp totalling +/- 65 kWp.
The panels are mounted at a 30 degree angle facing due South.
Total calculated electrical gain is +/- 56,000 kWh/year.
The electricity generated by the PV has a significant effect on the primary energy as the primary energy factor for electricity is relevantly high compared to other fuels.
Likewise the carbon dioxide emission factor of grid electricity is relatively high and reductions in imports are highly effective.

4.7 Calculation software.
Primary energy and carbon dioxide performance calculations are executed using the National Calculation Methodology government approved None domestic Energy Assessment Procedure (NEAP).

4.8 Over heating.
Over heating can be an issue and an over heating analysis was conducted using the Hevacomb 3D analysis software which concluded that the risk to overheating was minimal in accordance to CIBSE TM37 mainly due to the relative conservative amount of glazed elements.
Overheating was to some degree addressed by applying solar absorbent glass with solar factor (g) of 0.63.
The solar absorbent glass did effect the useful heat gains but we feel that this is a reasonable trade off against the lowering of the overheating risk of 26C for 4% of the occupied hours and 28C of only 0.9% of the occupied hours and well within the CIBSE TM37 parameters.

4.9 Calculation results.

The table below shows the calculation results from the building using the proposed Part L and building service parameters. We note the renewable energy achievement to be in excess of the originally targeted amount however this is necessary to achieve the primary energy reduction.

Element		REQUIREMENT	/ M2	ACHIEVED	/ M2	MP PC
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Renewable energy (pe)	kWh/yr	76,202	7	122,660	12	19.8%

4.10 Part L compliance conclusion.

From the calculation result we note the following
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The achieved MPCPC (carbon dioxide) of 0.81 is in excess of the minimum Part L 2017 requirement of 1.15
The achieved renewable energy contribution of 19.8% is in excess of the Part L 2017 minimum requirement of 10%
All the building and building services minimum parameters have been complied with.
We conclude therefore that the new development with the proposed reduction measures and renewable energy complies with the part L 2017 building regulations and the DCC development plan..