

Lands to the Ardshanavooly, Killarney, Co. Kerry

Proposed Residential Development

CLIMATE ACTION and ENERGY ANALYSIS REPORT

ENERGY (PART L COMPLIANCE) and CLIMATE IMPACT STATEMENT

Lands at Ardshanavooly,
Killarney,
Co. Kerry

Wrightwood Developments Ltd

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Planning consultants		RK Consulting	✓	✓	✓	✓
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ING Gerard (Craig) van Deventer CEng., BE(mech)., HDip CIOB, MCIBSE

M : [00] 353 (0)87 260 8080
E : gerard@dkpartnership.com

DKPartnership
70 Main Street, Applewood , Swords, Co. Dublin, Ireland
Reen Kenmare Co. Kerry

post@dkpartnership.com
www.dkpartnership.com

T : [00] 353 (0) 1813 1930
T : [00] 353 (0)64664 1686



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1 Introduction

1.1 Report purpose

This report gives information on the proposed 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 Wrightwood Development Ltd to carry out the analysis and report for the proposed residential development at Ardshanavooly, Killarney, Co. Kerry.

1.3 Development detail

Wrightwood Development Ltd, intend to apply for planning permission for a Large Scale Residential Development (LRD) for development at a 2.23 hectare site at lands at Ardshanavooly, Killarney, Co. Kerry. The proposed development comprises of:

1. Construction of a 123 no. dwellings in a mix of duplex, maisonette and apartment typologies comprising 16 no. 1 bed apartments, 6 no. 2 bed apartments, 11 no. 1 bed duplex apartments, 11 no. 2 bed duplex maisonettes, 28 no. 2 bed duplex apartments, 28 no. 3 bed duplex maisonettes and 23 no. 3 bed terrace houses, all in building heights ranging from 2 to 4 storeys. The development includes 20 no. townhouses designed to comply with requirements for affordable housing units and will be offered as affordable housing units.
2. A total of 139 no. surface car parking spaces, including 4 no. car-share parking spaces, 6 no. visitor spaces, and 5 no. assigned Part M/accessible spaces.
3. Bicycle parking comprising of 272 no spaces in total, comprising 124 no. spaces within the private open space of ground floor residential units and 96 no. spaces within secure sheltered structures and designated secure bicycle parking areas, and 52 no. short stay/visitor spaces.
4. 3,600 sq.m of public open space, including arrival pocket park, central pocket park and amenity landscape areas (including 117 sq.m of play), grass lawns, kickabout areas, picnic areas and seating areas;
5. 956 sq.m of communal external open space, including seating areas, nature trails, and amenity grass lawns.
6. Additional environmental open space of 1,790 sq.m, including landscape buffers, protection and enhancement of existing hedgerows and trees.
7. A new vehicular, pedestrian and cyclist access from the existing estate road adjoining the site to the south.
8. Infrastructure works to serve the proposed development to include the internal road and footpath network, ESB cabinets/substations/switchrooms, site and external building lighting, site drainage works, hard and soft landscaping, boundary treatments, communal bin stores, and all ancillary site services and development works above and below ground.

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 2022.



1.5 Project location

Image 1.1 the (google maps) site is an overview of the site area with the proposed development approximately outlined in red.



Image 1.1: Proposed development site boundary. Imagery © Google 2025.

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 and national and global climate impact.

2.2 Policy and building regulations applied

Given its time frame currently known the new development's requires compliance (energy) to new Part L 2022. Compliance to the above would deem the development and developments residential units to be "Nearly Zero Energy Buildings" (NZEB) in accordance with the EU Energy performance of Buildings Directive Recast 2013/31/EU.

2.3 Compliance target and achieved calculation data

For this report the calculation data provided in the tables below is based on residential Part L 2022 and covers the main compliance criteria; a) Primary energy, b) Carbon dioxide, c) Renewable energy. To comply to Part L the residential unit(s) requires to achieve a primary energy reduction of 70% (0.30 MEPC factor), a carbon emission reduction of 65% (0.35 MCPC factor) and a 20% renewable energy contribution on a reference residential unit. This reference residential unit is identical to the actual proposed residential unit but applies pre-fixed Part L stipulated calculation parameters, U-values, insulation levels, boiler efficiency, controls etc. Whereas all house types at all proposed orientations have been assessed the table below represents the overall development average calculations based on the average house type, volume, floor area, exposed façade area, glazed area, etc. to limit the amount of data for this report. The table details the primary energy, CO2 and renewable energy data of the reference building, the minimum Part L (to-be-achieved) targets and development achievements.

Single average unit: 82.5 m2

Element	Unit	Reference	To be achieved	Rate m2	mp epc/cpc	Achieved	Rate m2	epc/cpc
Primary Energy	kWh/y	13,759	4,128	50.0	0.30	3,836	46.50	0.279
Carbon Dioxide	kg/y	2,703	946	11.5	0.35	491	5.95	0.182
Renewable energy	kWh/y	0	826	10.0	0.20	1,983	24.04	0.517

Copy of Table 4.3

BER rating **A2** 46.5 kWh/m2/y

Overall combined development achievement **123** Units

Element	Unit	Reference	To be achieved	Rate m2	mp epc/cpc	Achieved	Rate m2	epc/cpc
Primary Energy	kWh/y	1,692,357	507,707	50.0	0.30	471,829	46.50	0.28
Carbon Dioxide	kg/y	332,469	116,364	11.5	0.35	60,376	5.95	0.18
Renewable energy	kWh/y	0	101,541	10.0	0.20	243,936	24.04	0.52

Copy of Table 4.4

Overall combined differences:

Primary Energy	kWh/y	REDUCTION	-1,220,528
Carbon Dioxide	kg/y	REDUCTION	-272,093
Renewable energy	kWh/y	CONTRIBUTION	243,936

Copy of Table 4.5

We note from the table above that the overall development achieved an annual energy reduction in energy of -1,220,528 kWh resulting in an annual carbon dioxide (CO2) reduction of -272,093 kg CO2. The combined total development annual renewable contribution with the proposed systems stands at 243,936 kWh which would be

In essence passive reduction measures and on-site produced renewable energy are most beneficial as they are a permanent reduction measures and alternative energy supply combatting not only the global climate change but also the inflation on energy cost.



2.4 Policy and building regulation compliance overview

The table below summarises the requirements of Part L for primary energy, CO₂ and renewable energy.

Policy/Regulation	Requirement	Achievements (Table 4.4, column 9)
Primary Energy	To achieve a primary energy reduction factor (EPC) of 0.30 or less over the 2021 energy reference building.	An EPC of 0.28 was achieved which is lower than the maximum MEPC of 0.30 and is therefore compliant.
Carbon Dioxide	To achieve carbon dioxide emission reduction factor of 0.35 or less over the 2021 energy reference building.	An CPC of 0.18 was achieved which is significantly lower than the maximum MCPC of 0.35 and is therefore compliant.
Renewable energy	To achieve at least a 20% renewable primary energy equivalent contribution.	An overall contribution of (primary energy) renewable energy of 52% was achieved with the heat pump renewable energy element which is significantly higher than the minimum 20% requirement and is therefore compliant.

Table 2.2: Requirements of Part L for primary energy, CO₂ and renewable energy.

2.5 National and global climate impact

To give some guidance on the environmental impact of the proposed development we have compared the achieved carbon emissions with our national emissions and the global emissions. The tables below detail the current national emissions, the EPA forecasted 2030 emissions, the EPA target emission with proposed additional national reduction measures to combat global carbon emissions and the global equivalents. We note that the carbon emissions for the proposed development year 1 are higher than following years as a result of the added carbon emissions of the construction element. For the purpose of the carbon emission calculations the carbon factor from the national electricity grid being the source of energy for the development is maintained at the same carbon factor rate through to 2030 whereas in real terms the carbon factor of the national grid would be less in 2030 as a result of the government's target to de-carbonise the grid and therefore the quoted impact would actually be less.

NATIONAL IMPACT

GHG CO ₂ eq emissions	Unit	National emissions	Development missions	Fraction (%)
Year 2024	Mt-CO ₂ /year	59.25		
Year 2025	Mt-CO ₂ /year	59.10	0.0001388	0.0002349
Year 2030 * target	Mt-CO ₂ /year	58.00	0.0000604	0.0001041
Year 2030 + Measures target	Mt-CO ₂ /year	48.00	0.0000604	0.0001258

Copy of Table 4.6

Mt=Million tonnes i.e.; 60,367 kgCO₂/y = 0.0000604 MtCO₂/y

We note from the table above that the Ardshnavooly Housing Development impact on our national Green House Gas is 0.0002349 % in 2025 and 0.0001041% in 2030 and would be deemed absolutely minimal.

GLOBAL IMPACT

GHG CO ₂ eq emissions	Unit	National emissions	Development missions	Fraction (%)
Year 2024	Gt-CO ₂ /year	53.50		
Year 2025	Gt-CO ₂ /year	53.15	0.0000001388	0.000000261231
Year 2030 * target	Gt-CO ₂ /year	51.50	0.0000000604	0.000000117217

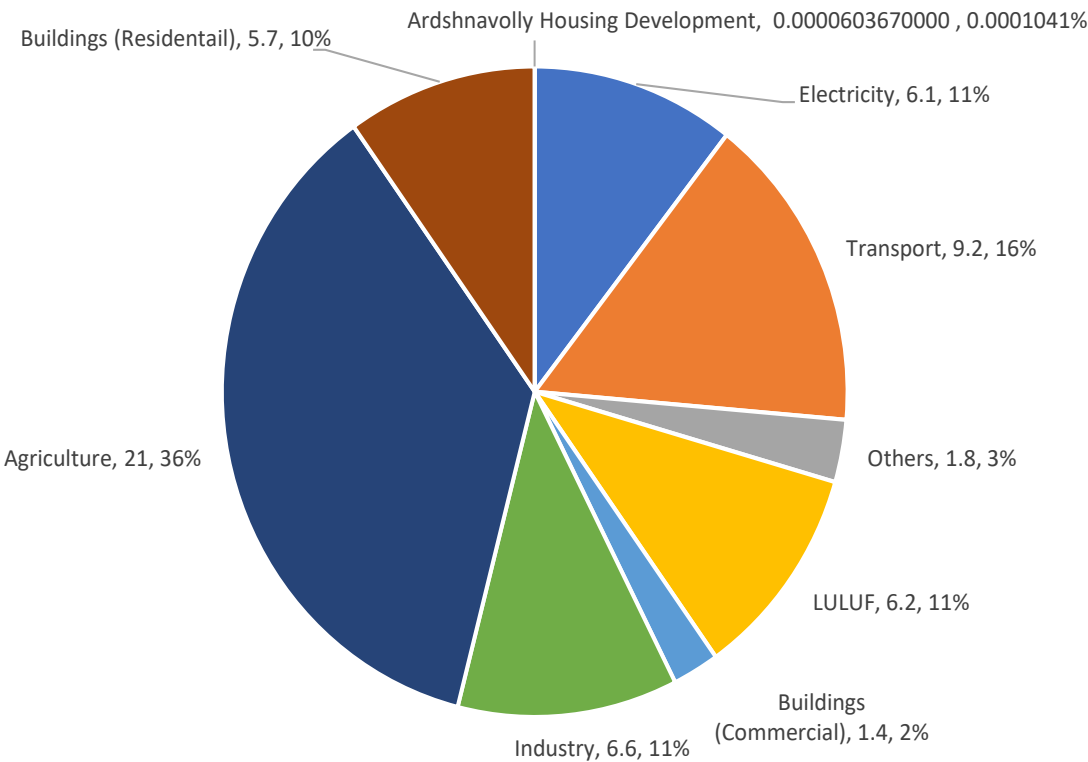
Copy of Table 4.7

Gt=1000 Million tonnes (Mt)

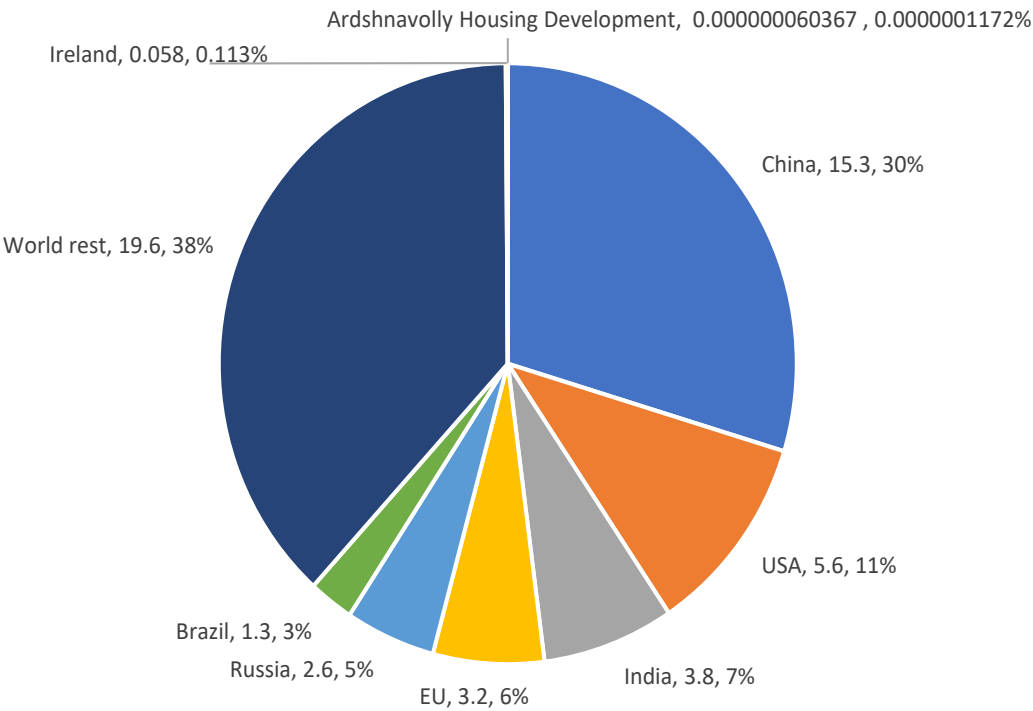
We note from the table above that the Ardshnavooly Housing Development impact on the Global Green House Gas CO₂ eq emissions of 0.0000002612 % in 2025 and 0.0000001172% in 2030 and would be deemed under any other situation other than CO₂ emissions to be negligible. Ireland's current GHG contribution of 0.0591 Gt/y represent 0.111% of the world's GHG emissions.



Year 2030 national and global proposed development impacts in chart form.
National Green House CO2 eq Gasses (Mt/y)



Global Green House CO2 eq Gasses (Gt/y)



2.6 Conclusion

Compliance to part L 2022 is achieved by means of a 70% primary energy reduction on the reference dwelling or an EPC (primary energy) of 0.30 or less and 65% carbon dioxide reduction or a CPC (carbon dioxide) of 0.35 or less and an equivalent primary renewable energy contribution of 20% or more. The energy reduction proposals resulted in a much lower primary energy and carbon dioxide performance than required under Part L 2022 and achieved a renewable energy contribution in excess of 50% or half of the primary energy coming from a renewable source. These results were achieved by applying the proposed exposed element parameters in combination with air source heat pumps for space & hot-water heating and other reduction measures proposed. However as mentioned in the technical sections similar results or compliance can also be achieved by a number of other methods listed in section 4.8 in combination with proposed passive reduction measures outlined in section 4.7.

We conclude to state that until we globally manage to construct and operate at actual zero carbon emissions, any new development in theory will increase the global carbon output however, in the meantime, key to the energy approach of this development is to minimise the impact as demonstrated above.



3 Approach and methodology

3.1 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 2022. Calculations have been conducted on all the developments dwelling/apartment units with the given data in this report representing the averages across all of the dwelling/apartment units.

3.2 Building regulations requirements

Building regulation (residential) Part L : 2022 will apply as the development has not commenced before November 1st nor has planning been applied for before November the 1st to avail of the transition period of Part L 2019.

3.3 Part L 2022 general approach

Part L requires a new dwelling to make primary energy and carbon dioxide emission reductions on a reference dwelling by applying improved calculation parameters and technologies. Part L also requires the actual dwelling to provide at least 20% of its primary energy usage by means of renewable energy. The reference dwelling is exactly the same as the actual dwelling but uses fixed pre-set (by the SEAI) basic standard Part L calculation parameters, U-values / insulation levels, energy conversion efficiency, controls etc. to enable the actual dwelling to make substantial reductions. The reference dwelling has no renewable energy element.

To simplify the calculation data presented in this report, rather than issuing the calculated data of each house type, we applied the DEAP /BER calculation to a dwelling representing the average floor area, exposed external wall area, roof area, window/door (glass) area etc across all of the units and all of the dwelling types. For this report the average unit is represented by a dwelling with a total floor area of 82.5m², an exposed wall area of 112.5m², window / door (glass) area of 14.2m² and a roof area of 55.6m².

Type	Accommodation Schedule				Area
	Type ID	Beds	Persons	Quantity	
Duplex	1	2	4	33	82.0
Duplex	2	3	5	33	112.0
Duplex	3	1	2	11	54.0
Duplex	4	2	4	16	65.0
Duplex	5	1	2	5	54.0
Town house	6	3	5	4	130.0
Studio	7	1	2	5	54.0
Apartment	8	1	2	12	65.0
Apartment	9	2	4	4	65.0
Total/Average		2.0	3.8	123	82.5

Table 3.1: Site dwelling accommodation schedule.



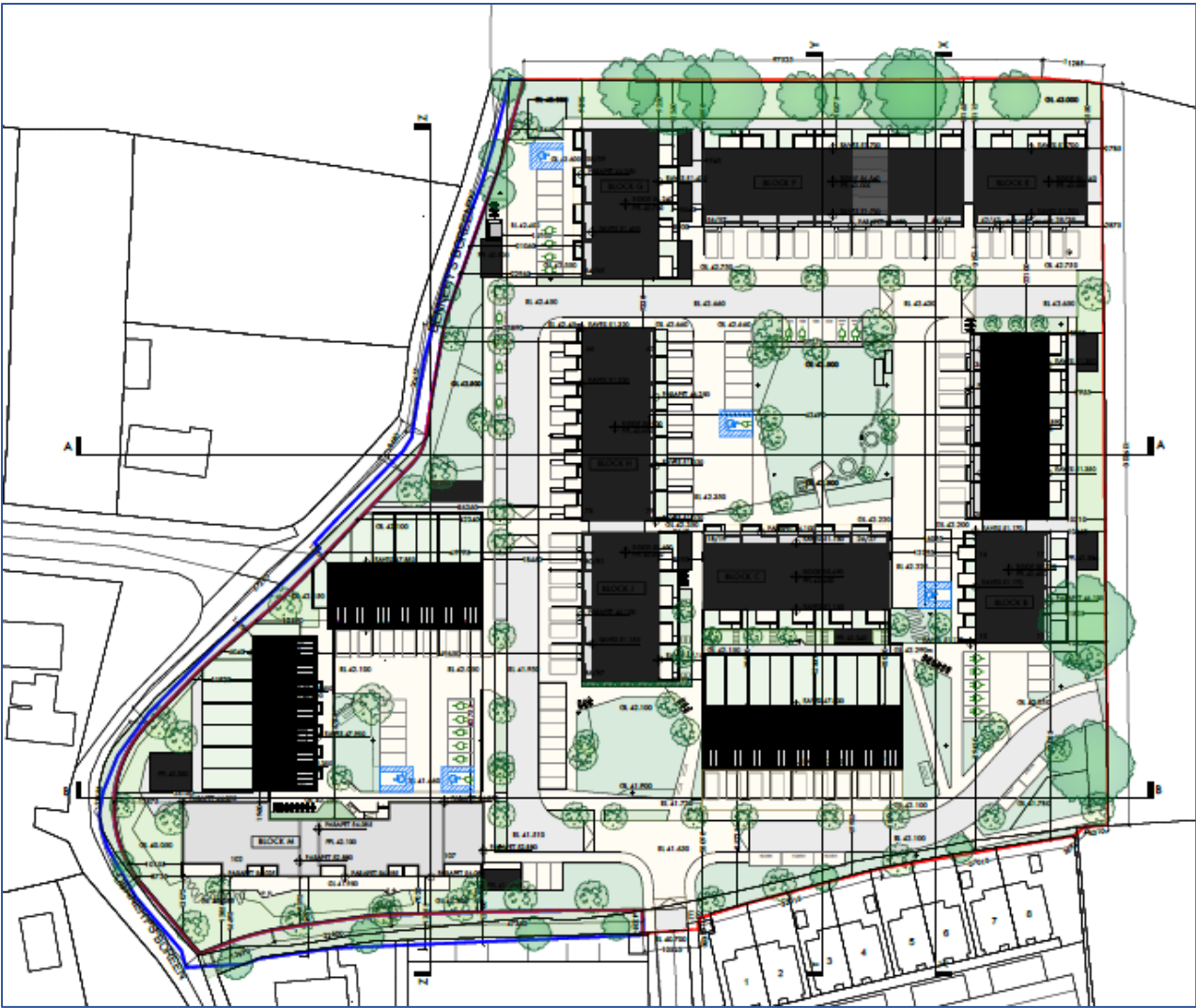


Illustration 3.1: Architects site layout.

3.4 Energy and Carbon dioxide reduction targets

The following are the reference building and target (to be achieved) values.

Single average unit:79.8 m2

ELEMENT	UNIT	REFERENCE	TO BE ACHIEVED	RATE m2
Primary Energy	kWh/y	13,759	4,128	51.7
Carbon Dioxide	kg/y	2,703	946	11.9

Table 3.2:

3.5 Reduction hierarchy

- To target the Part L minimum required reductions DKP use the following reduction hierarchy;
- Step 1 - Reduce energy usage
 - Step 2 – Produce energy efficiently
 - Step 3 – Provide on-site energy



3.6 Step 1 - Reducing energy usage

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

- Lowering the heat loss through the floors, walls, roof by increasing the thermal resistance of the elements.
- Lowering the heat loss through the glazed elements by using windows with a higher thermal resistance.
- Lowering the heat loss by using insulated construction joints.
- Increasing the air tightness to minimise the involuntary air infiltration rate.

The following parameters have been applied as a means to achieve compliance

3.7 Building minimum elemental parameters

The following are the main building minimum target values for Part L 2022.

Element	Unit	2022	Proposed
External walls	U (W/m ² K)	0.18	0.14
Windows/glazing	U (W/m ² K)	1.40	1.20
Solar transmittance		High g factor note	-----
Light transmittance			-----
Pitched roof horizontal	U (W/m ² K)	0.16	0.11
Pitched roof pitched	U (W/m ² K)	0.16	0.11
Flat roof	U (W/m ² K)	0.20	0.11
Ground floor	U (W/m ² K)	0.18	0.12
Cold bridging	U (W/m ² K)	0.15 / 0.08	0.06
Air tightness	M ³ /m ² *h	3	2.5

Table 3.3: main building minimum target values for Part L 2022.

Ground floors: Part L minimum 0.18 W/m²K.

U = **0.14 – 0.16** W/m²K

120-150mm high density polyurethane foam board (HDPUF) floor insulation, $k \leq 0.022/0.021$ W/mK plus

12.5mm high density polyurethane foam board (HDPUF) edge insulation around the perimeter, $k \leq 0.022$ W/mK

Used for this report & BER = 0.150 W/m²K

External walls + walls to unheated common spaces: Part L minimum 0.18 W/m²K.

U = **0.16 - 0.18** W/m²K

135 - 160mm partial or full fill cavity high density polyurethane foam board wall insulation, $k \leq 0.022/0.021$ W/mK

Emissivity factor: = 0.5

Used for this report & BER = 0.178 W/m²K

Roof: Part L minimum 0.18 W/m²K.

U = **0.12 – 0.16** W/m²K

Flat: 100-125mm high density polyurethane (HDPUF), cold side (roof) insulation, $k \leq 0.022/0.021$ W/mK +

50-60mm density polyurethane (HDPUF), warm side insulated plasterboard, $k \leq 0.022/0.021$ W/mK

Used for this report & BER = 0.124 W/m²K

Window & frame: Part L minimum 1.4 W/m²K.

U $\leq$ **1.2 – 1.4** W/m²K,

Double or triple glazed Argon filled insulated frame

Solar transmittance: 0.45

Light transmittance: 0.67

Frame factor: 0.7

Used for this report & BER = 1.4 W/m²K



External door & frame:

$U = 1.4 \text{ W/m}^2\text{K}$

Insulated solid door or as above.

Used in this report & BER = $1.4 \text{ W/m}^2\text{K}$

Party walls:

$U = 0.0 \text{ W/m}^2\text{K}$ where appropriate.

Solid plastered or skimmed both sides and sealed on all edges and joints.

Used in this report & BER = $0.00 \text{ W/m}^2\text{K}$

Air tightness:

Design target **1.5 to 2.0** $\text{m}^3/\text{m}^2\text{h}$

Design permeability is set at $1.5 \text{ m}^3/\text{m}^2\text{h}$ @ 50Pa or an approximate atmospheric exchange rate of 0.075 ach.

to be achieved with very good workmanship with taped and sealed construction joints and or purpose membrane.

Used in this report & BER = $1.6 \text{ m}^3/\text{m}^2\text{h}$

Cold bridging:

$U \leq 0.08 - 0.15 \text{ W/m}^2\text{K}$, All construction joints to be insulated. Approved Part L joints as per appendix D.

The actual linear coefficient will be applied using the Part L appendix D approved construction details with some (15%) recalculated better insulated joints as listed below using;

Used in this report & BER = $0.06 \text{ W/m}^2\text{K}$ (ICF construction)

Ventilation:

Natural ventilation by means of passive window or wall ventilators in combination with intermittent extract (fans) from bathrooms, en-suites, utilities, WC's and kitchens,

or

Demand controlled 24 hour/365 operated central mechanical extract system (no heat recovery)

Requires +/- 60% natural ventilation openings typically $4,000\text{mm}^2$ per habitable room. 100% permanent.

All wet rooms fully ducted from central location typically $\text{Ø}80\text{mm}$ duct work.

or

Demand controlled 24 hour/365 operated central mechanical supply and extract system (with heat recovery)

No natural ventilation opening. Sealed building. All habitable / wet rooms fully ducted typically $\text{Ø}100\text{mm}$ duct work.

the above with

Separate manual operated on/off kitchen extract with the 3 options above.

Used in this report & BER = Demand controlled 24 hour/365 operated central mechanical extract system (no heat recovery) Requires +/- 60% natural ventilation openings typically $4,000\text{mm}^2$ per habitable room. 100% permanent.

All wet rooms fully ducted from central location typically $\text{Ø}80\text{mm}$ duct work with separate manual operated on/off kitchen extract.

Lighting:

Low energy lighting **0%-100%**.

All lighting points are either LED or compact fluorescent fittings or fittings with LED or compact fluorescent filaments.

Used in this report & BER = 100%.

Circulation pumps:

Standard or Variable speed circulating pump(s)

Used in this report & BER = Standard pump



Heating / hot-water controls:

- 1 no. (space heating / hot-water) time clock, or
- 1 no. (space heating / hot-water) temperature control, or
- 1 no. (space heating / hot-water) time clock and 1 no. (space heating / hot-water) temperature control, or
- 1 no. (space heating / hot-water) time clock and individual room temperature control, or
- 1 no. (space heating / hot-water) time clock and individual room temperature control and hot water temperature control, or
- Individual (space heating / hot-water) time clock and individual room temperature control and hot water temperature control.

Used in this report & BER = 1 no. (space heating / hot-water) time clock and individual room temperature control and hot water temperature control.

- Avoided for this report; Chimney / open fire, Chimney / biomass stove, Biomass stove, Gas stove, Electric fire

3.8 Step 2 and 3) Provide energy efficiently and provide on-site renewable energy

Energy and renewable energy can be provided in numerous ways. Given the location of the project and its accessibility to grid utilities the following options could be considered for the provision of energy and renewable energy.

Energy and alternative renewable on-site energy source.

- a) LTHW (wet) Mains gas condensing system or instantaneous hot-water boiler ($\eta > 92\%$) + 5 PV 400Wp panels, or
- b) LTHW (wet) Mains gas condensing hot-water storage boiler ($\eta > 92\%$) + 4 PV 400Wp panels, or
- c) LTHW (wet) Split or mono block air source heat pump ($\eta_{\text{heating}} > 540\%$, $\eta_{\text{hot-water}} > 245\%$), or
- d) Electric space heating (dry) + Hot water heat pump ($\eta_{\text{hot-water}} > 485\%$) (units up to +/- 80m² only), or
- e) A communal form of heating system with any of the above options or a combination of any of the above options.

There are also other possible sources like city district heating networks CDHN, CHP heating networks, on site communal heating with CHP, 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. The project, as it is relatively dense, may suit a communal heating system fed by a combination of mains gas boilers and heat pumps however this needs to be economically assessed for viability and if applied does bring the additional requirement of heat energy metering and invoicing to apartment occupiers.

For the report we have applied option c) = Air source heat pump.

3.9 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.
- f) Heat pump renewable energy.

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 issues in other projects with similar use due to maintenance problems with the actual plant giving rise to complaints from occupants / users. PV is generally a good and passive option to be considered.

For this report we have applied option f) = Heat pump renewable energy fraction.



3.10 Calculation software

Primary energy and carbon dioxide performance calculations are executed using the National Calculation Methodology government approved Domestic Energy Assessment Procedure (DEAP version 4).

3.11 Over heating

Over heating can be an issue and an over heating analysis was conducted using the Passive House PPH analysis software which concluded that the risk to overheating was minimal in accordance to CIBSE TM37. Overheating can also be addressed by applying glass with a higher solar reflection factor or lower emittance factor.



4 Calculation results

4.1 Calculation results

The table below shows the calculation results from the average size dwelling with the average external wall area, glass area, orientation, floor * roof area etc. The table details the reference building primary energy, carbon dioxide and renewable energy data, the required reductions / contributions and what has been achieved using the more advanced building part L parameters from items 4.6 reduction parameters and 4.7 energy & renewable energy options.

Single average unit: 82.5 m²

Element	Unit	Reference	To be achieved	Rate m ²	mp epc/cpc	Achieved	Rate m ²	epc/cpc
Primary Energy	kWh/y	13,759	4,128	50.0	0.30	3,836	46.50	0.279
Carbon Dioxide	kg/y	2,703	946	11.5	0.35	491	5.95	0.182
Renewable energy	kWh/y	0	826	10.0	0.20	1,983	24.04	0.517

Table 4.3

BER rating **A2 46.5 kWh/m²/y**

Overall combined development achievement **123 Units**

Element	Unit	Reference	To be achieved	Rate m ²	mp epc/cpc	Achieved	Rate m ²	epc/cpc
Primary Energy	kWh/y	1,692,357	507,707	50.0	0.30	471,829	46.50	0.28
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Table 4.4

Overall combined differences:

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Renewable energy	kWh/y	CONTRIBUTION	243,936

Table 4.5

We note from the table above that the overall development achieved an annual energy reduction in energy of -1,220,528 kWh resulting in an annual carbon dioxide (CO₂) reduction of -272,093 kg CO₂. The combined total development annual renewable contribution with the proposed systems stands at 243,936 kWh which would be

A decision on the final agreed energy supply solution will be made in due time after the proposed systems economical assessment.

4.2 National impact

To give some guidance on the environmental impact of the proposed development we have compared the achieved carbon emissions with our national and global emissions. The table below shows the current national emissions, the forecasted 2030 emissions and the EPA forecasted emission with proposed additional national measures to combat global carbon emissions. We note that year 2023 (current) has higher carbon emissions as a result of the added construction element carbon emissions. We also note that for the purpose of these calculations the carbon factor from our electricity grid being the source of energy for the development is maintained at the same carbon output rate through to 20230 whereas in real terms the carbon factor of the national grid would be less in 2030 as a result of the government's target to de-carbonised the grid.



NATIONAL IMPACT

GHG CO2 eq emissions	Unit	National emissions	Development missions	Fraction (%)
Year 2023	Mt-CO2/year	59.50		
Year 2024	Mt-CO2/year	59.25	0.0001388	0.0002343
Year 2030 * target	Mt-CO2/year	58.00	0.0000604	0.0001041
Year 2030 + Measures target	Mt-CO2/year	48.00	0.0000604	0.0001258

Table 4.4 Mt=Million tonnes i.e.; 60,367 kgCO2/y = 0.0000604 MtCO2/y

We note from the table above that the overall impact of the Ardshnavooly Housing Development on our national greenhouse emissions is 0.0002343 % in 2024 and 0.0001041% in 2030 and would be deemed absolutely minimal.

The Pie chart below shows the national carbon emissions as issued by the EPA including the development's achieved carbon emission as a separate category.

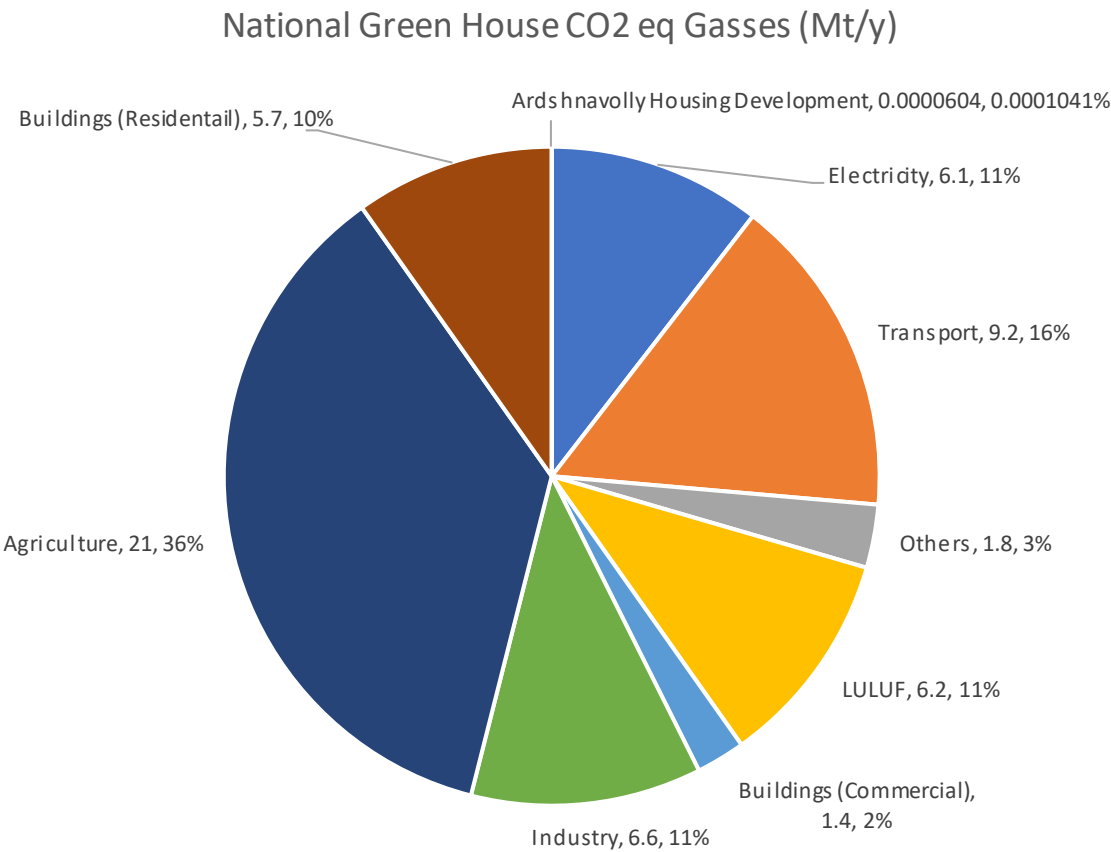


Illustration 4.1: Irelands national annual fractional CO2 (GHG) emissions.

4.3 Global impact

Irelands current impact on the +/- 53Gt global GHG emissions (2022) represents a mere 0.11% fraction hence the impact of the proposed development on the global emissions is near impossible to express in a fraction. The table below gives guidance on the global emissions and future targets against the emissions of the national output and the proposed development.



GLOBAL IMPACT

GHG CO2 eq emissions	Unit	National emissions	Development missions	Fraction
Year 2023	Gt-CO2/year	53.80		
Year 2024	Gt-CO2/year	53.50	0.0000001388	0.000000259522
Year 2030 * target	Gt-CO2/year	51.50	0.0000000604	0.000000117217

Copy of Table 4.7 Gt=1000 Million tonnes (Mt)

We note from the table above that the overall development impact on the global green house CO2 eq emissions is 0.0000002595 % in 2024 and 0.0000001172% in 2030 and would be deemed under any other situations other than CO2 emissions to be negligible. Irelands estimated 2024 global contribution of 0.05925 Gt/y stands at 0.11%

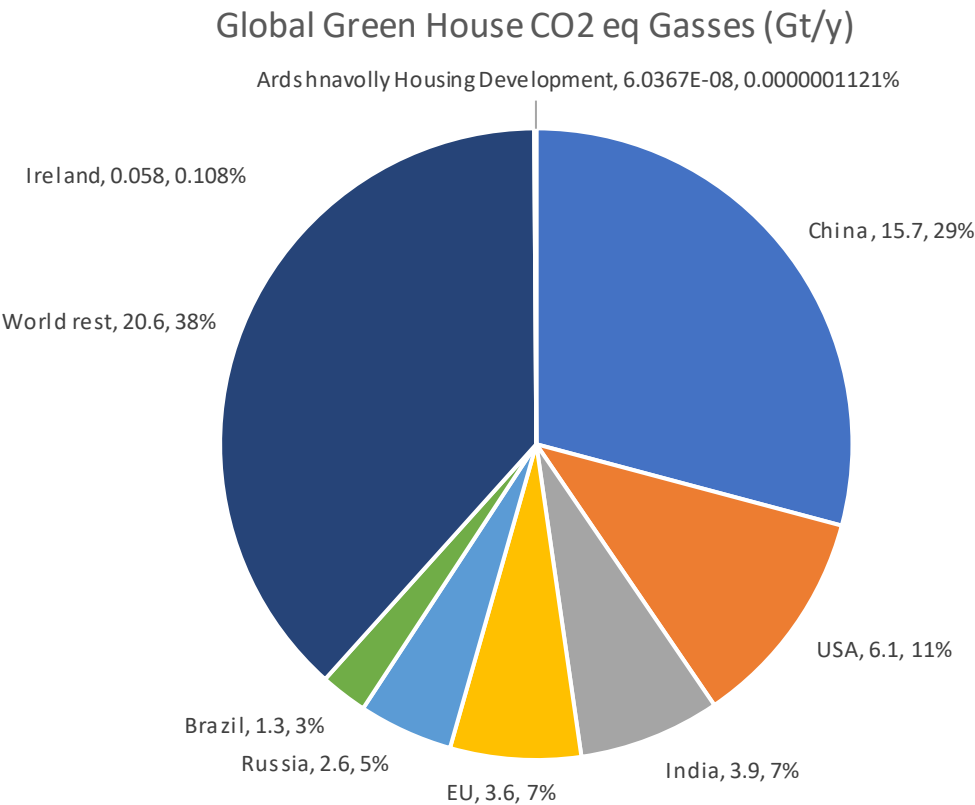


Illustration 4.2: Global annual fractional CO2 (GHG) emissions.

4.4 Part L compliance conclusion

Compliance to part L 2022 is achieved by means of a 70% primary energy reduction on the reference dwelling or an EPC (primary energy) of 0.30 or less, a 65% carbon diode reduction or a CPC (carbon dioxide) of 0.35 or less and an equivalent primary renewable energy contribution of 20% or more. The compliance calculation results were achieved by the application of the suggested façade parameters in combination with an air source heat pump for space & hot water heating and photovoltaic panels. As mentioned in the above sections this can be achieved by a number of methods listed in section 4.8 in combination with proposed passive reduction measures outlined in section 4.7. We note that, until the moment we can construct at actual zero carbon emissions, any new construction will increase the global carbon output however key to this is minimising the impact as demonstrated in the sections above.



APPENDIX A

Average unit preliminary BER certificate

Building Energy Rating (BER)

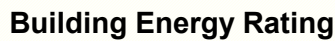
BER for the building detailed below is :

A2

Address	Average unit Killarney Co.Kerry
BER Number	112473009
Date of issue	30/09/2025
Valid untill	29/09/2027
Assessor number	266723
Assessor company No	337125

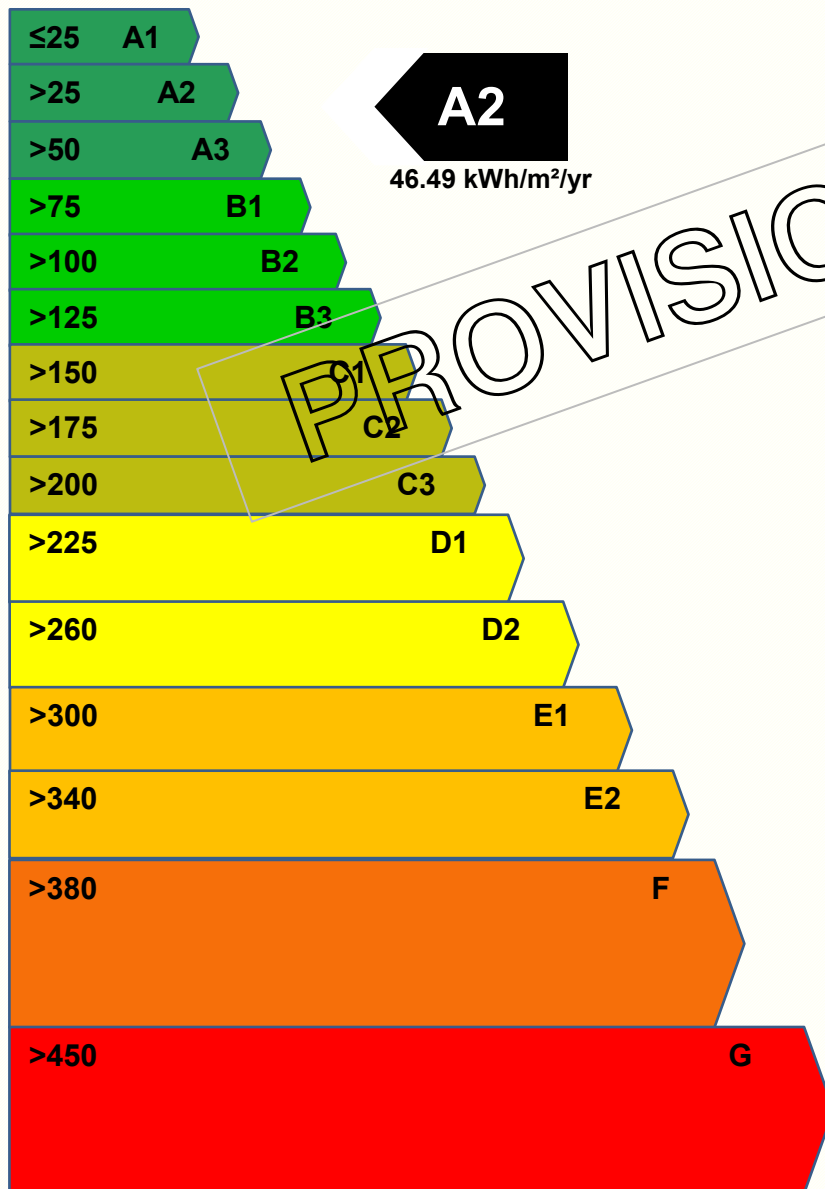
The building Energy Rating (BER) is an indication of the energy performance of this dwelling. It covers energy use for space heating, water heating, ventilation and lighting, calculated on the basis of standard occupancy. It is expressed as primary energy use per unit floor area per year (kWh/m²/yr)

A' Rated properties are the most energy efficient and will trend to have the lowest energy bills.



kWh/m²/yr

MOST EFFICIENT



LEAST EFFICIENT

Carbon Dioxide (CO₂)

Emissions Indicator

kgCO₂/m²/yr**BEST**

0

**Calculated
annual CO₂
emissions**

5.95 kgCO₂/m²/yr

WORST

**The less CO₂ produced
the less the dwelling
contributes to global
warming**

IMPORTANT : This BER is calculated on the basis of data provided to and by the BER assessor, and using this version of the assessment software quoted below. A future BER assigned to this dwelling maybe different, as a result of changes to the dwelling or to the assessment software.

APPENDIX B

Average unit Part L report

TGD Part L (2022) Report

DKP V-2022

End unit (3 exposed walls) , 2 Storey(s), 82.5m² floor area
46.5kWh/yr/m², A2

Space heating : Heat Pump, Hotwater heating : Heat Pump, Ventilation: CMEV

Average unit Ardshanavooly
Killarney
Co.Kerry

Issue date
2025-04-17

DKP project file no
DKP-P01-AVRG-5080 | 1G

DKP document no
5080

5080



DKP PART L REPORT

Space heating : Heat Pump, Hotwater heating : Heat Pump, Ventilation: CMEV

MAIN SUMMARY

Part L 2022

Primary energy

	TO BE ACHIEVED	ACHIEVED	Compliance	Margin
Energy performance (reduction %)	0.300 MEPC (70%)	0.279 EPC (72%)		+ 7%
Annual primary energy	4,128 kWh/y	3,836 kWh/y		+ 292.2
Annual primary energy / m2	A3 50.0 kWh/y/m2	A2 46.5 kWh/y/m2		+ 3.54

Carbon dioxide emission

	TO BE ACHIEVED	ACHIEVED	Compliance	Margin
Carbon performance coefficient	0.350 MCPC (65%)	0.182 CPC (82%)		+ 48%
Annual carbon emission	946 kg/y	491 kg/y		+ 455.1
Annual carbon emission / m2	11.47 kg/y/m2	6.0 kg/y/m2		+ 5.52

Renewable energy

	TO BE ACHIEVED	ACHIEVED	Compliance	Margin
Renewable energy ratio	0.20 RER	0.52 RER		+ 158%
Annual renewable energy	1,588 kWh/y	4,104 kWh/y		+ 2,516.0
Annual renewable energy / m2	19.2 kWh/y/m2	49.7 kWh/y/m2		+ 30.50

MEASURES APPLIED

Exposed envelope thermal resistance	area	Part L limits	Actual dwelling	Compliance
Floors	41.3 m2	0.180 W/m2K	0.152 W/m2K	
Walls	96.2 m2	0.180 W/m2K	0.201 W/m2K	**
Roofs	41.3 m2	0.160 W/m2K	0.127 W/m2K	
Glazing	Floor fraction: 17.2% 14.2 m2	1.400 W/m2K	1.400 W/m2K	
Door	2.1 m2	1.400 W/m2K	1.400 W/m2K	
Weighted opaque elements	178.7 m2	0.175 W/m2K	0.172 W/m2K	
Cold bridging		0.150 W/m2K	0.080 W/m2K	
Airtightness	0.10 ach	3.000 m3/m2h	* 2.000 m3/m2h	

* Airtightness design target

** Compliance achieved by overall weighted opaque elements

Building services parameters

Space heating 1:	Electricity	Heat Pump	443%	4kW, System flow temperature 50C°
Space heating 2:	n/a		n/a	
Water heating 1:	Electricity	Heat Pump	258%	4kW, 230L, 1.4kWh/d Standing loss
Water heating 2:	n/a		n/a	
Ventilation:		Whole-house extract ventilation		El n=0.5W//s
Lighting:		16 x LEDs/ CFL		
Glazing solar / light transmittance:	0.45 / 0.80	Glazing orientation and over shadowing. See page 6.		
Water saving measures:	None +/- 11l/s per shower			
Space / Water heating load:	SH 2,725W @ -3C° / WH 1,954W @ 150min recovery for a 45C° rise (10C°- 55C°)			
On site produced energy:	n/a			

Comments

The dwelling is compliant to Part L 2022 with a BER label of A2

Compliance to Part L has a reasonable margin of 7.1% allowing for some construction adjustments if required.

Insulation data used for U value calculations:

Wall T1 (96.2m2) : Uv = 0.201W/m2K 75mm EPS @ 0.033 W/mK Foil faced + 75mm EPS @ 0.033 W/mK
 Roof T1 (41.3m2) : Uv = 0.127W/m2K 150mm Rockwool @ 0.04 W/mK + 150mm Rockwool @ 0.04 W/mK
 Floor T1 (41.3m2) : Uv = 0.152W/m2K 160mm EPS @ 0.031 W/mK

Hierarchy

	Not compliant
	Within 5%
	Compliant **
	Compliant

page 1



DKP PART L REPORT

Space heating : Heat Pump, Hotwater heating : Heat Pump, Ventilation: CMEV

DEAP CALCULATION DATA / RESULTS

Dwelling dimensions		TGD L version		2022						
	Area [m ²]	Height [m]								
level 1	41.3	2.60								
level 2	41.3	2.40								
level 3	0.0	0.00								
level 4	0.0	0.00								
Total floor area [m ²]	82.5									
Dwelling volume [m ³]	206.3									
Living area [m ²]	15.0									
Ventilation										
Number of chimneys		0								
Number of open flues		0								
Number of intermittent fans and passive vents		7								
Number of flueless gas fires		0								
Is there a draught lobby on main entrance?		no								
Number of storeys in the dwelling		2								
Has an air permeability test been carried out?		Yes	1							
<i>If no</i> Not applicable										
Structure type		-								
Is there a suspended wooden ground floor?		-								
Percentage of windows and doors draughtstripped [%]		0								
<i>If ye :</i>										
Air permeability [m3/h.m2 at 50 Pa]		2								
<i>End if</i>										
Number of sides sheltered		2								
Ventilation method	Whole-house extract ventilation					4				
Effective air change rate [ac/h]		0.67								
Ventilation heat loss [W/K]		45								
Permeability test carried out and meets guidelines in TGD L?			Complies							
For mechanical ventilation, other than positive input ventilation from loft:									:	
Is measured "PCDB" data available?			Yes							
Manufacturer and model			TBA							
Specific fan power [W/(l/s)]			0.5							
Heat exchanger efficiency [%]			-							
Windows										
Orientation	East/West	East/West	0	0	0	0	0	0	Horizontal	
Orientation ID	3	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6	
Area [m ²]	9.06	5.17	0	0	0	0	0	0	0	
U-value [W/m ² K]	1.40	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Is U-value a manufacturer's certified value?	yes	yes	yes	yes	yes	yes	yes	yes	yes	
<i>If yes:</i>										
Manufacturer and model	-	-	-	-	-	-	-	-	-	
Solar energy transmittance	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	
<i>End if</i>										
Correction for roof window and/or metal frame if applicable (Table 6a, notes 1 and 2).										
	0	0	0	0	0	0	0	0	0	
Overshading ID	2	2	2	0	0	0	2	2	2	
Frame factor (Table 6c) [-]	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	
Window type ID	2	2	2	2	2	2	2	2	2	



DKP PART L REPORT

Space heating : Heat Pump, Hotwater heating : Heat Pump, Ventilation: CMEV

Fabric

Exposed element type	Area [m ²]	U-value [W/m ² K]	AU [W/K]	Comment (optional)	Element type (for assessing TGD L conformity)
Windows/rooftlights	14.23	1.326	18.87	1.4	
Doors	2.10	1.400	2.94	1.4	
Floor	41.25	0.152	6.25	0.18 No underfloor heating	
Floor (type 2)	0.00	0.000	0.00	0.18 No underfloor heating	
Floor (type 3)	0.00	0.000	0.00	0.18 No underfloor heating	
Walls	96.17	0.201	19.34	0.18 Wall relevant for TGD L fabric compliance check	
Walls (type 2)	0.00	0.000	0.00	0.18 Wall relevant for TGD L fabric compliance check	
Walls (type 3)	0.00	0.000	0.00	0.18 Wall relevant for TGD L fabric compliance check	
Walls (type 4)	0.00	0.000	0.00	0.18 Wall relevant for TGD L fabric compliance check	
Walls (type 5)	0.00	0.000	0.00	0.18 Wall relevant for TGD L fabric compliance check	
Roof	41.25	0.127	5.22	0.16 Flat roof	
Roof (type 2)	0.00	0.000	0.00	0.16 Pitched roof - Insulation at ceiling	
Roof (type 3)	0.00	0.000	0.00	0.16 Pitched roof - Insulation on slope	
Roof (type 4)	0.00	0.000	0.00	0.2 Pitched roof - Insulation at ceiling	
Roof (type 5)	0.00	0.000	0.00	0.16 Pitched roof - Insulation on slope	
Total area of elements [m ²]	195.0				
Heat loss via plane elements [W/K]			52.62		
Factor for thermal bridging [W/m ² K]			0.08		
Fabric heat loss [W/K]			68.22		
Dwelling heat loss coefficient [W/K]			113.55		
Heat loss parameter, HLP [W/K m ²]			1.38		

Water heating

Are there distribution losses?	yes				
Distribution loss [kWh/y]	338				
Are there storage losses?	yes	1			
If ye :					
Water storage volume [litres]			230		
Is manufacturer's declared loss factor available?	yes	1			
If ye :					
Manufacturer and model name		tba			
Manufacturer's declared loss factor [kWh/day]		1.4			
If no Not applicable					
Insulation type on hot water store		Factory insulated			
Insulation thickness [mm]		70			
End if					
Temperature factor unadjusted (Table 2)		0.6			
Temperature factor multiplier (from Table 2 notes)		0.9			
End if					
Is there a solar water heating system?	No	0			
If ye Not applicable					
Solar DHW input, Qs [kWh/y]	0		Solar fraction [%]	0	
Is solar water heating pump PV powered?	-				
End if					
Primary circuit loss [kWh/y] (Table 3)			0		
Additional loss for combi boiler [kWh/y] (Table 3a)			0		
Electricity consumption of electric keep-hot facility of combi boiler [kWh/y] (Table 4f)			0		
Is supplementary electric immersion heating is used in summer?			no		
Output from main water heater [kWh/y]		2527			
Output from supplementary heater [kWh/y]		0			
Heat gains from water heating system [W]		111			
Is hot water storage indoors or in group heating scheme?	Yes				



DKP PART L REPORT

Space heating : Heat Pump, Hotwater heating : Heat Pump, Ventilation: CMEV

Lighting

Annual energy used for lighting, EL [kWh/y] 209

Internal gains

Net internal gains [W] 411

Heat use

Living area fraction [-] 0.18
 Thermal mass category of dwelling Medium
 Heat use [kWh/y] 3358

Space heating**Control and responsiveness**

Temperature adjustment (Table 4e), where appropriate [C] 0
 Heating system control category (Table 4e) 3
 Heating system responsiveness category (Table 4a or 4d) 1

Pumps/fans

	Enter number present	If present, is boiler controlled by room thermostat?	If present, inside dwelling?
Central heating pump (supplying hot water to radiators or underfloor system)	1	Yes	
Oil boiler - pump (supplying oil to boiler and flue fan)	0	Yes	Yes
Gas boiler - flue fan (if fan assisted flue)	0		
Is there a warm air heating system present?	no		

Emission efficiency

Is main heat emission system within an envelope element? (e.g. underfloor heating in ground floor) no 0
 If yes, U-value of envelope element [W/m² K] 0.1515
 Type of main heating system Individual system 1

Energy requirements - individual heating systems :**Space Heating**

Efficiency of main heating system [%] (including Efficiency Adjustment Factor) 442.8
 Fraction of heat from secondary / supplementary system (from Table 7, Table 10 or Appendix F) 0
 Efficiency of secondary / supplementary heater(s) [%] (from Table 4a or Appendix E) 0

Water heating

Efficiency of main water heater [%] (from HARP or from Table 4a or 4b) 257.63

Fuel data

	Fuel
Space heating - main	Electricity
Space heating - secondary	-
Water heating - main	Electricity
Water heating - supplementary	-
Photovoltaic/ Wind Turbine	0 kWh/y
Solar Thermal	0 kWh/y

Renewable and energy-saving technologies	Primary energy factor [-]	CO2 factor [kg/kWh]	Delivered energy [kWh/y]
Type Description			
Energy produced or saved	1.75	0.224	0
Energy consumed	0.00	0.000	0
Type Description	-		
Energy produced or saved	0.00	0.000	0
Energy consumed	0.00	0.000	0
Type Description	-		
Energy produced or saved	0.00	0.000	0
Energy consumed	0.00	0.000	0



DKP PART L REPORT

Space heating : Heat Pump, Hotwater heating : Heat Pump, Ventilation: CMEV

Energy requirements - group/community heating scheme

Not applicable

Secondary space heating

Fraction of heat use from secondary / supplementary system (use value from Table 7, Table 10 or Appendix F)	0
Generation efficiency of secondary / supplementary heating system [%] (use value from Table 4a or Appendix E)	0

Main (group heating) system

Is charging based on heat consumed?	-
Distribution loss factor [-] (Table 9)	0
Fraction of heat from CHP unit or fraction of heat recovered from power station	0

Boilers

(If the fraction of heat from boilers is zero, this section is irrelevant).

Heat source type	Fuel	Efficiency [%]	Percent of heat [%]
Other	-	0	0
Other	-	0	0
Other	-	0	0
Other	-	0	0
Solar heating system			0

Fuel data

	Fuel	Primary energy factor [-]	CO2 factor [kg/kWh]	Delivered energy [kWh/y]
Space heating - secondary	-			
Photovoltaics/ Wind Turbine	0 kWh/yr			
Solar	0 kWh/yr			
Renewable and energy-saving technologies				
Type Description	-			
Energy produced or saved		0.00	0.000	0
Energy consumed		0.00	0.000	0
Type Description	-			
Energy produced or saved		0.00	0.000	0
Energy consumed		0.00	0.000	0
Type Description	-			
Energy produced or saved		0.00	0.000	0
Energy consumed		0.00	0.000	0

Results

	Delivered energy [kWh/y]	Primary energy [kWh/y]	CO ₂ [kg/y]
Space heating - main	746	1,306	167
Space heating - secondary	0	0	0
Water heating - main	981	1,717	220
Water heating - supplementary	0	0	0
Pumps, fans	256	448	57
Energy for lighting	209	366	47
Renewable and energy-saving technologies			
CHP input (individual heating systems only)	0	0	0
CHP electrical output (individual heating system only)	0	0	0
Photovoltaic/ Wind Turbine	0	0	0
Type	0	0	0
Type -	0	0	0
Type -	0	0	0
Total	2,192	3,836	491
per m ² floor area	26.6	46.5	6.0
Building Energy Rating [kWh/m ² y]		46	A2



DKP PART L REPORT

Space heating : Heat Pump, Hotwater heating : Heat Pump, Ventilation: CMEV

Conformity with MPEPC and MPCPC requirements in TGD L**2022**

		Max permitted	
EPC	0.279	0.30	Complies
CPC	0.182	0.35	Complies
RER	0.517	0.20	Complies

Window schedule	8no.	GF	FF
Overshadowing		2	2
		East/West	East/West
Width		0.80	1.40
Height		1.18	1.18
Area		0.94	1.65
U-value		1.40	1.40
Width		1.80	1.40
Height		2.10	1.18
Area		3.78	1.65
U-value		1.40	1.40
Width		1.40	0.80
Height		1.55	1.18
Area		2.17	0.94
U-value		1.40	1.40
Width		1.40	0.80
Height		1.55	1.18
Area		2.17	0.94
U-value		1.40	1.40

Glazing shadow status : 8no @ 2 : average or unknown shadow,

East/West,

Heat energy load / Heat energy input :

Space heating load / input : 2,725 W @ -3C°

Hotwater heating load / input : 1,954 W @ 150min recovery for a 45C° rise (10C° - 55C°)
144 l per day hot water usage**HEAT PUMP SPACE HEATING DATA**

		A (88%) -7oC	B (54%) 2oC	C (35%) 7oC	D (15%) 12oC	E* (100%)	
Daiken 4kW / 230l hot-water		A-7 W34	A2 W30	A7 W27	A12 W24	A-10 W35	Test Conditions EN 14825:2013
Low Temperature Application (35oC)	kW	5.5	3.3	3.2	3.3	5.2	
	COP	2.9	4.33	6.19	7.78	2.56	
High Temperature Application (55oC)	kW	A-7 W52	A2 W42	A7 W36	A12 W30	A-10 W55	
	COP	5.3	3.3	3	3.3	4	
		1.97	3.23	4.4	6.1	1.37	

HEAT PUMP WATER HEATING DATA

Water heating energy efficiency, η_{wh}	133.0 %	Test Conditions EN 16147
Equivalent Coefficient of Performance	3.33 kW/kW	
Reference Hot Water Temperature	52.50 oC	
Required Source Temperature	7.00 oC	
Capacity of Heat Pump	4.00 kW	
Declared Load Profile	XL	
Standby Heat Loss	1.40 kWh/day	
Volume of DHW accounted for in test	288 litre	

