IN2
ENGINEERING DESIGN PARTNERSHIP

White Heather, South Circular Road, Dublin 8

Energy Analysis Report

IN2 Project No. D2044

16/03/2022

REV06

Revision History

Date	Revision	Description
08/02/2021	00	Initial issue for client review
04/05/2021	01	Updated project description
11/05/2021	02	Updated site address
09/02/2022	03	Updated project description
24/02/2022	04	Updated project description
11/03/2022	05	Incorporating comments from Client and Planner
16/03/2022	06	Updated project description

Registered Office:. Unit E, Mount Pleasant Business Park, Upper Mount Pleasant Avenue, Dublin 6

Company Registration No.: 466565

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1.0 Executive Summary

Permission is sought by U and I (White Heather) Limited for a Strategic Housing Development at the White Heather Industrial Estate, South Circular Road, Dolphin's Barn, Dublin 8 and No. 307/307a South Circular Road, Dublin 8 and an industrial building at 12a St James's Terrace. The 1.535ha site is bounded by the Grand Canal to the south; Our Lady of Dolours Church and residential dwellings on the South Circular Road to the north; Priestfield Cottages to the east; and residential dwellings at St James's Terrace to the west.

A new residential neighbourhood development of 335 no. units is proposed to make efficient use of this residentially zoned site, which benefits from high-quality amenity space along the Grand Canal and access to high-quality transport links. The site benefits from the opportunity to access the existing Dolphins Barn neighbourhood facilities, as well as enhancing the connectivity of the area for the Dublin 8 community as a whole. A core principle of the proposed residential scheme is to put residential amenity and recreation to the fore, opening up the site and the local area to the Grand Canal.

The proposed development is intended to provide for a vibrant and diverse community, while delivering a connected residential neighbourhood which knits in to both the established and the emerging residential developments in the area. High-quality landscaping and public realm, with a focus on the creation of distinctive character areas is proposed. A new street will run east-west across the north of the site and the creation of a new public space at the heart of the proposed scheme will connect to a publicly accessible linear park along the canal to the south. Permeability is a key feature of the proposed pedestrian realm, including a mix of dedicated and shared surface areas through the site with a c. 190 m continuous amenity strip along the Grand Canal Linear Park.

The entrance to the scheme will be from the existing junction at the South Circular Road, which will be reconfigured and upgraded. The existing access road at St James's Terrace will provide pedestrian access only to the development. Car parking is proposed at undercroft and at surface levels, with a number of dedicated car sharing spaces in convenient locations. Covered and secure bicycle storage facilities are located at undercroft and at surface level, adjacent to block entrances. A sustainable travel approach has been adopted, particularly with regards to access to Dublin City Centre, with the Luas (850m) and Dublin Bus stops adjacent to the development site. The City Centre area is also accessible by bicycle and walking, at approximately 10 and 30 minutes respectively.

The proposed residential mix includes a combination of studio units, 1-bedroom apartments, 2-bedroomapartments units within 7 no. blocks and a terrace of 3-bedroom townhouse units. A change of use of an existing residential building at 307/307a South Circular Road to be used as a shared workspace. The proposed Part V social housing requirement is provided at 10% in 2 no. discrete blocks within the proposed scheme. This high-quality Build to Rent scheme will also include 2 no. cafés and a 2-storey creche unit, while the residents will also have access to residential amenity areas at ground floor level and at fifth floor level with access to a roof terrace area overlooking the canal. A landscaped square will be accessible to the public, with private open space and amenity areas for the residents also provided including children's play areas and roof level terraces. Building heights range from 2 no. to 10 no. storeys, with finger blocks arranged in a north-south direction and height tapering down from the centre of the site to the boundary.

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The proposed development is intended to provide for a vibrant and diverse community, while delivering a connected residential neighbourhood which knits in to both the established and the emerging residential developments in the area. High-quality landscaping and public realm, with a focus on the creation of distinctive character areas is proposed. A new street will run east-west across the north of the site and the creation of a new public space at the heart of the proposed scheme will connect to a publicly accessible linear park along the canal to the south. Permeability is a key feature of the proposed pedestrian realm, including a mix of dedicated and shared surface areas through the site with a c. 190 m continuous amenity strip along the Grand Canal Linear Park.

Energy analysis has been undertaken in order to demonstrate compliance to Building Regulations Technical Guidance Document (TGD) Part L 2019 and Section 2.0 outlines the requirements to ensure compliance: outlining the overarching EU Directive for Near Zero Energy Buildings (NZEB) and how this is implemented in Ireland and detailing

associated requirements within Part L 2019. The report then examines the methodology in terms of Primary Energy, Renewable Technologies and Decentralised plant, illustrating how electrically based technologies (Air Source Heat Pumps, Photovoltaic panels etc.) are increasingly favoured within Part L and associated Building Energy Rating (BER) calculations techniques within the approved software Dwelling Energy Assessment Procedure (DEAP).

This DEAP software was used to undertake energy analysis for Part L and BER for the development. Section 3.0 details the assumptions made in terms of Building Construction, Mechanical and Electrical Systems and Renewable Technologies, before confirmation of compliance is confirmed in terms of Primary Energy, Carbon Emissions and Renewable Energy Ratio.

The analysis determined that through the following energy and servicing strategies that an A2/A3 BER should be obtainable:

Improvements to building thermal transmittance (U-Values), thermal bridging and air permeability with respect to Part L defaults.

Centralised Heating and Hot Water Plant arrangement to each apartment with Heat Interface Unit (HIU's) to each Apartment.

Renewable technologies comprising of Air Source Heat Pumps (ASHP's) and Combined Heat and Pump (CHP) plant delivering primary contribution to the annual heating and hot water load, with natural gas fired condensing Boilers.

De-Centralised Heating and Hot Water Plant arrangement to individual house via air source heat pump technology.

Local Heat Recovery Ventilation extracting stale air from apartment and supply fresh air to space.

Finally, the detailed DEAP report, compiling all assumptions and calculations undertaken within the software, is included as an Appendix. The analysis has been completed for modelling purposes only and to indicate that compliance through both options can be achieved. Exact details including plant equipment manufacturer and model have yet to be chosen. This will be completed at the detailed design stage.

Figure 1.1.1– Development Site Layout

2.0 Building Regulations

2.1 NZEB

Building energy has been long understood as contributing a major component of greenhouse gas emissions which was acknowledged within the 2030 Communication published by the European Commission (2014) which stated that “the majority of the energy-saving potential (for the EU) is in the building sector.” Figure 2.1.1 illustrates comparative Primary Energy (see Section 2.3) for Dwellings in Ireland from 1970’s through to NZEB.

The EU Energy Performance of Buildings Directive set out the target that all *new* developments should be Nearly Zero-Energy Buildings (NZEB) by the end of 2020, with the intention having been that all Public buildings be in accordance with this by the end of 2018.

A Nearly-Zero Energy Building is defined as having “very high energy performance”, with Article 2 of the EPBD outlining that “the nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby”; the latter understood to refer to district heating systems and centralised plant arrangements.

Interpretation and implantation of these statements within the directive are at the discretion of each EU Member State in accordance with their “National, Regional or Local considerations” and thus the definition of NZEB itself varies greatly between different countries.

For new dwellings in Ireland, NZEB has been defined was being (primarily) associated with demonstrating the following characteristics are achieved:

- Primary Energy/ Carbon Emissions: 70% reduction against Part L 2005
- Renewable Energy: 20% of this Primary Energy required

Figure 2.1.2 illustrates the NZEB targets for Primary Energy (and Carbon Emissions) and Renewable Energy. The Part L 2005 benchmark could be expected to be achieving a B3 BER, in comparison to A2 for NZEB compliance.

These NZEB targets have been now incorporated within the Technical Guidance Document (TGD) Part L 2019, as discussed in the section.

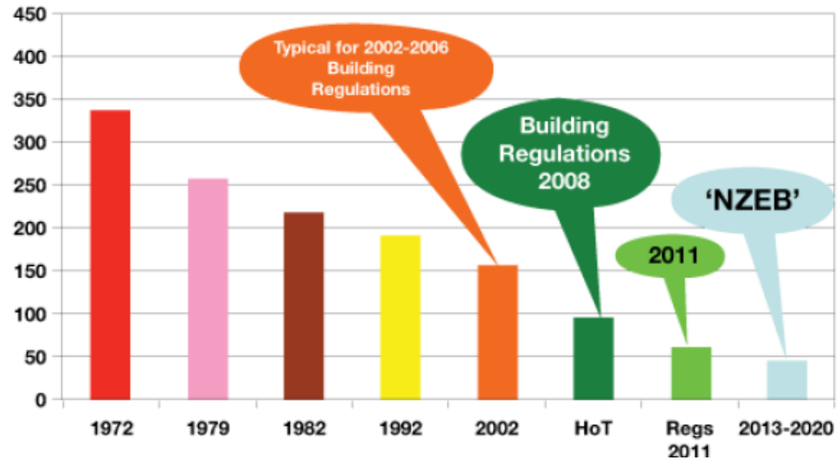

Figure 2.1.1 – Primary Energy Consumption in Irish Housing

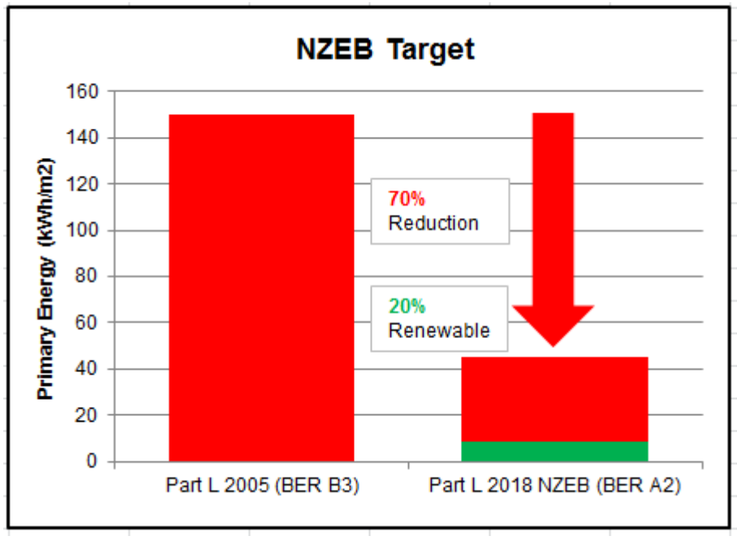

Figure 2.1.2 – NZEB Targets

2.2 Part L 2019

Technical Guidance Document (TGD) Part L Conservation of Fuel and Energy – Dwellings outlines how compliance to this element of the Building Regulations can be demonstrated through the utilisation of the Dwelling Energy Assessment Procedure (DEAP) software, which analyses comparative energy usage for a particular residence.

The energy assessment is determined annually on a floor area basis (kWh/m^2.ann) for the following usages, known as “regulated loads”:

- Heating
- Hot Water
- Auxiliary (Fans, Pumps and Controls)
- Lighting

It may be noted therefore that considerable energy usages within dwellings; particularly equipment associated with cooking, washing etc. are excluded from DEAP analysis and associated Part L Compliance/ BER calculations. These energy usages, known as “unregulated loads” are deemed to be associated with *operational* usage, as opposed to the building’s fabric and services performance.

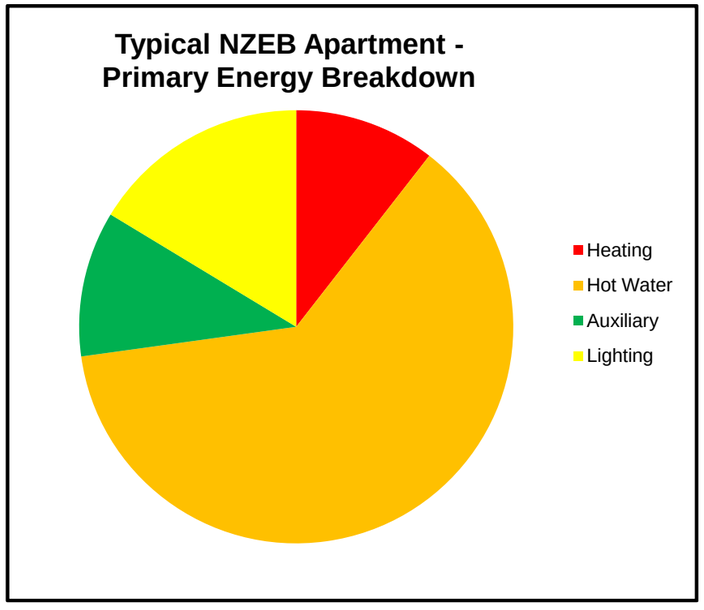

Figure 2.2.1 –Primary Energy Breakdown

Figure 2.2.1 indicates an energy breakdown for a typical apartment (100m^2, local gas-fired boiler) compliant to NZEB/ Part L 2019. It can be seen that Hot Water Energy consumption dominates, with Heating Energy considerably lower; reflective of the extensive improvement in insulation/ air permeability/ thermal bridging/ glazing/ heating system efficiency etc. through successive Building Regulations improvements.

However, as both Hot Water and Lighting Energy consumption are effectively fixed within the calculation methodology (as based on standardised databases of hot water usage etc.), further improvements to Heating related items (insulation etc.) are generally required to ensure overall compliance can be achieved.

In summary, DEAP analysis must demonstrate the following to ensure compliance to Part L 2019:

- Energy Performance Coefficient (EPC): 0.30 or lower
  (i.e. 70% reduction in Primary Energy against Part L 2005 benchmark)
- Carbon Performance Coefficient (CPC): 0.35 or lower
- Renewable Energy Ratio (RER): 0.20

In addition, minimum Fabric Performance is defined as follows in Part L 2019:

Building Construction and U-Values		
Element Type	Part-L 2019 Regulations	Targeted
Roof	0.16 W/m^{2}k	0.15 W/m^{2}k
External Wall	0.18 W/m^{2}k	0.18 W/m^{2}k
Ground/Exposed Floors	0.18 W/m^{2}k	0.12 W/m^{2}k
Windows/Doors/Rooflights	1.4 W/m^{2}k	1.2 W/m^{2}k
Heat Transmission Coefficient	0.15 W/m^{2}k	0.08 W/m^{2}k (ACD’s)

Figure 2.2.2 –Building Construction

Glazing Parameters	
Total Solar Heat Transmittance	0.40
Framing Factor	0.70
Overshadowing	Average

Figure 2.2.3 –Glazing Parameters

Miscellaneous Building Parameters	
Element	Value Targeted
Air Leakage Rate	$3m^3/hr.m^2$ @ 50Pa
Shower Flow Rates	6 l/min
Water Usage	125 l/person/day
Lighting	100% LED

Figure 2.2.4 –Building Parameters

In terms of apartments or other terraced residential buildings, Part L allows that the compliance can be demonstrated based on the *average* of all dwellings for each of the parameters associated with Part L, namely Primary Energy (EPC), Carbon Emissions (CPC) and Renewable Energy (RER). Therefore, for the purposes of analysis, an apartment representative of the average attributes of the dwellings has been selected.

2.3 Primary Energy

In assessing energy performance for dwellings, Part L (and BER) utilises *Primary Energy* as a means of comparative analysis. This relates to the energy *at source* as required for the dwelling, as opposed to that consumed within the actual building. For example, electrical Primary Energy relates to that required for both generation (based on average of power plant fuels and efficiencies) and transmission for electricity through the ESB grid.

Primary Energy Factor (PEF) conversions for main fuel types are as follows

- Electricity: 2.08
- Natural Gas/ LPG/ Oil/ Biomass: 1.10

It can be seen from the above that the Primary Energy conversion for Electricity is twice that of Natural Gas (as well as other fossil fuels and biomass); therefore a direct electric heater would consume double the Primary Energy of a LPHW radiator. However, as can be seen from Figure 2.3.1 below, the underlying trend over time has been that the Primary Energy of electricity with respect to Natural Gas (and other fuels) has been reducing (due to the increased “greening” of the ESB grid with Wind and Solar renewables and more efficient plant operation), with the following impacts in terms of technologies and associated Part L compliance, as PEF for electricity reduces.

Heat Pump, both Air Source and Geothermal, are becoming increasingly viable.

Larger Photovoltaic (PV) arrays required to offset electricity usage (albeit offset by increases in PV efficiency for equivalent array sizes).

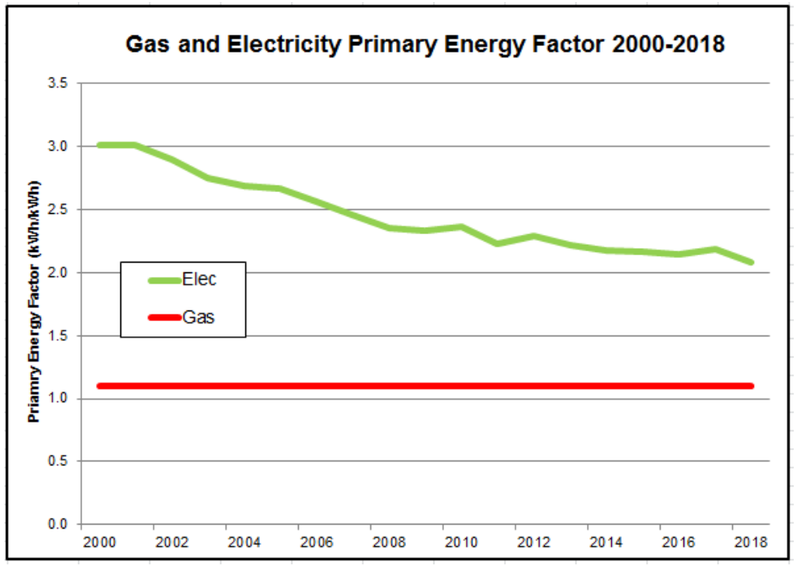

Figure 2.3.1 –Primary Energy Factors for Gas and Electricity 2000-2018

2.4 Renewable Technologies

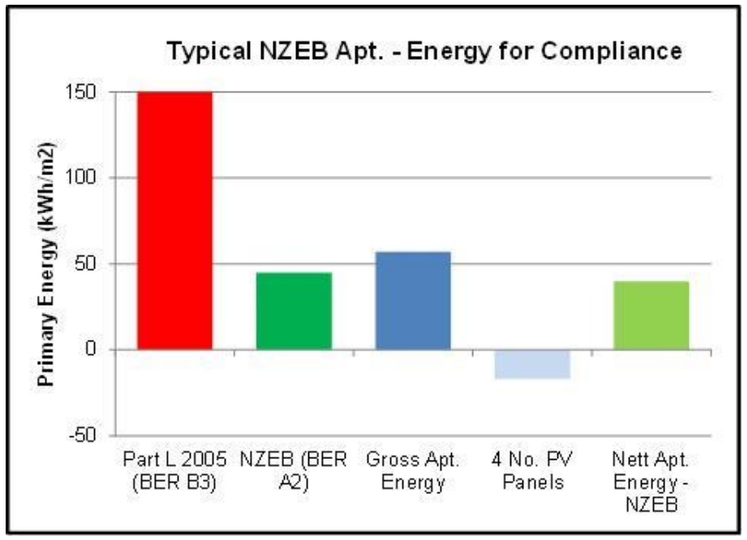

Figure 2.4.1 –EPC Compliance for Typical Apartment

In addition to improving heating energy related aspects, renewable technologies can be utilised to significantly reduce Primary Energy requirements (in addition to ensuring the renewable energy percentage is achieved). Figure 2.4.1 above indicates how, for a typical apartment (notional 100m^2) designed to ensure NZEB compliance, 4 no. (250W) PV panels would offset the excess energy within the gross consumption. This extent of renewable energy must be at least 20% of the overall Primary Energy (RER =0.20+).

With regards to renewable energy technology types, the most effective for integration within apartment design to ensure compliance to Part L in a cost-effective manner are as follows:

- Air Source Heat Pumps (ASHP)
  Reduces Primary Energy associated with both Heating and Hot Water compared to gas boilers.

- Exhaust Air Heat Pump (EAHP)
  Reduces Primary Energy associated with both Heating and Hot Water compared to gas boilers.

- Photovoltaics (PV)
  Offsets Primary Energy associated with Electricity. Most cost-effective where installed as part of Centralised plant arrangement, with single array interlinked to Landlord electricity supply (as opposed to individual units).

3.0 DEAP Methodology and Analysis

3.1 DEAP Parameters (Centralised – Apartment)

The White Heather Residential Development will avail of a centralised system to serve Apartments as outlined below. Low-energy systems were selected and analysed for the mechanical and electrical installations, comprising of heat generators, heating and hot water systems, ventilation, and lighting.

The solution will consist of a centralised plant area with modulating gas fired condensing boiler, CHP, air source heat pump and centralised cold-water storage. Apartments would be provided with an Individual Heating Interface Unit (HIU) to provide domestic hot water and heating. Details of this system can be found in the figure below:

Centralised Option	
Element	
Method of Heat Generation	Air Source Heat Pump, Cascade Boilers and Combined Heat and Power(CHP) Plant
Model	Daikin ASHP[1], Wessex ModuMax Boilers, Dachs Micro-CHP[2] in Plantroom with HIU located in each apartment.[3]
Ventilation Method	Heat Recovery Unit
Fuel	Electricity & Gas
Heating Flow Temperature	65°C
Hot Water Flow Temperature	60°C

Figure 3.1.1 – Decentralised Parameters

For the de-centralised option, an Exhaust Air Heat Pump (EAHP) solution was also considered. Due to the requirement for Green Roof and PV panels with EAHP, it was, at the time of this report, not considered for this project but the option does comply with TGD Part L if the client is to reconsider at later stage.

[1] Units mentioned within table 3.1.1 are indicative for the purposes of analysis only and may be subject to change
[2] Units mentioned within table 3.1.1 are indicative for the purposes of analysis only and may be subject to change

3.2 Part-L Compliance (Apartment)

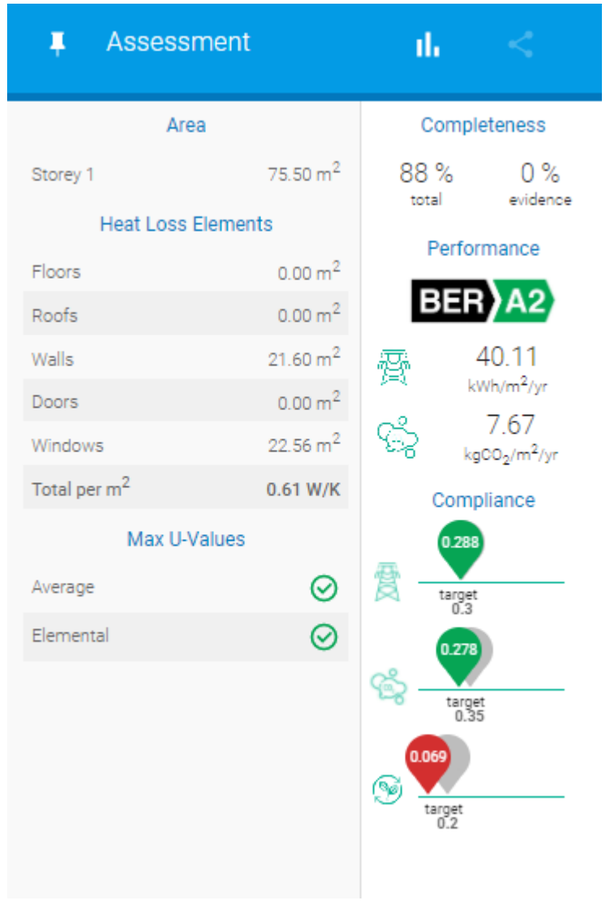

Figure 3.2.1 –Part-L Compliance – Primary Energy Breakdown (Apartment)

Figure 3.2.1 indicates confirmation of compliance to Part L for the apartments with the following parameters achieved:

- Energy Performance Coefficient (EPC) < 0.30
- Carbon Performance Coefficient (CPC) < 0.35

[3] Units mentioned within table 3.1.1 are indicative for the purposes of analysis only and may be subject to change

From Figure 3.2.1, it is clear that the renewable energy ratio, RER, shown is not sufficient to meet the requirement within DEAP 4.2.1. The RER requirement is as per the value indicated below:

- Renewable Energy Ratio (RER) > 0.20

The SEAI have released a new heat pump calculator which considers heat pumps used within group schemes. Based on inputs from both DEAP and the overall design of the system, an adjusted RER is generated and is shown in Figure 3.3.1.

Figure 3.2.2 shows that a centralised system, as designed, complies with the regulations for the White Heather Residential. Also refer to Appendix section 4.1 for DEAP software results for technical input data to achieve Part L compliance.

RESULTS: Part L compliance Renewable Energy Ratio (RER) Adjustment. Applies to New final and New provisional assessments only. BER Assessor must advise the client of any adjustment to RER, and attach details of adjusted RER to Part L compliance report. This section is completed AFTER the above heat pump calculation results are entered in DEAP software.		
Total renewable contribution adjustment	509.35	
Total renewables primary energy from DEAP software	540.65	
Total Primary Energy from DEAP software	3146.01	
Adjusted Renewable Energy Ratio to be attached to compliance report	**0.29**	

Figure 3.2.2 – Part L Compliance – Primary Energy Breakdown (Apartment)

3.3 DEAP Parameters (De-Centralised – House)

The White Heather Residential Development will avail of a decentralised system to serve House as outlined below. Low-energy systems were selected and analysed for the mechanical and electrical installations, comprising of heat generators, heating and hot water systems, ventilation, and lighting.

The solution will consist of a decentralised plant area with electrical driven air source heat pump and individual cold-water storage. House would be provided with an Heat Pump technology to provide domestic hot water and heating. Details of this system can be found in the table below:

De-Centralised Option	
Element	
Method of Heat Generation	Air Source Heat Pump
Model	Daikin ASHP[4] with 230 Litre Hot Water Cylinder located in each house
Ventilation Method	Heat Recovery Unit
Fuel	Electricity
Heating Flow Temperature	45°C
Hot Water Flow Temperature	60°C

Figure 3.3.1 – Decentralised Parameters

Also refer to Appendix section 4.2 for DEAP software results for technical input data to achieve Part L compliance.

[4] Units mentioned within table 3.1.1 are indicative for the purposes of analysis only and may be subject to change

3.4 Part-L Compliance (House)

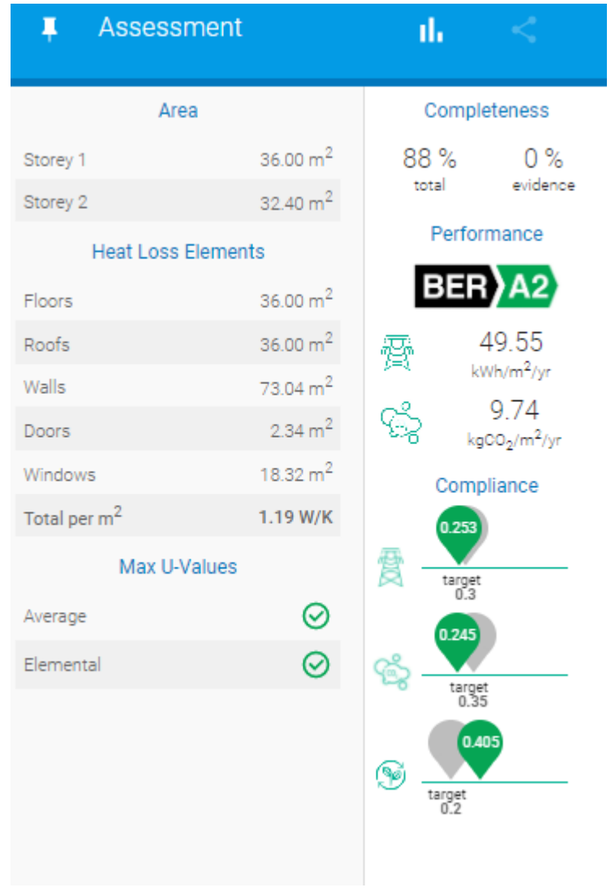

Figure 3.4.1 –Part L Compliance – Primary Energy Breakdown

Figure 3.4.1 above, indicates confirmation of compliance to Part-L for the apartments with the following parameters achieved:

- Energy Performance Coefficient (EPC) < 0.30
- Carbon Performance Coefficient (CPC) < 0.35
- Renewable Energy Ratio (RER) > 0.20

4.0 Appendix

4.1 Centralised DEAP Results (Apartments)

SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Dwelling Details Report
Date report created: 08/02/2021
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Property details

MPRN		**Shared MPRN**	
BER Number	N/A	**BER number assigned to shared dwelling**	N/A
Address line 1	White Heather,	**Type of Rating**	New Dwelling - Final
Address line 2	South Circular Road	**Purpose of Rating**	New dwelling for owner occupation
Address line 3			
County	Dublin 8	**Building Regulations**	2019 TGD L
Eircode		**Planning Reference**	
Dwelling Type	Mid-floor apartment	**Date of Plans**	
Year of construction	2020	**Assessor Name**	
Dwelling Extension	No	**Date of Assessment**	02/02/2021
Storeys	1	**Assessor Comments**	
		Assessor Description	White Header - Mid Floor - Central system- Type 2X

Dimension details

	Area [m^2]	Height [m]	Volume [m^3]
Ground floor	75.50	2.40	181.20
First floor	0.00	0.00	0.00
Second floor	0.00	0.00	0.00
Third and other floors	0.00	0.00	0.00
Room in Roof	0.00	0.00	0.00
Totals	75.50		181.20

Living Area	34.50 m^2	**Living Area Percentage**	45.70 %

Ventilation details

	Number	Air Change Rate [ac/h]
Chimneys	0	0.00
Open Flues	0	0.00
Fans & vents	1	10.00
Flueless combustion room heaters	0	0.00

Has a permeability test been carried out	Yes	**Is there a draught lobby on main entrance?**	Yes
Infiltration rate due to structure [ac/h]	0.15	**Draught lobby air change [ac/h]**	0.00
Intermediate infiltration rate	0.21	**Openings infiltration [ac/h]**	0.06
Number of sides sheltered	2	**Structure type**	N/A
Adjusted infiltration rate	0.17	**Is there a suspended wooden ground floor?**	No
Effective air change rate [ac/h]	0.22	**Windows/doors/attic hatches draught stripped [%]**	N/A
Ventilation heat loss [W/K]	13.12	**Ventilation method**	Balanced whole-house mechanical ventilation with heat recovery
Adjusted result of air permeability test [ac/h]	0.15		
Manufacturer and Model name	Vent Axia LO-CARBON SENTINEL KINETIC ADVANCE	**How many wetrooms (inc. kitchen)? Is the vent. ducting flexible/rigid/both?**	3 (K+3)
		Is MVHR ducting uninsulated where outside of insulated envelope?	No
		Adjusted heat exchanger efficiency	91.00
Specific fan power [W/(l/s)]	0.51		
Heat exchanger efficiency [%]	91.00		
Electricity for ventilation fans [Kwh/y]	112.74		
Heat gains from ventilation fans [W]	5.54		

Building Elements - Floors

Type	Description	U/F Heating	In Roof	Age Band	Exposed Perimeter [m]	Area [m^2]	U-Value [W/m^2K]	Heat Loss (AU) [W/K]
Non-Heat Loss Floor		N/A	No	2010 onwards	N/A	75.50	0.00	0.00
Total area [m^2]								75.50

Building Elements - Roofs

Type	Description	Insulation Thickness [mm]	Age Band	Area [m^2]	U-Value [W/m^2K]	Heat Loss (AU) [W/K]
Total area [m^2]						0.00

Building Elements - Walls

Type	Description	Wall is semi-exposed	Include in compliance check	Age Band	Area [m^2]	U-Value [W/m^2K]	Heat Loss (AU) [W/K]
325mm Solid Brick		No	Yes	2010 onwards	21.60	0.18	3.89
Total area [m^2]							21.60

Building Elements - Doors

Count	Type	Description	Draught Stripped	Area [m^2]	U-Value [W/m^2K]	Heat Loss (AU) [W/K]
Total area [m^2]						0.00

Building Elements - Windows

Count	Glazing Type	Frame Type	Frame Factor	Solar Transm.	In Roof	Over shading	Orient.	Area [m^2]	U-value [W/m^2K]
1	Double-glazed, air filled (low-E, en = 0.05, soft coat)	Wood/PVC	0.700	0.630	No	Very Little	Northwest	3.84	1.20
1	Double-glazed, air filled (low-E, en = 0.05, soft coat)	Wood/PVC	0.700	0.630	No	Very Little	Northwest	1.92	1.20
1	Double-glazed, air filled (low-E, en = 0.05, soft coat)	Wood/PVC	0.700	0.630	No	Very Little	North	3.60	1.20
1	Double-glazed, air filled (low-E, en = 0.05, soft coat)	Wood/PVC	0.700	0.630	No	Very Little	Northeast	9.36	1.20
1	Double-glazed, air filled (low-E, en = 0.05, soft coat)	Wood/PVC	0.700	0.630	No	Very Little	Northeast	3.84	1.20
Total area [m^2]									22.56

Heat loss details

Total glazed area [m^2]	22.56	**Glazing ratio**	0.15
Total glazed heat loss [W/K]	25.83	**Summer solar gain [W/m^2]**	811.3
Total effective collection area [m^2]	8.95	**Total element area [m^2]**	44.16
Total plane heat loss [W/K]	29.72	**Thermal bridging factor [W/m^2K]**	0.0800
Fabric heat loss [W/K]	33.25		
Total heat loss [W/K]	46.37	**Per m2**	0.61

Lighting and Internal Gains

Lighting Design Calculation Method	Lighting Design	**Average Efficacy [lm/W]**	86.52
Fixed lighting provision [klmh/y]	5025.69	**Top up lighting requirement [klmh/y]**	0.00
Energy required for fixed lighting [kWh/y]	58.09	**Energy required for top up lighting [kWh/y]**	0.00
Energy required for portable lighting [kWh/y]	115.95		
Basic energy consumption for lighting [kWh/y]	689.10	**Water heating (In watts [W])**	91.35
Annual energy used for lighting [kWh/y]	174.04	**Occupants (In watts [W])**	118.60
Internal gains from lighting during heating season [kWh/hs] (In watts [W])	133.14 (22.83)	**Mechanical ventilation (In watts [W])**	5.54
Lighting (In watts [W])	22.83	**Heat loss to the cold water network (In watts [W])**	-35.35
Appliance and cooking (In watts [W])	172.67	**Net internal gains (In watts [W])**	375.64

Lights

Count	Name	Description	Type	Efficiency	Power [W]
27	B1 Lights	Downwards ligths	LED/CFL	66.90	10.00
1	STRIP LIGHT	Kitchen Strip Lights	LED/CFL	66.90	13.00
1	WALL MOUNTED LED		LED/CFL	66.90	10.00

Water heating details

Are there distribution losses?	Yes	**Is supplementary electric water heating used in summer?**	N/A
Are there storage losses?	Yes	**Is there a combi boiler?**	No
Is there a solar water heating system?	No	**Total hot water demand [kWh/y]**	1405.90
Standard number of occupants	2.37	**Temperature factor unadjusted**	1.00
Number of mixer showers	2	**Temperature Factor Multiplier**	1.00
Number of electric showers	0	**Hot water storage loss factor [kWh/l d]**	0.00
Number of baths	0	**Volume factor**	0.00
Daily hot water use [Litres/d]	89.66	**Combi-boiler electricity consumption [kWh/y]**	0.00
Hot water energy reqs. at taps [kWh/y]	1195.02	**Adjusted storage loss [kWh/y]**	129.21
Distribution losses [kWh/y]	210.89	**Adjusted primary circuit loss [kWh/y]**	286.74
Water storage volume [Litres]	4.00	**Heat gains from water heating system [W]**	91.35
Is manufacturers declared loss factor available?	Yes	**Output from supplementary heater [kWh/y]**	0.00
Declared loss factor [kWh/d]	0.35		
Manufacturer and Model name			
Insulation type	None		
Insulation thickness [mm]	0		

Type of mixer shower	Flow restriction	Flow rate [l/min]	HW usage [l/day]	WWHRS Manufacturer/Model	WWHRS efficiency	WWHRS Utilisation Factor	Energy Savings [kWh/yr]
Unvented hot water system	Yes	6.000		Any / Any			
Total :			57.13				0.00

Combi-boiler Type	None	**Output from main water heater [kWh/y]**	1821.85
Combi-boiler loss [kWh/y]	0.00	**Annual Heat gains from water heating system [kWh/y]**	800.22
Keep Hot facility	None	**WWHRS input to main system [kWh/y]**	0.00
Storage Loss	129.21	**WWHRS input to supplementary system [kWh/y]**	0.00
Storage Type	Plate heat exchanger in a group heating system		
Primary Circuit loss type	Community heating		
Primary circuit loss [kWh/y]	360.00	**Heat Pump Type of DHW**	None
Is hot water storage indoors or in group heating system	Yes		

Net space heat demand

Required temp. during heated hours	21.00	**Length of one unheated period [h]**	8
Required temperature rest of dwelling	18.00	**Unheated periods per week**	14
Living area percentage	45.70	**Heat use during heating season [kWh/y]**	374.09
Required mean internal temperature [C]	19.37	**Heat use for full year [kWh/y]**	374.13
Thermal mass category of dwelling	Medium		

	Utilisation factor	Intermittent heating
Internal heat capacity of dwelling [per m^2]	0.20	0.11
Internal heat capacity [MJ/K]	15.10	8.31

Space heat demand details

Month	Mean Ext. Temp [C]	Adj. Int. Temp [C]	Heat Loss [W]	Heat Use [kWh]	Gain/Loss Ratio	Utilisation Factor	Heat Use [W]	Useful Gains [W]	Solar Gain [W]
January	5.3	18.66	619	121	0.77	0.96	163	457	101
February	5.5	18.67	611	63	0.94	0.90	94	516	197
March	7.0	18.74	545	13	1.38	0.70	17	527	374
April	8.3	18.81	487	1	2.02	0.49	2	486	608
May	11.0	18.95	368	0	3.32	0.30	0	368	846
June	13.5	19.07	258	0	4.96	0.20	0	258	907
July	15.5	19.17	170	0	7.08	0.14	0	170	830
August	15.2	19.16	184	0	5.83	0.17	0	184	695
September	13.3	19.06	267	0	3.16	0.32	0	267	468
October	10.4	18.91	395	4	1.59	0.62	6	389	253
November	7.5	18.77	522	55	0.95	0.89	76	446	123
December	6.0	18.69	589	116	0.77	0.96	156	432	75

Space Heating

Manufacturer & Model	Type	Space Heating Standard	Fuel	Design flow temp[°C]	Daily Operation [h]	SH Seasonal eff.	WH Seasonal eff.	Heats water

Dist. System Losses and Gains

Temperature adjustment [C]	0.000	**Additional heat emissions due to non ideal control and responsiveness [kWh/y]**	69.70
Heating system control category	2	**Gross heat emission to heated space [kWh/y]**	443.79
Heating system responsiveness category	1	**Mean internal temperature [C]**	19.03
Mean internal temperature during heating hours [C]	19.64		

	Number present	Boiler controlled by thermostat	Inside dwelling	Electricity consumption [kWh/y]	Heat gain [W]
Central heating pumps	0	No	No	0	0
Oil boiler pumps	0	No	No	0	0
Gas boiler flue fan	0			0	
Warm air heating or fan coil radiators present	No			0	0
Totals				0	0

Note: Wet central heating systems are likely to have one or more central heating pumps.

Gains from fans and pumps associated with space heating system	0	**Is there underfloor heating on the ground floor?**	No
Average utilisation factor, October to May	0.73	**U-Value of ground floor [W/m^{2}K]**	0.00
Useful net gain [kWh/y]	0	**Fraction of heating system output from ground floor**	1.00
Net heat emission to heated space [kWh/y]	444	**Additional heat loss via envelope element**	0.00
		Annual space heating requirement [kWh/y]	444

Energy Requirements: Group Heating Systems

Is charging based on heat consumed?	Yes	**Distribution loss factor**	1.05
Heat for space heating delivered to dwelling [kWh/y]	443.79	**Fraction of heat from CHP/recovered from power station**	
Percentage of heat from secondary system			
Efficiency of secondary system [%]			
Energy required for secondary space heating [kWh/y]	0		

CHP

	Fuel Type	Efficiency [%]	Percentage of Heat [%]	Primary energy conversion factor	CO_2 emission factor [kg/kWh]
Heating System 1	Mains Gas	95	50	1.10	0.203
Heating System 2	Electricity	374.23	10	2.08	0.409
Heating System 3	Electricity	226.15	40	2.08	0.409

Heat demand from CHP	0	**Efficiency adjustment factor**	N/A
Manufacturer name	N/A	**Adjusted efficiency of main water heating system [%]**	0.00
Model name	N/A	**Energy required for main water heater [kWh/y]**	1917.58
		Energy required for secondary water heater [kWh/y]	0

	Primary energy conversion factor	CO_2 emission factor
Factors for CHP fuel	0.00	0.00
Factors for electricity displaced from grid	2.08	0.41
Factors for heat leaving CHP plant	1.10	0.02
Factors for waste heat from power stations	1.05	0.02
Factors for heat delivered to dwelling	1.05	0.20

	Fuel Type	Primary energy conversion factor	CO_2 emission factor
Main space heating system	group heating scheme	1.05	0.20
Secondary space heating system	group heating scheme	1.05	0.20
Main water heating system	None	1.05	0.20
Supplementary water heating system		0.00	0.00
Pumps, fans		2.08	0.41
Energy for lighting		2.08	0.41

	Type	Part L Total Contribution [kWh/y]	Delivered Energy [kWh/y]	Primary energy conversion factor	CO_2 emission factor [kg/kWh]
Energy produced or saved 1	Electrical (Solar PV/Wind)	0.000	0.000	0.00	0.000
Energy consumed by the technology 1			0.000	0.00	0.000
Energy produced or saved 2	N/A	0.000	0.000	0.00	0.000
Energy consumed by the technology 2			0.000	0.00	0.000
Energy produced or saved 3	N/A	0.000	0.000	0.00	0.000
Energy consumed by the technology 3			0.000	0.00	0.000

Summer internal gains

Dwelling volume [m^3]	181.200	**Total gains in summer [W]**	1186.93
Effective air change rate for summer period [ac/h]	0.5	**Temperature increment due to gains [C]**	18.80
Ventilation heat loss coefficient [W/K]	29.90	**Summer mean external temperature [C]**	15
Fabric heat loss coefficient [W/K]	33.25	**Heat capacity parameter**	0.20
Heat loss coefficient under summer conditions [W/K]	63.15	**Temperature increment related to thermal mass [C]**	0.60
Total Solar Gains from Summer Period	811.30	**Threshold internal temperature [C]**	34.40
Internal gains [W]	375.64		

Results

	Delivered energy [kWh/y]	Primary energy [kWh/y]	CO_2 emissions [$kgCO_2/y$]
Main space heating system	444	467	89
Secondary space heating system	0	0	0
Main water heating system	1822	1918	364
Supplementary water heating system	0	0	0
Pumps and fans	135	282	55
Energy for lighting	174	362	71
CHP input (individual heating systems only)			
CHP electric output (individual heating systems only)			
Renewable and energy saving technologies			
Energy produced and saved	0	0	0
Energy consumed by the technology	0	0	0
Total	2575	3028	579
Per m^2 floor area	34.11	40.11	7.67
Energy Rating	A2		

4.2 De-centralised DEAP Results(House)

SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Dwelling Details Report
Date report created: 08/02/2021
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Property details

MPRN		**Shared MPRN**	
BER Number	N/A	**BER number assigned to shared dwelling**	N/A
Address line 1	White Heather,	**Type of Rating**	New Dwelling - Provisional
Address line 2	South Circular Road	**Purpose of Rating**	Private letting
Address line 3	Dublin 8	**Building Regulations**	2019 TGD L
County	Co. Dublin	**Planning Reference**	
Eircode		**Date of Plans**	
Dwelling Type	End of terrace house	**Assessor Name**	
Year of construction	2020	**Date of Assessment**	02/06/2020
Dwelling Extension	N/A	**Assessor Comments**	
Storeys	2	**Assessor Description**	White Heather -House

Dimension details

	Area [m^2]	Height [m]	Volume [m^3]
Ground floor	36.00	2.70	97.20
First floor	32.40	2.40	77.76
Second floor	0.00	0.00	0.00
Third and other floors	0.00	0.00	0.00
Room in Roof	0.00	0.00	0.00
Totals	68.40		174.96

Living Area	30.00 m^2	**Living Area Percentage**	43.86 %

Ventilation details

	Number	Air Change Rate [ac/h]
Chimneys	0	0.00
Open Flues	0	0.00
Fans & vents	1	10.00
Flueless combustion room heaters	0	0.00

Has a permeability test been carried out	Yes	**Is there a draught lobby on main entrance?**	Yes
Infiltration rate due to structure [ac/h]	0.15	**Draught lobby air change [ac/h]**	0.00
Intermediate infiltration rate	0.21	**Openings infiltration [ac/h]**	0.06
Number of sides sheltered	0	**Structure type**	N/A
Adjusted infiltration rate	0.21	**Is there a suspended wooden ground floor?**	No
Effective air change rate [ac/h]	0.32	**Windows/doors/attic hatches draught stripped [%]**	N/A
Ventilation heat loss [W/K]	18.50	**Ventilation method**	Balanced whole-house mechanical ventilation with heat recovery
Adjusted result of air permeability test [ac/h]	0.15		
Manufacturer and Model name	Vent Axia Lo-Carbon Sentinel Kinetic Advance	**How many wetrooms (inc. kitchen)? Is the vent. ducting flexible/rigid/both?**	3 bathroom, 1 utility room
Specific fan power [W/(l/s)]	0.70	**Is MVHR ducting uninsulated where outside of insulated envelope?**	Yes
Heat exchanger efficiency [%]	91.00	**Adjusted heat exchanger efficiency**	77.35
Electricity for ventilation fans [Kwh/y]	149.42		
Heat gains from ventilation fans [W]	7.35		

Building Elements - Floors

Type	Description	U/F Heating	In Roof	Age Band	Exposed Perimeter [m]	Area [m^2]	U-Value [W/m^2K]	Heat Loss (AU) [W/K]
Ground Floor - Solid	Ground Floor	No	No	2010 onwards	N/A	36.00	0.15	5.40
Non-Heat Loss Floor	First Floor	N/A	No	2010 onwards	N/A	32.40	0.00	0.00
Total area [m^2]								68.40

Building Elements - Roofs

Type	Description	Insulation Thickness [mm]	Age Band	Area [m^2]	U-Value [W/m^2K]	Heat Loss (AU) [W/K]
Pitched Roof - Insulated on Ceiling		200	2010 onwards	36.00	0.15	5.40
Total area [m^2]						36.00

Building Elements - Walls

Type	Description	Wall is semi-exposed	Include in compliance check	Age Band	Area [m^2]	U-Value [W/m^2K]	Heat Loss (AU) [W/K]
325mm Solid Brick	External wall	No	Yes	2010 onwards	73.04	0.18	13.15
Total area [m^2]							73.04

Building Elements - Doors

Count	Type	Description	Draught Stripped	Area [m^2]	U-Value [W/m^2K]	Heat Loss (AU) [W/K]
1	door		Yes	2.34	2.00	4.68
Total area [m^2]						2.34

Building Elements - Windows

Count	Glazing Type	Frame Type	Frame Factor	Solar Transm.	In Roof	Over shading	Orient.	Area [m^2]	U-value [W/m^2K]
1	Double-glazed, air filled (low-E, en = 0.05, soft coat)	Wood/PVC	0.700	0.400	No	Very Little	Northwest	3.80	1.20
1	Double-glazed, air filled (low-E, en = 0.05, soft coat)	Wood/PVC	0.700	0.400	No	Very Little	Southeast	2.90	1.20
1	Double-glazed, air filled (low-E, en = 0.05, soft coat)	Wood/PVC	0.700	0.400	No	Very Little	Northwest	2.30	1.20
1	Double-glazed, air filled (low-E, en = 0.05, soft coat)	Wood/PVC	0.700	0.400	No	Very Little	Southeast	3.50	1.20
1	Double-glazed, air filled (low-E, en = 0.05, soft coat)	Wood/PVC	0.700	0.400	No	Very Little	South	2.70	1.20
1	Double-glazed, air filled (low-E, en = 0.05, soft coat)	Wood/PVC	0.700	0.400	No	Very Little	Southeast	3.12	1.20
Total area [m^2]									18.32

Heat loss details

Total glazed area [m^2]	18.32	**Glazing ratio**	0.13
Total glazed heat loss [W/K]	20.98	**Summer solar gain [W/m^2]**	493.69
Total effective collection area [m^2]	4.62	**Total element area [m^2]**	165.7
Total plane heat loss [W/K]	49.60	**Thermal bridging factor [W/m^2K]**	0.0800
Fabric heat loss [W/K]	62.86		
Total heat loss [W/K]	81.36	**Per m2**	1.19

Lighting and Internal Gains

Lighting Design Calculation Method	Lighting Design	**Average Efficacy [lm/W]**	107.32
		Top up lighting requirement [klmh/y]	0.00
Fixed lighting provision [klmh/y]	7106.33	**Energy required for top up lighting [kWh/y]**	0.00
Energy required for fixed lighting [kWh/y]	66.22		
Energy required for portable lighting [kWh/y]	106.97		
Basic energy consumption for lighting [kWh/y]	635.73	**Water heating (In watts [W])**	97.88
		Occupants (In watts [W])	110.33
Annual energy used for lighting [kWh/y]	173.19	**Mechanical ventilation (In watts [W])**	7.35
Internal gains from lighting during heating season [kWh/hs] (In watts [W])	132.49 (22.72)	**Heat loss to the cold water network (In watts [W])**	-33.86
Lighting (In watts [W])	22.72	**Net internal gains (In watts [W])**	365.43
Appliance and cooking (In watts [W])	161.01		

Lights

Count	Name	Description	Type	Efficiency	Power [W]
36	RECESS DOWN LIGHT	B3 - KITCHEN / LIVING/BATH/BED	LED/CFL	66.90	8.00
1	CEILING ROSE PENDANT	P1 - APARTMENT	LED/CFL	66.90	20.00
2	WALL MOUNTED LED	X1 - BALCONY	LED/CFL	66.90	10.00

Water heating details

Are there distribution losses?	Yes	**Is supplementary electric water heating used in summer?**	N/A
Are there storage losses?	Yes	**Is there a combi boiler?**	No
Is there a solar water heating system?	No	**Total hot water demand [kWh/y]**	1344.78
Standard number of occupants	2.21	**Temperature factor unadjusted**	0.60
Number of mixer showers	1	**Temperature Factor Multiplier**	0.90
Number of electric showers	0	**Hot water storage loss factor [kWh/l d]**	0.00
Number of baths	0	**Volume factor**	0.00
Daily hot water use [Litres/d]	85.76	**Combi-boiler electricity consumption [kWh/y]**	0.00
Hot water energy reqs. at taps [kWh/y]	1143.07	**Adjusted storage loss [kWh/y]**	295.65
Distribution losses [kWh/y]	201.72	**Adjusted primary circuit loss [kWh/y]**	217.23
Water storage volume [Litres]	230.00	**Heat gains from water heating system [W]**	97.88
Is manufacturers declared loss factor available?	Yes	**Output from supplementary heater [kWh/y]**	0.00
Declared loss factor [kWh/d]	1.50		
Manufacturer and Model name	Daikin EKHWP-B		
Insulation type	None		
Insulation thickness [mm]	0		

Type of mixer shower	Flow restriction	Flow rate [l/min]	HW usage [l/day]	WWHRS Manufacturer/Model	WWHRS efficiency	WWHRS Utilisation Factor	Energy Savings [kWh/yr]
Unvented hot water system	Yes	6.000		Any / Any			
Total :			54.65				0.00

Combi-boiler Type	None	**Output from main water heater [kWh/y]**	1857.67
Combi-boiler loss [kWh/y]	0.00	**Annual Heat gains from water heating system [kWh/y]**	857.45
Keep Hot facility	None	**WWHRS input to main system [kWh/y]**	0.00
Storage Loss	295.65	**WWHRS input to supplementary system [kWh/y]**	0.00
Storage Type	Cylinder, indirect		

Primary Circuit loss type Separate boiler and thermal store connected by more than 1.5 m of insulated pipework

Primary circuit loss [kWh/y]	280.00	**Heat Pump Type of DHW**	Separate Hot Water Storage
Is hot water storage indoors or in group heating system	Yes		

Net space heat demand

Required temp. during heated hours	21.00	**Length of one unheated period [h]**	8
Required temperature rest of dwelling	18.00	**Unheated periods per week**	14
Living area percentage	43.86	**Heat use during heating season [kWh/y]**	1779.79
Required mean internal temperature [C]	19.32	**Heat use for full year [kWh/y]**	1807.44
Thermal mass category of dwelling	Medium		

	Utilisation factor	Intermittent heating
Internal heat capacity of dwelling [per m^2]	0.20	0.11
Internal heat capacity [MJ/K]	13.68	7.52

Space heat demand details

Month	Mean Ext. Temp [C]	Adj. Int. Temp [C]	Heat Loss [W]	Heat Use [kWh]	Gain/Loss Ratio	Utilisation Factor	Heat Use [W]	Useful Gains [W]	Solar Gain [W]
January	5.3	18.00	1033	399	0.49	0.97	537	497	146
February	5.5	18.02	1019	298	0.60	0.95	443	576	242
March	7.0	18.16	908	209	0.77	0.89	281	627	337
April	8.3	18.28	812	115	1.00	0.81	160	652	443
May	11.0	18.54	613	35	1.47	0.63	47	566	533
June	13.5	18.77	429	8	2.07	0.47	11	417	523
July	15.5	18.96	281	1	3.05	0.33	2	279	493
August	15.2	18.93	303	2	2.74	0.36	3	300	467
September	13.3	18.75	444	16	1.70	0.56	22	422	390
October	10.4	18.48	657	96	1.00	0.80	129	529	291
November	7.5	18.21	871	256	0.63	0.94	355	516	184
December	6.0	18.07	982	372	0.51	0.97	499	482	132

Space Heating

Manufacturer & Model	Type	Space Heating Standard	Fuel	Design flow temp[°C]	Daily Operation [h]	SH Seasonal eff.	WH Seasonal eff.	Heats water
Daikin, ERGA06DV3	Heat pumps	I.S. EN 14825	Electricity	55	16	380.39	225.34	Yes

Heating System Test data: I.S. EN 14825

Heat Pump Type Air to Water

Test Condition - Low (35°C)

	A (88%) -7°C	B (54%) 2°C	C (35%) 7°C	D (15%) 12°C	E* (100%) TOL
Source	A-7	A2	A7	A12	A-10
Sink	W34	W30	W27	W24	W35
Heating Capacity (kW)	6.00	3.90	3.20	3.30	6.00
Coefficient of Performance (kW/kW)	2.86	4.25	6.30	7.78	2.49

Test Condition - High (55°C) *

	A (88%) -7°C	B (54%) 2°C	C (35%) 7°C	D (15%) 12°C	E* (100%) TOL
Source	A-7	A2	A7	A12	A-10
Sink	W52	W42	W36	W30	W55
Heating Capacity (kW)	5.90	3.90	3.00	3.30	6.10
Coefficient of Performance (kW/kW)	1.98	3.16	4.49	6.10	2.12

Heating System Test data: I.S. EN 16147

Source of Data Water heating energy efficiency, nwh [%]

Co-efficient of Performance [kW/kW] 0.00

Water heating energy efficiency, nwh [%] 133.00

Reference Hot water Temperature [°C] 52.50

Capacity of Heat Pump [kW] 5.90

Declared load profile XL

Standby Heat Loss [kWh/day] 1.40

Volume of DHW accounted for in test [litre] 288

Heat Pump Type Air to Water

Dist. System Losses and Gains

Temperature adjustment [C]	0	**Additional heat emissions due to non ideal control and responsiveness [kWh/y]**	0.00
Heating system control category	3	**Gross heat emission to heated space [kWh/y]**	1779.79
Heating system responsiveness category	1	**Mean internal temperature [C]**	18.22
Mean internal temperature during heating hours [C]	19.32		

	Number present	Boiler controlled by thermostat	Inside dwelling	Electricity consumption [kWh/y]	Heat gain [W]
Central heating pumps	1	Yes	Yes	28	10
Oil boiler pumps	0	No	No	0	0
Gas boiler flue fan	0			0	
Warm air heating or fan coil radiators present	No			0	0
Totals				28	10

Note: Wet central heating systems are likely to have one or more central heating pumps.

Gains from fans and pumps associated with space heating system	58	**Is there underfloor heating on the ground floor?**	No
Average utilisation factor, October to May	0.87	**U-Value of ground floor [W/m^{2}K]**	0.00
Useful net gain [kWh/y]	51	**Fraction of heating system output from ground floor**	0.67
Net heat emission to heated space [kWh/y]	1729	**Additional heat loss via envelope element**	0.00
		Annual space heating requirement [kWh/y]	1729

Energy Requirements: Individual Heating Systems

Efficiency of main heating system [%]	380.39	**Fraction of heat from secondary system**	N/A
Manufacturer name	Daikin	**Efficiency of secondary system [%]**	N/A
Model name	ERGA06DV3	**Energy required for main heating system [kWh/y]**	454.55
Efficiency adjustment factor	1.00		
Adjusted efficiency of main heating system [%]	380.39	**Energy required for secondary heating system [kWh/y]**	0

Fraction of main space and water heat from CHP	N/A	**Efficiency adjustment factor**	1.0000
Heat demand from CHP	0.0	**Adj. efficiency of main water heating system [%]**	225.34
Efficiency of main water heating system [%]	225.34	**Water Heating Efficiency, ηwh**	133
Manufacturer name	Daikin	**Energy req. for main water heater [kWh/y]**	1714.72
Model name	ERGA06DV3	**Energy req. for secondary water heater [kWh/y]**	0.00
Heat Pump Type	Air to Water	**Water Heating Standard**	I.S. EN 16147

	Fuel Type	Primary energy conversion factor	CO_2 emission factor
Main space heating system	Electricity	2.08	0.409
Secondary space heating system	None	0.00	0.000
Main water heating system	Electricity	2.08	0.409
Pumps, fans	Electricity	2.08	0.409
Energy for lighting	Electricity	2.08	0.409

	Type	Part L Total Contribution [kWh/y]	Delivered Energy [kWh/y]	Primary energy conversion factor	CO_2 emission factor [kg/kWh]
Energy produced or saved 1	Thermal	0.000	0.000	0.00	0.000
Energy consumed by the technology 1			0.000	0.00	0.000
Energy produced or saved 2	N/A	0.000	0.000	0.00	0.000
Energy consumed by the technology 2			0.000	0.00	0.000
Energy produced or saved 3	N/A	0.000	0.000	0.00	0.000
Energy consumed by the technology 3			0.000	0.00	0.000

CHP data

Heat output from CHP [kWh/y]	0.00	**CHP Fuel type**	N/A
Electrical efficiency of CHP		**Energy delivered to CHP [kWh/y]**	0
Heat efficiency of CHP		**Electrical output from CHP [kWh/y]**	0

Summer internal gains

Dwelling volume [m^3]	174.960	**Total gains in summer [W]**	859.12
Effective air change rate for summer period [ac/h]		**Temperature increment due to gains [C]**	13.67
Ventilation heat loss coefficient [W/K]	0.00	**Summer mean external temperature [C]**	15
Fabric heat loss coefficient [W/K]	62.86	**Heat capacity parameter**	0.20
Heat loss coefficient under summer conditions [W/K]	62.86	**Temperature increment related to thermal mass [C]**	0.60
Total Solar Gains from Summer Period	493.69	**Threshold internal temperature [C]**	29.27
Internal gains [W]	365.43		

Results

	Delivered energy [kWh/y]	Primary energy [kWh/y]	CO_2 emissions [$kgCO_2/y$]
Main space heating system	455	945	186
Secondary space heating system	0	0	0
Main water heating system	824	1715	337
Supplementary water heating system	0	0	0
Pumps and fans	177	369	73
Energy for lighting	173	360	71
CHP input (individual heating systems only)	0	0	0
CHP electric output (individual heating systems only)	0	0	0
Renewable and energy saving technologies			
Energy produced and saved	0	0	0
Energy consumed by the technology	0	0	0
Total	1630	3389	666
Per m^2 floor area	23.82	49.55	9.74
Energy Rating	A2		

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