16-MAY-2022

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Purpose	Planning
Version	P.00.04

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ENERGY STATEMENT

(TBG PART L & PART F)

RATOATH SOUTH SHD

CO. MEATH

Architect	RKD Architects
Project Managers	Floton Project Management
Structural & Transport Engineers	OCSC Consulting Engineers
Services Engineers	BBSC Consulting Engineers
Environmental Consultants	Altemar
Landscape Architects	BSM

On Behalf of Beo Properties Ltd.

Revision	DATE OF ISSUE	Reason For Issue	By	Chk'd
P.00.04	16 May 2022	PLANNING	BON	BON

PROPOSED DEVELOPMENT

Summary Description

The development will principally consist of the construction of 452 no. residential units which are located in 12 neighbourhoods. Building heights ranging from 2-3 storey terraced houses and 3-4storey duplex buildings (1 storey ground floor units and 2 storey first and second floor units; 2 storey ground and first floor units and 2 storey second and third floor units) and 6-storey apartment blocks. Private open space associated with the residential units is provided in the form of rear gardens, balconies, terraces and winter gardens. The development includes a crèche with associated outdoor play areas at ground floor and at roof level; 4 no. commercial/retail units; a landscaped public open space which includes a civic plaza; communal open space in the form of communal courtyards for each neighbourhood; associated car and cycle parking serving the full development and uses therein; solar PV panels; a second phase of the Ratoath Outer Relief Road (RORR), that will run along the southern boundary of the application site join up to the existing constructed section of the RORR, with two priority controlled junctions; a series of pedestrian and cycle connections from the Fairyhouse Road (R155), Cairn Court, Glascarn Lane and the new RORR; internal road and shared surface networks including pedestrian and cycle paths; public lighting and all associated site development and infrastructural works, services provision, ESB substations, foul and surface water drainage, extension to the foul network, access roads/footpaths, lighting, landscaping and boundary treatment works and all ancillary works necessary to facilitate the development

(Full Statutory Description will be circulated separately to this report).

KEY PROJECT DETAILS:

No. of Units: 452

Site Area: 14.166 Hectares

EXECUTIVE SUMMARY

Beo Properties Ltd. appointed BBSC, April 2021 appointed BBSC, January 2020 to study the impact on energy to the development as set out under SI 600/2001.

This report sets out the engineering pathways to demonstrate the engineering solutions employed in the Houses, Maisonettes, Apartments to achieve a A2 BER level using DEAP and SEAI SR50-5 worksheet tools in accordance with Part L, Domestic of the Technical Guidance Document.

The Creche shall a A2 BER level using NEAP achieve Part L, Building other than Dwellings of the Technical Guidance Document.

Domestic Element of Development		
BER:	A2 NZEB	
Heat Pumps:	To provide both Domestic Hot Water and Space Heating Hot Water via Radiators to each dwelling. • Maisonettes and Apartments, Waste Air Heat Pumps • Houses shall employ outdoor condensers running to internal heat exchangers and vessels	
Part F Ventilation :	• Maisonettes, Apartments Waste Air Heat Pumps pulling air via fans, ducts and grilles from wet areas to heat pump and recovery energy from same, air enters via engineered wall vents to suit space requirements • Houses, whole house demand control extract ventilation, using central fan and engineered wall vents to suit space requirements • All fans to be A rated	
Pumps:	All space and water pumps to be A rated with low energy consumption	
Lighting:	All LED	
Public Street Lighting:	All LED	
Electrical Energy Generation:	Solar Photovoltaics to be provided to each roof to suit SEAI BER requirements in accordance with Part L in force at the time of sale.	
Fabric U-Values:	Walls	0.18 W/m²/K
	Roofs	0.16 W/m²/K
	Doors & Windows	1.4 W/m²/K
	Floors	0.18 W/m²/K
Thermal Bridging:	Limited to 0.05 of losses.	
Air Tightness:	Target 2.5 m³/hr/m² or better (0.13 Air Changes Per Hour of infiltration)	
Part B:	All services openings to be fire sealed to suit each building construction detail and build up.	

Commercial Elements of Development		
BER:	A2 NZEB	
Heat Pumps:	Heat Pumps outdoor condensers running to internal heat exchangers and vessels running to internal AC units for Cafe, Gym, Retail, Office, Healthcare or other similar units as detailed in the Development Description Underfloor heating for Creche	
Water Heating	Undersink Electrically Power Water heaters	
Part F Ventilation :	Energy recovery ventilation units for Fresh air and foul air requirements with ductwork running to wall mounted louvres using local system to minimise energy losses.	
Pumps:	All space and water pumps to be A rated with low energy consumption	
Lighting:	All LED	
Public Street Lighting:	All LED	
Electrical Energy Generation:	Solar Photovoltaics to be provided to each roof to suit SEAI BER requirements in accordance with Part L in force at the time of sale or lease.	
Fabric U-Values:	Walls	0.21 W/m²/K
	Roofs	0.16 W/m²/K
	Doors & Windows	1.6 W/m²/K
	Floors	0.21 W/m²/K
Thermal Bridging:	Limited to 0.05 of losses.	
Air Tightness:	Target 2.5 m³/hr/m² or better (0.13 Air Changes Per Hour of infiltration)	
Part B:	All services openings to be fire sealed to suit each building construction detail and build up.	

Contents

1 PURPOSE OF REPORT

Beo Properties Ltd. appointed BBSC, April 2021 appointed BBSC, January 2020 to study the impact on energy to the development as set out under SI 600/2001.

The development will be over multiple phases.

It shall comprise Houses, Masionettes, Apartments, Landlord areas, Civic Amenity, Creche as outlined in the Development Description above.

2 PRINCIPLE STANDARDS

2.1 BUILDING REGULATIONS

- Technical Guidance Documents as A through M as published and set out in Law, Department of the Environment, relevant edition relates to date of publication and date of building.
- S.I. No. 600/2001 - Planning and Development Regulations, 2001
- Domestic Energy Auditing Procedure, Version 4.2 Published by SEAI

2.2 GENERAL

The purpose of this Sustainability Report is to define the requirements for achieving Part F & L of the Building Regulations with respect to the Energy usage of the development.

Planning requirements applicable shall be to the Meath Council Development Plan 2021-2027.

This report aims to satisfy the legislative planning requirements by addressing how the overall energy strategy of the proposed development has been approached in a holistic manner, striving to meet the highest standards of sustainable building design such as passive solar design, high efficiency systems and use of renewable energy technologies.

Principle energy targets and objectives shall be nZEB (Near Zero Energy Building As defined by Part L of the building regulations, current edition at time of publication).

This report sets out how the building will achieve these objectives, the underpinning Part L compliance are energy demand reduction through passive measures and increased supply from renewable and efficient sources.

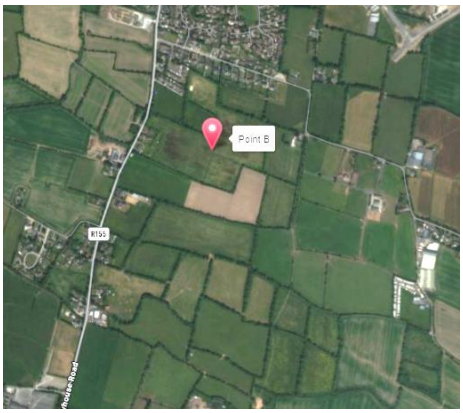
The proposed design will employ the necessary engineering solutions to follow this principle.

The proposed site development will meet or exceed where feasible the requirements of the Part L 2021 building regulations, which stipulates requirements on minimum renewable contribution, minimum fabric and air permeability requirements, maximum energy use and carbon dioxide emissions as calculated using the SEAI published DEAP (Dwellings Energy Assessment Procedure) methodology excel workbook.

Assessments carried out in this report are based on latest floor plans and elevations received from the Architect, at the time of assessment.

2.3 SITE LOCATION

The Site is located over a Green field site, off R155 (Fairyhouse Road), Ratoath, Meath.



Grid ref:	O 01892 50414
X (ITM)	701835
Y(ITM)	750437
Latitude :	53.494079
Longitude :	-6.4652778

(https://irish.gridreferencefinder.com/)

2.4 SCHEDULE OF UNITS

The following tables details the units.

Refer to the Schedule of space and accommodations for full details

Unit Description	Qty.
House Plan A.1	61
House Plan A.2	28
House Plan B.1	30
House Plan B.2	31
Maisonette Corner Ground M1	42
Maisonette Corner Upper M2	42
Maisonette Mid-Terrace Ground M3	34
Maisonette Mid-Terrace Upper M4	34
Maisonette Mid-Terrace Universal Design M5	15
Maisonette Mid-Terrace Upper M6	15
Apartments 2-bed A	80
Apartments 2-bed B	20
Apartments 3-bed	20
Total (houses)	**452**

3 LEGISLATIVE/PLANNING REQUIREMENTS

3.1 MEATH DEVELOPMENT PLAN 2021-2027

The following policies of Local County Council shall be applied

Section / Policy	Commentary pertaining to proposed development
6.14 Climate Change	
6.14.1 Statutory Context **Framework Convention on Climate Change- United Nations- (UNFCCC) 1992** **Adaptation Strategy- European Union- 2013** **Climate Action and Low Carbon Development Act-Dept of Communications, Climate Action and Environment-2015** **Planning and Development Act 2000, as amended** The Act sets out provisions for climate change within Section 10 (2) (n). These include requirements to: Reduce energy demand in response to the likelihood of increases in energy and other costs due to long-term decline in non-renewable resources, Reduce anthropogenic greenhouse gas emissions, and Address the necessity of adaptation to climate change; in particular, having regard to location, layout and design of new development. **National Climate Change Adaptation Framework (NCCAF) - Department of Environment, Heritage and Local Government- 2013**	Development will comply with standards as per Building Regulations Near Zero Energy Buildings requirements. Technical Guidance Document L- Conservation of Fuel and Energy – Dwellings (2021) to be applied SEAI DEAP current edition to be applied for BER
6.15 Energy	
EU Energy Performance of Buildings Directive 2010 (2010/31/EU) (EPBD) This Directive seeks to promote high energy performance within buildings and aims to strengthen the provisions of Directive 2002/91/EC which it supersedes. The EPBD also contains a target that by 31st December 2018, all new public buildings owned and occupied by public bodies are nearly zero energy consumption buildings (NZEB's). EU Energy Efficiency Directive 2012 (2012/27/EU) This Directive was transposed into Irish Law as S.I. 426 of 2014, European Union (Energy Efficiency) Regulations 2014, sets out the policy roadmap up to 2020 and identifies measures that are required to be introduced by Member States in order for the EU to meet its binding energy efficiency and emissions targets. National Energy Policy White Paper-Ireland's Transition to a Low Carbon Energy Economy-Department of Communications Climate Action and the Environment-2015-2030 Building Regulations-Part L-S I No 259-Department of Housing Planning and Local Government-2011 The Part L Amendment Regulations 2011 applies to dwellings, both new and existing. These regulations relate to the application of Part L contained in Technical Guidance Document L - Conservation of Fuel and Energy. Ireland's 4th National Energy Efficiency Action Plan- Department of Communications, Climate Action and the Environment 2017-2020 Delivering Homes Sustaining Communities-Statement on Housing Policy-Department of Environment, Heritage and Local Government 2007	All Dwellings shall be issued with a BER as per EPBD requirements as transcribed into law in the Republic of Ireland via Part(s) F and L of the building regulations, SEAI Domestic Energy Auditing Procedure (DEAP) or NEAP (Commercial)

Section / Policy	Commentary pertaining to proposed development
Delivering a Sustainable Energy Future for Ireland-The Energy Policy Framework- Department of Communications, Marine and Natural Resources 2007-2020, 2007 Towards Nearly Zero Energy Buildings in Ireland-Planning for 2020 and Beyond-Department of Environment, Community and Local Government-2012	
6.15.3 Renewable Energy	
The potential feasible renewable energy options for the County include, but are not limited to, a balanced mix of: • Bioenergy - crops, forestry; • Biomass - anaerobic digestion, combined heat and power (CHP); • Geothermal - hot dry rock reservoirs, groundwater aquifers; • Hydro energy - small and micro hydro systems; • Solar - passive solar heating, active solar heating; • Waste - landfill methane gas collection; • Wave - wave action, and; • Wind - onshore wind, offshore wind (single turbines and groups).	Solar Photovoltaic panels to be provided on a dwelling by dwelling basis as assessed by SEAI DEAP.
6.15.3.1 Solar Energy There are a range of technologies available to exploit the benefits of harnessing energy of the sun, including solar panels, solar farms, solar energy storage facilities all of which contribute to a reduction in energy demand. Solar technologies can be designed into buildings or retrofitted. Large scale solar farms have been positively considered on suitable sites within the County in the recent past. As of May 2019, twenty solar photovoltaic farms have been granted planning permission across the County but none have commenced development. A number of other solar farm proposals are at the pre-planning stage. Proposals for the development of solar farms will not be permitted within areas identified as being within Flood zones A or B as set out in the Planning System and Flood Risk Management Guidelines 2009 for Planning Authorities (or any updated guidelines).;	
6.15.3.6 Energy Efficiency The Council support the concept of generating renewable energy at a 'local' level and is cognisant of the benefits that accrue to local communities, for example using solar energy as a means to empower communities to take control of the production and consumption of energy. Local community engagement will form a key part of the Council's future energy strategy, and this engagement could be developed through the Public Participation Network (PPN) which could be used to inform people of the economic, environmental and social benefits of moving away from solid/fossil fuels towards a low carbon economy. The Council will endeavour: • To promote the rational uses of energy; • To promote renewable energy; • To promote and disseminate energy information; • To protect the environment; • To reduce energy waste in all sectors of society, and; • To encourage the replacement of imported fossil fuels with regionally generated renewable energy in an effort to ensure security of energy supply, where it is feasible.	All dwellings will be A2 or better as assessed to nZEB using SEAI DEAP software and workbooks.

Section / Policy	Commentary pertaining to proposed development
Ireland is committed to achieving its renewable energy and efficiency targets by 2020 as set down by the European Commission under the renewable energy directive	
INF OBJ 41 To promote the generation and supply of low carbon and renewable energy alternatives, having regard to the opportunities offered by the settlement hierarchy of the County and the built environment.	Solar Photovoltaic panels, air to water electrically powered heat pumps, electrically powered waste air heat pumps, demand controlled ventilation to be employed along with all lights to be LED. Buildings fabric will to current Part L requirements.
INF OBJ 42 To support the recording and monitoring of renewable energy potential in the County in partnership with other stakeholders including the Sustainable Energy Authority of Ireland (SEAI).	SEAI Published DEAP values will be available to the Council via the SEAI portal website.
INF OBJ 43 To require, where feasible and practicable, the provision of Photovoltaic solar panels in new residential developments, commercial developments, and public buildings for electricity generation/storage and/or water heating purposes so as to minimise carbon emissions and reduce dependence on imported fossil fuels and reduce energy costs.	Solar Photovoltaic panels, demand controlled ventilation to be employed along with all lights to be LED.
INF OBJ 49 To support the use of heat pumps as an alternative to gas boilers, where appropriate, for domestic and commercial development	Air to water electrically powered heat pumps (houses), waste air heat pumps (apartments), to be employed in all dwellings. Buildings fabric will be to current or better than Part L requirements.
10. Climate Change Strategy	
10.5.6 Residential **Mitigation Strategy** Promote and facilitate energy efficient building design, environmentally sustainable layout and locations	Development will be provided with Energy efficient public lighting and all buildings complying with INF OBJ 43, 49 above
INF POL 38 To encourage that new development proposals maximise energy efficiency through siting, layout, design and incorporate best practice in energy technologies, conservation and smart technology.	Majority of buildings are set out with South-North or East-West aspects, refer to site plan as published by Architects for details of all orientations.
INF POL 39 To encourage the attainment of high standards of energy efficiency and environmental sustainability in development.	Development will be provided with Energy efficient public lighting and all buildings complying with INF OBJ 43, 49 above
MOV OBJ 43 To require, where feasible and practicable, the provision of Photovoltaic solar panels in new residential developments, commercial developments, and public buildings for electricity generation/storage and/or water heating purposes so as to minimise carbon emissions and reduce dependence on imported fossil fuels and reduce energy costs.	Development will be provided with Energy efficient public lighting and all buildings complying with INF OBJ 43, 49 above

Section / Policy	Commentary pertaining to proposed development
MOV OBJ 49 To support the use of heat pumps as an alternative to gas boilers, where appropriate, for domestic and commercial development	Development will be provided with Energy efficient public lighting and all buildings complying with INF OBJ 43, 49 above
Promote the use of lower carbon fuels in the home.	
INF OBJ 41 To promote the generation and supply of low carbon and renewable energy alternatives, having regard to the opportunities offered by the settlement hierarchy of the County and the built environment	Development will be provided with Energy efficient public lighting and all buildings complying with INF OBJ 43, 49 above
INF OBJ 42	See above.
INF OBJ 43	See above.
10.5.8 Energy	
Encourage the uptake of more renewable energy sources	
INF POL 34 To promote sustainable energy sources, locally based renewable energy alternatives, where such development does not have a negative impact on the surrounding environment (including water quality), landscape, biodiversity or local amenities.	Renewable energy, each dwelling to be provided with Solar Photovoltaic Panels, thus harvesting up to 1200 hours of the Suns energy, as identified in Meath Councils Appendix 13 Rural Design Guide
INF POL 35 To seek a reduce greenhouse gas emissions through energy efficiency and the development of renewable energy sources utilising the natural resources of the County in an environmentally acceptable manner consistent with best practice and planning principles.	Development will be provided with Energy efficient public lighting and all buildings complying with INF OBJ 43, 49 above
INF OBJ 41 To promote the generation and supply of low carbon and renewable energy alternatives, having regard to the opportunities offered by the settlement hierarchy of the County and the built environment.	The development will be provided with Renewable Solar Energy to electrical energy Capture devices, Photovoltaic cells.
INF OBJ 42	See Above
INF OBJ 43	See Above
INF OBJ 48 To support Ireland's renewable energy commitments by promoting the use of district heating systems in urban residential and enterprise developments, where such developments will not negatively impact upon the surrounding landscape, environment, biodiversity or local amenities	Due to the amount of Solar Energy being provided as tabulated in Appendix 2 below The use of District Heating is not a viable technology for geographical reasons and that the plant used for District heating produces Carbon as a by product with would not meet the requirements of INF OBJ 41
11.6 General Standards applicable to all Development Types	
11.6.1 Energy Efficiency Mitigation of the causes and impacts of climate change is one of the cross cutting themes of this Development Plan. The importance of reducing energy requirements associated with the built environment is one of the challenges identified in the Climate Action Plan 2019. The issues to be considered in addressing this challenge include selection of building materials, type of buildings being constructed, orientation	The following technologies shall be employed • Solar Photovoltaic panel • Air to water electrically powered heat pumps in housing and similar

Section / Policy	Commentary pertaining to proposed development
on site and life time energy demands of the building. The challenge presented in measuring the carbon footprint of new residential development is currently being examined by EMRA in conjunction with other State Agencies. It is noted that ongoing research relating to the number of jobs located in towns and the size of the resident population forms part of this process. The 'live work' community concept, one of the key tenets of this plan represents a solution to the disconnect between where people live and work, this is particularly relevant to Co Meath which experienced the highest level of out-bound commuting in 2016.6 The Council's approach to encouraging gains in energy efficiency is based on the following concepts: Focus on compact sustainable growth as set out in the National Planning Framework; Increased energy efficiency in the design of buildings, Increased promotion of sustainable mobility measures in order to achieve significant future reductions in energy demands.	• Electrically powered waste air heat pumps in Apartments and similar • Demand controlled ventilation • All lights to be LED. • Buildings fabric will to current Part L requirements • Controls to meet Achieving Compliance with Part L • Air Tightness
DM POL 2 Appropriate energy conservation strategies should be employed in location, design, mass, orientation and the choice of materials of all new and renovated developments.	Refer to Architectural Design Statement for further details
DM OBJ 5 Building design which minimises resource consumption, reduces waste, water and energy use shall be incorporated where possible, in all new and renovated developments.	Solar Photovoltaic panels, air to water electrically powered heat pumps, electrically powered waste air heat pumps, demand controlled ventilation to be employed along with all lights to be LED. Buildings fabric will to current Part L requirements.
DM OBJ 6 Building design shall maximise natural ventilation, solar gain and daylight, where possible, all new and renovated developments.	Solar Photovoltaic panels, air to water electrically powered heat pumps, electrically powered waste air heat pumps, demand controlled ventilation to be employed along with all lights to be LED. Buildings fabric will to current Part L requirements.
11.11.2 EV Charging Points The Climate Action Plan, 2019 acknowledges that the pricing structure for EV vehicles is a major factor in consumers decision making. However the Plan also acknowledges the importance of 'ensuring the EV Charging network underpins public confidence.'19 The Council will encourage the provision of EV charging points in all developments for future proofing. **DM OBJ 166** All car parks shall include the provision of necessary wiring and ducting to be; capable of accommodating future Electric Vehicle charging points, at a rate of 10% of total space numbers. **DM OBJ 167** In any car park in excess of 20 spaces where public access is available, one fully functional charging point for Electric Vehicles shall be provided in accordance with IEC 61851 Standard for Electric Vehicle Conductive Charging Systems.	1 in 10 of car parking spaces shall be provided with car chargers, 3.7kw in size 1 in 10 spaces, subject to analysis by ESB Networks, Tesla, Porches will be provided with or provision for future fast charging via in ground ducting. These chargers are commercial in nature and exceed ESB guidelines for domestic levels of connection Note that latest generation of chargers require 350kw to be supplied as fast as the vehicle can accept Ducting will be provided for all site car parking in accordance with Part L 2021 section 1.4.6.

4 PART F

4.1 PRINCIPLE STANDARD

- Technical Guidance Document F - Ventilation (2009)
- Leakage classification of Class 2 or better as defined in IS EN 13141-7

4.2 COMMENT

Each Dwelling is to be sealed against un-wanted external air, infiltration.

This is to be achieved using certified building products CE and Irish Agrément certification.

As a result of sealing of the building it is intended to meet the requirements of Part F, section 1.2.3 by means of Mechanical Ventilation with Heat Recovery (MVHR). This unit shall fully comply with the requirements of Section 1.2.3., with 80% or better energy recovery.

Air shall be supplied to all habitable rooms and removed from ancillary rooms i.e. bathrooms etc.

All air shall be ducted in Class E fire rated Ductwork, with fire dampers at all fire compartment zones.

Air shall be feed from the external walls on the same level as the apartment, no ducting shall rise vertical or cross structural floors.

All ducting shall be contained in the apartment it services.

4.3 AIR PERMEABILITY OF THE DWELLING.

Air Tightness shall not exceed the limits as laid down in Part L, Section 1.5.4.2,

Below 3 $m^3/hr/m^2$ - Ventilation to be provided

Between 3 &7 $m^3/hr/m^2$ - Natural Ventilation is permitted if it meets requirements of BER

Shall exceed 7 $m^3/hr/m^2$ - Building shall be remediated to achieve limits above

The dwellings shall be tested as per the requirements of section 1.5.4, Air permeability pressure tests.

4.4 VENTILATION CHARACTERISTICS OF THE DWELLING AND VENTILATION EQUIPMENT;

The building regulations permit a number of solutions to achieve compliance with Part F.

Currently Part F allows the following or similar systems employing these principles and Irish Agrément certificated systems.

DEAP allows for additional systems and is detailed in the SEAI DEAP manual

- Centralized Continuous Mechanical Extract Ventilation (CMEV)
- Centralized Mechanical Ventilation with Heat Recovery (MVHR)
- Natural Ventilation

DEAP

- Intermittent Fans and passive vents (Extract fans, Passive stack ventilators, Trickle vents or air bricks)
- Positive input ventilation
- Mechanical extract ventilation (Demand Control Ventilation)
- Exhaust Air Heat Pumps

Apartments will generally be heated and ventilated by means of waste air heat recovery system providing heat from the waste hot air in the apartment, this solution is recognised in the Part F

Houses will be ventilated by means of an Irish Agrément certificated Demand Controlled Mechanical Extract Systems. A demand-driven ventilation system will ventilate each dwelling comprising Humidity controlled ventilators to continuously transport the exhaust air from the bathrooms, kitchen, utility room and WC to external, creating a slightly reduced, or negative air pressure in the living spaces. Due to this low-pressure fresh air is made up to the living and sleeping areas through humidity controlled fresh air inlets. Air inlets will be acoustic and wind pressure protected and ensure draught free fresh air.

System Components:

- Air inlets to bring fresh air to habitable rooms
- Extract units to transfer moisture or odour intensive air to external via ducting and a central extract fan(s).
- Central electric constant pressure fan to extract moisture and odour intensive air from each dwelling to external.

Humidity sensors in the fresh air inlets and extract units automatically adjust air flow volume to ensure a comfortable room climate. The system automatically adjusts ventilation volume according to the humidity.

All ducts running to the unit from or too external shall be insulated to reduce cold bridging effects.

This distance between intake and discharge shall not be less than 3m in so far as is practicable.

5 COMPLIANCE (PART L AND PART F)

The principal standard to be employed, and reference model.

- Technical Guidance Document L- Conservation of Fuel and Energy – Dwellings (2021)
- Table E1.6 Example F Mid Floor Apartment Dwelling space heating-heat pump and continuous mechanical extract ventilation
- nZEB or Part L

These stipulates the requirements for

- the minimum fabric and air permeability requirements,
- maximum primary energy use and carbon dioxide (CO2) emissions
- to be calculated using the DEAP (Domestic Energy Assessment Procedure) methodology.

This is a national standard and compliance is compulsory for all new dwellings.

Three design aspects demonstrate compliance:

- The limitation of primary energy use and CO2 emissions
- Building fabric (namely thermal performance)
- The use of renewable energy sources

5.1 LIMITATION OF PRIMARY ENERGY USE AND CO2 EMISSIONS

To demonstrate that an acceptable primary energy consumption rate has been achieved, the calculated Energy Performance Coefficient (EPC) shall be no greater than the Maximum Energy Performance Coefficient (MEPC).

- As per section 0.7.1, Part L, MPEPC is 0.30.

To demonstrate that an acceptable CO2 emission rate has been achieved, the calculated Carbon Performance Coefficient (CPC) of the dwellings being assessed will be no greater than the Maximum Carbon Performance Coefficient (MPCPC).

- As per Section 0.7.2, Part L, MPCPC is 0.35.

5.2 SIZE, GEOMETRY AND EXPOSURE OF THE DWELLING

Refer to the Architects general arrangements, site plan for details of the Buildings size, geometry and exposure.

5.3 MATERIALS USED FOR CONSTRUCTION OF THE DWELLING

The building shall be built of walls, floors and roofs as detailed on the Architects drawings the proposed U-Values shall meet or exceed the requirements as set out in Part L.

Table 1	Maximum elemental U-value (W/m^2K)[1, 2]	
Column 1 Fabric Elements	**Column 2 Area-weighted Average Elemental U-value (Um)**	**Column 3 Average Elemental U-value – individual element or section of element**
Roofs Pitched roof - Insulation at ceiling - Insulation on slope Flat roof	 0.16 0.16 0.20	 0.3
Walls	0.18	0.6
Ground floors[3]	0.18	0.6
Other exposed floors	0.18	0.6
External doors, windows and rooflights	1.4[4,5]	3.0

Notes:
1. *The U-value includes the effect of unheated voids or other spaces.*
2. *For alternative method of showing compliance see paragraph 1.3.2.3.*
3. *For insulation of ground floors and exposed floors incorporating underfloor heating, see paragraph 1.3.2.2.*
4. *Windows, doors and rooflights should have a maximum U-value of 1.4 W/m^2K.*
5. *The NSAI Window Energy Performance Scheme (WEPS) provides a rating for windows combining heat loss and solar transmittance. The solar transmittance value g_{perp} measures the solar energy through the window.*

5.4 THERMAL INSULATION OF THE DIFFERENT ELEMENTS OF THE BUILDING FABRIC

The Building fabric shall be constructed form various differing materials with different thermal properties. For full data on elements used in construction shall be listed as part of the BCAR process with the total U-Values as per above table, when calculated as per Part L Appendix A and B.

5.5 EFFICIENCY, RESPONSIVENESS AND CONTROL CHARACTERISTICS OF THE HEATING SYSTEM(S)

The heating system control characteristics is defined as per the requirements of DEAP as per samples attached in the Appendix 1

5.6 SOLAR GAINS THROUGH GLAZED OPENINGS OF THE DWELLING

Solar gains are based on aspect to the sun.

The results have been calculated by means of the DEAP spreadsheet.

5.7 THERMAL STORAGE (MASS) CAPACITY OF THE DWELLING

The buildings are being constructed of Concrete Materials with storage capacities as indicated in the databases used for the SEAI published in the National Calculation Methodology.

That stated the buildings insulation envelope will be on the inner side of the occupied wall thus ensuring that the buildings thermal response is lightweight in nature.

5.8 THERMAL BRIDGING

The impact of Thermal Bridging can result in a heat loss of 15%, as a result the development shall conform to the meet or exceed the Approved Construction Details. Refer to Appendix 1 for details. The details are proposed and shall be finalised during the BCAR process.

5.9 RENEWABLE AND ALTERNATIVE ENERGY GENERATION TECHNOLOGIES INCORPORATED IN THE DWELLING

Each Dwelling shall be provided with Photovoltaic panels to produce electrical energy to meet or exceed the 4 kw/hr/annum/ m² requirement. Refer to Appendix 1 for calculations of same.

Part L, section 1.2.1, allows for Heat pumps to be define the Renewable Energy requirement and the effect of heat pumps is included in the calculation procedure.

The apartments shall be heated or cooled by Heat Pumps.

These shall be verified using BER software as published by SEAI and operated by a licensed BER consultant as part of the design and during the BCAR process.

Photovoltaic cells shall be applied, however the requirement to provide green roofs will limit this or Thermal Solar Cells for water heating.

5.10 PRIMARY ENERGY USAGE.

It is envisaged to provide on a dwelling-by-dwelling basis a Electrically operated Heat Pump, Waste Air heat recovery type, it shall feed heat via radiators with pipes to the space and shall provide heat via coils to the hot water storage vessel.

Storage vessel shall be selected to be A rated or better.

Controls shall be by means of valves linked to temperature and 2 zone control valves, these shall be supplemented with each radiator being thermostatically controlled.

Radiators to be selected in accordance with SR50 calculation methodology

5.11 THE FUEL USED TO PROVIDE SPACE AND WATER HEATING, VENTILATION AND LIGHTING.

The following systems shall be provided and operated

- Space Heating
- Air to Water Heat Pump.
- Water Heating
- Air to Water heat pump with summer immersion to a calorifier
- Lighting

Shall be by means of LED Fittings, electrically operated.

5.12 WATER FIXTURES & SANITARY FITTING

The calculation methodology requires the use of water consumption figures provided from manufacturers' product details.

Before the assessment can be carried out, figures will need to be collected from manufacturers product information to determine the consumption of each terminal fitting

DEAP-Water-Efficiency-Calculator_v.0 Calculation Tool (SEAI) Typical 3-bedroom calculation indicated the maximum flowrates etc to be employed.

Using the tool, the values are determined as, 184.19 litres per unit time per person as per the calculation for the above example.

6 BUILDING SERVICES

The following details the proposed building services solutions to be applied

Method of Heating :	To be a HARP registered Heat Pump
Heating appliance efficiency:	Greater than 600 % subject to BER Calculations etc. based on the final selection of products to be used
Space heating and hot water supply system controls	Controls shall meet the requirements as per 'Heating and Domestic Hot Water Systems for Dwellings- Achieving Compliance with TGD Part L 2008' Section 8 Heat pump systems. In summary

<table>
<tr><th>Method of Heating :</th><th>To be a HARP registered Heat Pump</th></tr>
<tr><td></td><td>
<table>
<tr><th>Type</th><th>Heat Pump</th></tr>
<tr><td>Medium</td><td>Refrigerant Gas/ Water</td></tr>
<tr><td>Efficiency</td><td>600 % (Calculations indicate 720 %)</td></tr>
<tr><td>Radiators</td><td>High-efficiency radiators with high water volume to be utilized
Supply water temperature to the radiators should be in the range 55ºC return at 50ºC</td></tr>
<tr><td>Installation</td><td>A pressurised water distribution system with expansion vessel is to be employed
Works to be undertaken by a F-Gas Plumber so qualified to undertake the works as described.</td></tr>
<tr><td>Domestic hot water</td><td>The domestic hot water system will include a tank thermostat and a time clock to optimise the time taken to heat the water</td></tr>
<tr><td>Controls</td><td>As required by the Supplement to Part L</td></tr>
</table>
</td></tr>
<tr><td>Insulation of hot water storage vessels, pipes and ducts</td><td>Insulation of primary stores. Because of the higher than normal storage temperatures in primary stores shall be insulated to meet or exceed the following standards
Standards BS 1566: 2002 Copper indirect cylinders for domestic purposes. Open vented copper cylinders. Requirements and test methods
BS 7206:1990 Specification for unvented hot water storage units and packages
Heating pipework
All pipes where not in the thermal envelope shall be insulated.
BS 5422:2001 Method for specifying thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range of –40°C to +700°C
BRE Report No 262 Thermal insulation: avoiding risks, 2002 edition
Where insulation is labelled as complying with the Heating and Domestic Hot Water Systems for dwellings-Achieving Compliance with Part L it must not exceed the following heat loss levels:
<table>
<tr><th>Pipe diameter (OD) mm</th><th>Maximum permissible heat loss (W/m)</th></tr>
<tr><td>8mm</td><td>7.06</td></tr>
<tr><td>10mm</td><td>7.23</td></tr>
<tr><td>12mm</td><td>7.35</td></tr>
<tr><td>15mm</td><td>7.89</td></tr>
<tr><td>22mm</td><td>9.12</td></tr>
<tr><td>28mm</td><td>10.07</td></tr>
<tr><td>35mm</td><td>11.08</td></tr>
<tr><td>42mm</td><td>12.19</td></tr>
<tr><td>54mm</td><td>14.12</td></tr>
</table>
</td></tr>
<tr><td>Mechanical ventilation systems</td><td>Fans are to be on the SEAI register or SAP Appendix Q database, all fans other than room based non ducted type, shall be SPF of 1.5 W/l/s or better in energy usage, to table 3 of the Building Regulations Part L
Heat exchangers shall be greater than 67% efficient</td></tr>
<tr><td>Space Heating and Hot Water Supply System Control</td><td>Space and water heating systems to be effectively controlled so as to ensure the efficient use of energy by limiting the provision of heat to that required to satisfy the user requirements.
The design intent is to provide the following minimum level of control;</td></tr>
</table>

Method of Heating :	To be a HARP registered Heat Pump
	• Automatic control of space heating on the basis of room temperature • Automatic control of heat input to stored hot water on the basis of stored water temperature • Separate and independent automatic time control of space heating and hot water • Shut down of boiler or other heat source when there is no demand for either space or water heating from that source It is proposed to use a control system with full time and temperature control in each occupied room
Low Flow Sanitary Ware	Water efficient showers, taps, wash hand basins and baths to be employed. The installation of flow restrictors is required. Good practice would include: • Shower – 6L/min • Bath Volumes – Can vary but 175-130 L would be usual. 150L would be a recommended design target. These figures will be confirmed when the software officially becomes available
Lighting Design	A focus on lighting design will be another new aspect of the DEAP4 software where it is expected that credit will be given for an appropriate LED lighting design in relation to the dwelling. In the case of a deprived or over-elaborated lighting design spec, there will be a penalty for the building energy rating. A full lighting design analysis using appropriate software i.e. Dialux or allows for a full and balanced lighting design.

7 CONSTRUCTION QUALITY AND COMMISSIONING OF SERVICES

The building and its services shall be continuously monitored and adjusted on an on going basis but formally at three stages during the build.

- Stage 1 is at the end of the trial dwelling type where all methods of installation shall be adjusted to meet the required standards and best installation practices before being applied to all areas of the build.
- Stage 2 is a formal first fix walk down, snagging and reporting to Building Control Authority.
- Stage 3 is a formal second fix walk down, snagging and reporting to Building Control Authority.
- Commissioning of Services shall occur and be witnessed by the Site Engineers as per contract specifications and in accordance with CIBSE , IS10101, IS3218, IS3217, BSRIA etc. requirements.

7.1 INSULATION CONTINUITY AND AIR PERMEABILITY

Shall be monitored by the Architect and reported accordingly in accordance with the methodology outlined above.

7.2 THERMAL BRIDGING

All thermal bridging shall be kept to a minimum and to the Approved Construction Details for the relevant elements of the build.

7.3 AIR PERMEABILITY PRESSURE TESTS

All Dwellings shall be air sealed and tested as per the requirements of Part L. It should be noted that the details being employed shall so ensure that the air permeability of the building is better than that noted in the Part L.

8 USER INFORMATION

At the end of the project all relevant information will be published online with a link to the information being provided to each dwelling owner.

It shall comprise of but not limited to,

- Drawings of the unit(s)
- Details of the products used in the unit(s)
- Details of operation of same
- Wiring test reports and certifications
- Fire Alarm test reports and certifications
- Emergency Lighting test reports and certifications
- Plumbing test reports and certifications
- Heat Pump test reports and certifications
- Public Health test reports and certifications for plumbing

These documents are typically entitled Operating and Maintenance (O&M) Manuals

9 SOLAR PV CELLS

Following amended calculation procedure in the DEAP software the estimated solar panels for apartments and houses has been determined based on the data as presented.

The final air tightness, plant efficiency of the final equipment as installed along with the calculation version at time of BER assessment will affect the total number of panels per dwelling.

The numbers presented herein are for the purposes of completeness only as the final BER will dedicate the final numbers to be applied, it is expected that the numbers per dwelling will not increase from the samples below.

Appendix 2 outlines a basic solar PV model as employed by SEAI, DEAP calculation method.

10 CRECHE AND OTHER COMMERICAL UNITS

The Creche is to achieve a nZEB rating of A2, using commercial NEAP as published by SEAI, it is to be heated by heat pumps with Solar PV Cells on the roof, covering up to 60% of the area of the roof as is typical for buildings of this type and energy classification.

Ventilation will be subject to current guidance relating to airborne infection control at the time of BER assessment, as the national advice is in flux, the energy used will not be determined until final design is completed an shall not exceed the rating above.

At time of writing, 3 Air Changes Per hour, heat recovery ventilation unit(s) is proposed.

11 DISTRICT HEATING

District heating was not considered as the changes in the Part L and the need to provide nZEB houses has as a result of preliminary calculation resulted in approx. 3,136 solar panels (PV) each producing 310W of power per hour for a total of 778,820KW per year of electrical solar power.

The final energy produced will be subject to further design development and final load calculations.

APPENDIX 1 – DEAP 4.2 OUTPUT

Tool is available to down load from SEAI website

(https://www.seai.ie/home-energy/building-energy-rating-ber/support-for-ber-assessors/domestic-ber-resources/deap4-software/)

Please note,

The DEAP 4.2.1 Manual (2019) is applicable to new and existing dwellings for compliance checking with Part L of the Irish Building Regulations 2019.

For technical requirements, tables reference in the work book please refer to DEAP 4.2.2 Manual

For Part L compliance at planning please refer to the tool, DEAP 4.2.0 Workbook

For Part F compliance at planning, apartments are provided with Waste Air heat pumps, and houses with demand controlled ventilations systems.

In addition to the above SR50-4: 2021 Heat pump sample calculations are provided.

List of Sample assessments

Plan	DEAP 4.2.0	SR50-4:2021	Orientation	Comment
Rowhouse A.1	N	Y	E/W	
Rowhouse A.2	Y	Y	E/W	SAMPLE CALCULATION PROVIDED
Rowhouse B.1	N	Y	E/W	
Rowhouse B.2	Y	Y	E/W	
Maisonette Corner Ground C.1	Y	Y	E/W	
Maisonette Corner Upper C.2	Y	Y	E/W	
Maisonette Mid-Terrace Ground C.3	N	C.1	E/W	
Maisonette Mid-Terrace Upper C.4	N	C.2	E/W	
Maisonette 1-Bed Mid-Terrace UD C.5	Y	Y	N/S	
Maisonette Mid-Terrace Upper C.6	N	N	N/S	
Apartments 2-bed D.1	Y	D.2	E/W	
Apartments 2-bed D.2	Y	Y	E/W	
Apartments 2-bed D.3	Y	D.2	N/E	
Apartments 3-bed D.4	Y	Y	S/E	

PLANS

Refer to Architects General Arrangements for further details beyond information presented here after.

SAMPLE DEAP (BER) Calculations

- SEAI Domestic Energy Auditing Procedure, Version 4.2.0.
- Part L, Part F applied
- Sample Calculation printouts attached.

DEAP Report

SAMPLE BER CALCULATION FOR PLAN TYPE A2

DEAP Workbook: Aligned to DEAP software version 3.2 plus inclusion of Part L 2019 requirements, incorporating NZEB
Inputs and results, with selected intermediate results shown in *italics*
Details not applicable for this dwelling are grayed out.
Print out 'Proj' worksheet separately if required.

Dwelling dimensions **TGD L version** 2019

	Area [m^2]	Height [m]
Ground floor	63	2.7
First floor	63	2.7
Second floor	0	0.0
Third and other floors	0	0.0
Total floor area [m^2]	126	
Dwelling volume [m^3]	340	
Living area [m^2]	22.5	

Ventilation

Number of chimneys	0	
Number of open flues	0	
Number of intermittent fans and passive vents	4	
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?	No	0

If no :

Structure type	Masonry
Is there a suspended wooden ground floor?	None
Percentage of windows and doors draughtstripped [%]	100

If yes Not applicable

End if

Number of sides sheltered	2	
Ventilation method	Natural ventilation	1
Effective air change rate [ac/h]	0.66	
Ventilation heat loss [W/K]	74	

Permeability test carried out and meets guidelines in TGD L? Does Not Comply
For mechanical ventilation, other than positive input ventilation from loft: Not applicable

Windows

Orientation	East/West	East/West	East/West	SE/SW	South	North	North	North	Horizontal
Orientation ID	3	3	3	4	5	1	1	1	6
Area [m^2]	7.9515	8.4375	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?	-	-	0.00	-	-	-	-	-	-
If yes:									
Manufacturer and model	-	-	-	-	-	-	-	-	-
Solar energy transmittance	0.8	0.8	-	-	-	-	-	-	-
End if									
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	1	1	0	0	0	0	0	0	0
Frame factor (Table 6c) [-]	0.80	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Window type ID	2	2	0	0	0	0	0	0	0

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/rooflights	16.4	1.3	21.7	-	
Doors	6.3	1.4	8.8	-	
Floor	63.0	0.2	11.3	-	No underfloor heating
Floor (type 2)	0.0	0.0	0.0	-	No underfloor heating
Floor (type 3)	0.0	0.0	0.0	-	No underfloor heating
Walls	45.2	0.2	8.1	-	Wall relevant for TGD L fabric compliance check
Walls (type 2)	0.0	0.0	0.0	-	Wall relevant for TGD L fabric compliance check
Walls (type 3)	0.0	0.0	0.0	-	Wall relevant for TGD L fabric compliance check
Walls (type 4)	0.0	0.0	0.0	-	Wall relevant for TGD L fabric compliance check
Walls (type 5)	0.0	0.0	0.0	-	Wall relevant for TGD L fabric compliance check
Roof	63.0	0.2	10.1	-	Pitched roof - Insulation at ceiling
Roof (type 2)	0.0	0.0	0.0	-	Flat roof
Roof (type 3)	0.0	0.0	0.0	-	Pitched roof - Insulation at ceiling
Roof (type 4)	0.0	0.0	0.0	-	Pitched roof - Insulation at ceiling
Roof (type 5)	0.0	0.0	0.0	-	Pitched roof - Insulation at ceiling
Total area of elements [m^2]	193.89				
Heat loss via plane elements [W/K]			60		
Factor for thermal bridging [W/m^2 K]			0.08		
Fabric heat loss [W/K]			76		
Dwelling heat loss coefficient [W/K]			150		
Heat loss parameter, HLP [W/K m^2]			1.19		

Water heating

Are there distribution losses?	Yes
Distribution loss [kWh/y]	276

Are there storage losses?	Yes	1	
If yes :			
Water storage volume [litres]		200	
Is manufacturer's declared loss factor available?		Yes	1
If yes :			
Manufacturer and model name		SUZ-SWM60VA	
Manufacturer's declared loss factor [kWh/day]		1.91	
If no	Not applicable		
End if			
Temperature factor unadjusted (Table 2)		0.89	
Temperature factor multiplier (from Table 2 notes)		0.9	
End if			
Is there a solar water heating system?		No	0
If yes	Not applicable		
Solar fraction [%]			0
End if			
Primary circuit loss [kWh/y] (Table 3)			360
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]		2707	
Output from supplementary heater [kWh/y]		0	
Heat gains from water heating system [W]		98	
Is hot water storage indoors or in group heating scheme?		No	

Lighting

Annual energy used for lighting, EL [kWh/y]		271

Internal gains

Net internal gains [W]		481

Heat use

Living area fraction [-]	0.18	
Thermal mass category of dwelling	Medium	
Heat use [kWh/y]	3863	

Space heating

Control and responsiveness

Temperature adjustment (Table 4e), where appropriate [C]		0
Heating system control category (Table 4e)		2
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	-	-
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/m^2 K]	0	
Type of main heating system	Individual system	1

Energy requirements - individual heating systems :

Space Heating

Efficiency of main heating system [%] (including Efficiency Adjustment Factor)	240.0
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)	152.381

Fuel data

	Fuel
Space heating - main	electricity
Space heating - secondary	-
Water heating - main	electricity
Water heating - supplementary	-
Photovoltaic/ Wind Turbine	1,843 kWh/y
Solar Thermal	0 kWh/y

Renewable and energy-saving technologies			Primary energy factor [-]	CO2 factor [kg/kWh]	Delivered energy [kWh/y]
Type 1	Description	PV			

	Energy produced or saved	2.08	0.409	0
	Energy consumed	0.00	0.000	0
Type 2	Description -			
	Energy produced or saved	2.08	0.409	0
	Energy consumed	0.00	0.000	0
Type 3	Description -			
	Energy produced or saved	0.00	0.000	0
	Energy consumed	0.00	0.000	0

Energy requirements - group/community heating scheme Not applicable

Results

	Delivered energy	Primary energy	CO_2 emissions
	[kWh/y]	[kWh/y]	[kg/y]
Space heating - main	1,723	3,584	705
Space heating - secondary	0	0	0
Water heating - main	1,776	3,695	727
Water heating - supplementary	0	0	0
Pumps, fans	30	62	12
Energy for lighting	271	563	111
Renewable and energy-saving technologies			
CHP input (individual heating systems only)	0	0	0
CHP electrical output (individual heating sys	0	0	0
Photovoltaic/ Wind Turbine	-1,843	-3,833	-754
Type 1 PV	0	0	0
Type 2 -	0	0	0
Type 3 -	0	0	0
Total	1,957	4,071	801
per m^2 floor area	15.5	32.3	6.4
Building Energy Rating [kWh/m^2 y]		32	A2

Check conformity with MPEPC and MPCPC requirements in TGD L 2019

		Max permitted	
EPC	0.242	0.30	Complies
CPC	0.232	0.35	Complies
RER	0.638	0.20	Complies

SAMPLE SR50-4 CALCULATIONS

- Sample Calculation for sample dwelling to NSAI Standard Recommendations SR50-4:2021 Building Services – Part 4 Heat Pump systems in dwellings
- Full calculation for one unit as a sample, all information will be submitted as part of BCAR process.

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

Project	21_0706-BBSC-CALC-HOUSE A1 RATOATH BEO SHD	By	Barry O'Neill CEng 07Sep2021

U-Value Inputs

Element	w/mK	
Wall1	0.18	Part L: 2019
Wall2	0.18	Part L: 2019
Wall3	0.18	Part L: 2019
Party Wall	0.9	
Floor	0.18	Part L: 2019
Roof	0.16	Part L: 2019 table 5
Door	1.4	Part L: 2019
Window1	1.4	Part L: 2019
Roof Light	1.4	Part L: 2019

Heat Losses Based on SEAI calculation Spreadsheet

Room	**Heat Loss Watts**	**Area m²**	**Volume m³**	
Hall				
L00-HALL	324	7.60	20.90	
L00-UTILITY	160	5.09	12.22	
L00-WC	180	2.40	6.60	
L00-KITCHEN-DINING ROOM	2502	45.31	122.34	77.30228
L01-LANDING	181	6.19	16.71	
L01-BEDROOM (1)	454	13.87	37.45	
L01-BEDROOM (2)	326	9.02	24.35	
L01-BATHROOM	219	4.60	12.42	
L01-MASTER BEDROOM (3)	879	17.59	47.49	
L01-ENSUITE	323	3.73	10.07	
Totals	**5,548**	115.40	310.55	
Plus margin **10%**	**6.10**	KW		

SR50:4 2021 HEAT PUMP SIZING METHOD

E4.2 Hot Water Storage (accumulation method.)

Vdp60 allowance	25	**l/person**
nr of Persons	5	**persons**
Total	250	**litres**

E4.3 Tank Sizing **SR50-4:2021 Appendix E**

Temperature	55	°C of the hot water
Temperature	10	°C of the cold water
Volume	278	litres
Energy Stored	**14.5**	**kWh**

E4.4 Heat Pump Capacity

Hours Recovery	2	hrs	On at 1am off 3am
thermal capacity of the heat pump	7.3	kw	

Design Capacity	**Table E.16**		Note Max External Noise	45	dB(A)
Space Heating	6.1	kW	ISEN 15450:2007 Table F.1		
DHW	7.3	kW			
Design Capacity	**7.3**	kW			

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

Project	21_0706-BBSC-CALC-HOUSE A2 RATOATH BEO SHD	By	Barry O'Neill CEng 07Sep2021

U-Value Inputs

Element	w/mK	
Wall1	0.18	Part L: 2019
Wall2	0.18	Part L: 2019
Wall3	0.18	Part L: 2019
Party Wall	0.9	
Floor	0.18	Part L: 2019
Roof	0.16	Part L: 2019 table 5
Door	1.4	Part L: 2019
Window1	1.4	Part L: 2019
Roof Light	1.4	Part L: 2019

Heat Losses Based on SEAI calculation Spreadsheet

Room	**Heat Loss Watts**	**Area m²**	**Volume m³**	
Hall				
L00-HALL	440	14.86	40.87	
L00-UTILITY	81	3.22	7.73	
L00-WC	79	2.42	6.66	
L00-LIVING ROOM	844	14.64	39.53	
L00-KITCHEN-DINING ROOM	1588	22.54	60.86	98.63033
L01-LANDING	122	4.20	11.34	
L01-BEDROOM (1)	425	13.04	35.21	
L01-BEDROOM (2)	405	11.83	31.94	
L01-BATHROOM	230	4.62	12.47	
L01-MASTER BEDROOM (3)	828	16.56	44.71	
L01-ENSUITE	298	3.73	10.07	
Totals	**5,340**	111.66	301.38	
Plus margin **10%**	**5.87**	KW		

SR50:4 2021 HEAT PUMP SIZING METHOD

E4.2 Hot Water Storage (accumulation method.)

Vdp60 allowance	25	**l/person**
nr of Persons	5	**persons**
Total	250	**litres**

E4.3 Tank Sizing **SR50-4:2021 Appendix E**

Temperature	55	°C of the hot water
Temperature	10	°C of the cold water
Volume	278	litres
Energy Stored	**14.5**	**kWh**

E4.4 Heat Pump Capacity

Hours Recovery	2	hrs	On at 1am off 3am
thermal capacity of the heat pump	7.3	kw	

Design Capacity	**Table E.16**		Note Max External Noise	45	dB(A)
Space Heating	5.9	kW	ISEN 15450:2007 Table F.1		
DHW	7.3	kW			
Design Capacity	**7.3**	kW			

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

Project	21_0706-BBSC-CALC-HOUSE B1 RATOATH BEO SHD	By	Barry O'Neill CEng 07Sep2021

U-Value Inputs

Element	w/mK	
Wall1	0.18	Part L: 2019
Wall2	0.18	Part L: 2019
Wall3	0.18	Part L: 2019
Party Wall	0.9	
Floor	0.18	Part L: 2019
Roof	0.16	Part L: 2019 table 5
Door	1.4	Part L: 2019
Window1	1.4	Part L: 2019
Roof Light	1.4	Part L: 2019

Heat Losses Based on SEAI calculation Spreadsheet

Room		**Heat Loss Watts**	**Area m²**	**Volume m³**
Hall				
L00-HALL		352	10.81	29.72
L00-WC		133	4.24	11.66
L00-UTILITY		92	4.24	11.66
L00-KITCHEN-DINING ROOM		2673	34.90	127.98
L01-LANDING		179	5.41	14.61
L01-BEDROOM 1		305	11.90	32.13
L01-MASTER BEDROOM (2)		435	17.18	46.39
L01-ENSUITE		233	3.50	9.45
L02-OFFICE		410	13.73	37.07
L01-BATHROOM		214	4.39	11.85
L02-LANDING		245	6.33	17.09
L02-BEDROOM (3)		610	11.90	32.13
Totals		**5,882**	128.53	381.74
Plus margin	**10%**	**6.47**	KW	

SR50:4 2021 HEAT PUMP SIZING METHOD

E4.2 Hot Water Storage (accumulation method.)

Vdp60 allowance	25	**l/person**
nr of Persons	5	**persons**
Total	250	**litres**

E4.3 Tank Sizing — **SR50-4:2021 Appendix E**

Temperature	55	°C of the hot water
Temperature	10	°C of the cold water
Volume	278	litres
Energy Stored	**14.5**	**kWh**

E4.4 Heat Pump Capacity

Hours Recovery	2	hrs
thermal capacity of the heat pump	7.3	kw

On at 1am off 3am

Design Capacity	**Table E.16**	
Space Heating	6.5	kW
DHW	7.3	kW
Design Capacity	**7.3**	kW

Note Max External Noise 45 dB(A)
ISEN 15450:2007 Table F.1

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

Project	21_0706-BBSC-CALC-HOUSE B2 RATOATH BEO SHD	By	Barry O'Neill CEng 07Sep2021

U-Value Inputs

Element	w/mK	
Wall1	0.18	Part L: 2019
Wall2	0.18	Part L: 2019
Wall3	0.18	Part L: 2019
Party Wall	0.9	
Floor	0.18	Part L: 2019
Roof	0.16	Part L: 2019 table 5
Door	1.4	Part L: 2019
Window1	1.4	Part L: 2019
Roof Light	1.4	Part L: 2019

Heat Losses Based on SEAI calculation Spreadsheet

Room	**Heat Loss Watts**	**Area m²**	**Volume m³**
Hall			
L00-HALL	368	7.70	28.24
L00-WC	110	2.40	6.60
L00-UTILITY	90	4.14	11.39
L00-KITCHEN-DINING ROOM	2781	36.87	135.20
L01-LANDING	130	8.89	24.00
L01-BEDROOM 1	299	12.91	34.86
L01-MASTER BEDROOM (2)	516	20.91	56.46
L01-ENSUITE	266	3.74	10.10
L02-OFFICE	384	11.69	31.56
L01-BATHROOM	380	4.61	12.45
L02-LANDING	289	7.98	21.55
L02-BEDROOM (3)	621	12.96	34.99
Totals	**6,232**	134.80	407.39
Plus margin **10%**	**6.86**	KW	

SR50:4 2021 HEAT PUMP SIZING METHOD

E4.2 Hot Water Storage (accumulation method.)

Vdp60 allowance	25	**l/person**
nr of Persons	5	**persons**
Total	250	**litres**

E4.3 Tank Sizing **SR50-4:2021 Appendix E**

Temperature	55	°C of the hot water
Temperature	10	°C of the cold water
Volume	278	litres
Energy Stored	**14.5**	**kWh**

E4.4 Heat Pump Capacity

Hours Recovery	2	hrs
thermal capacity of the heat pump	7.3	kw

On at 1am off 3am

Design Capacity	**Table E.16**	
Space Heating	6.9	kW
DHW	7.3	kW
Design Capacity	**7.3**	kW

Note Max External Noise 45 dB(A)
ISEN 15450:2007 Table F.1

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

Project	21_0706-BBSC-CALC-MAISONETTE C.1. GROUND RATOATH BEO SHD	By	Barry O'Neill CEng 09Sep2021

U-Value Inputs

Element	w/mK	
Wall1	0.18	Part L: 2019
Wall2	0.18	Part L: 2019
Wall3	0.18	Part L: 2019
Party Wall	0.9	
Floor	0.18	Part L: 2019
Roof	0.16	Part L: 2019 table 5
Door	1.4	Part L: 2019
Window1	1.4	Part L: 2019
Roof Light	1.4	Part L: 2019

Heat Losses Based on SEAI calculation Spreadsheet

Room	**Heat Loss Watts**	**Area m²**	**Volume m³**
Hall			
L00-HALL	258	7.30	20.08
L00-UTILITY	88	4.10	11.28
L00-WC	100	3.20	8.80
L00-KITCHEN-DINING ROOM	3772	47.60	130.90
L01-LANDING	365	10.17	27.97
L01-BEDROOM (1)	310	12.90	35.48
L01-BEDROOM (2)	427	11.90	32.73
L01-BATHROOM	154	4.60	12.42
L01-BEDROOM (3)	730	17.70	48.68
L01-ENSUITE	214	3.80	10.45
Totals	**6,417**	123.27	338.76
Plus margin **10%**	**7.06**	KW	

SR50:4 2021 HEAT PUMP SIZING METHOD

E4.2 Hot Water Storage (accumulation method.)

Vdp60 allowance	25	**l/person**
nr of Persons	5	**persons**
Total	250	**litres**

E4.3 Tank Sizing **SR50-4:2021 Appendix E**

Temperature	55	°C of the hot water
Temperature	10	°C of the cold water
Volume	278	litres
Energy Stored	**14.5**	**kWh**

E4.4 Heat Pump Capacity

Hours Recovery	4	hrs
thermal capacity of the heat pump	3.6	kw

On at 1am off 5am

Design Capacity	**Table E.16**	
Space Heating	7.1	kW
DHW	3.6	kW
Design Capacity	**7.1**	kW

Note Max External Noise 45 dB(A)
ISEN 15450:2007 Table F.1

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

Project	21_0706-BBSC-CALC-MAISONETTE C2 UPPER RATOATH BEO SHD	By	Barry O'Neill CEng 09Sep2021

U-Value Inputs

Element	w/mK	
Wall1	0.18	Part L: 2019
Wall2	0.18	Part L: 2019
Wall3	0.18	Part L: 2019
Party Wall	0.9	
Floor	0.18	Part L: 2019
Roof	0.16	Part L: 2019 table 5
Door	1.4	Part L: 2019
Window1	1.4	Part L: 2019
Roof Light	1.4	Part L: 2019

Heat Losses Based on SEAI calculation Spreadsheet

Room	**Heat Loss Watts**	**Area m²**	**Volume m³**
Hall			
L00-HALL	852	15.56	42.79
L02-LANDING (2)	337	45.16	16.42
L03-UTILITY	247	4.57	12.56
L03-WC	147	2.50	6.88
L03-KITCHEN-DINING ROOM	2080	40.33	110.91
L03-LANDING	365	10.17	27.97
L02-BEDROOM (1)	311	13.00	35.75
L02-BEDROOM (2)	308	9.20	25.30
L02-BATHROOM	154	4.60	12.42
L02-BEDROOM (3)	986	20.30	55.83
L02-ENSUITE	223	4.00	11.00
Totals	**6,008**	169.39	357.82
Plus margin **10%**	**6.61**	KW	

SR50:4 2021 HEAT PUMP SIZING METHOD

E4.2 Hot Water Storage (accumulation method.)

Vdp60 allowance	25	**l/person**
nr of Persons	5	**persons**
Total	250	**litres**

E4.3 Tank Sizing **SR50-4:2021 Appendix E**

Temperature	55	°C of the hot water
Temperature	10	°C of the cold water
Volume	278	litres
Energy Stored	**14.5**	**kWh**

E4.4 Heat Pump Capacity

Hours Recovery	2	hrs	i.e. On at 1am off 3am
thermal capacity of the heat pump	7.3	kw	

Design Capacity	**Table E.16**		Note Max External Noise	45	dB(A)
Space Heating	6.6	kW	ISEN 15450:2007 Table F.1		
DHW	7.3	kW			
Design Capacity	**7.3**	kW			

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

Project	21_0706-BBSC-CALC-MAISONETTE-C.5 UD RATOATH BEO SHD	By	Barry O'Neill CEng 09Sep2021

U-Value Inputs

Element	w/mK	
Wall1	0.18	Part L: 2019
Wall2	0.18	Part L: 2019
Wall3	0.18	Part L: 2019
Party Wall	0.9	
Floor	0.18	Part L: 2019
Roof	0.16	Part L: 2019 table 5
Door	1.4	Part L: 2019
Window1	1.4	Part L: 2019
Roof Light	1.4	Part L: 2019

Heat Losses Based on SEAI calculation Spreadsheet

Room		**Heat Loss Watts**	**Area m²**	**Volume m³**
Hall				
L00-HALL		334	11.30	31.08
L00-STORE		247	4.57	12.56
L00-KITCHEN-DINING ROOM		1595	28.80	79.20
L00-BEDROOM (1)		368	13.40	36.85
L00-BATHROOM		268	5.80	15.95
Totals		**2,811**	63.87	175.64
Plus margin	**10%**	**3.09**	KW	

SR50:4 2021 HEAT PUMP SIZING METHOD

E4.2 Hot Water Storage (accumulation method.)

Vdp60 allowance	25	**l/person**
nr of Persons	5	**persons**
Total	250	**litres**

E4.3 Tank Sizing **SR50-4:2021 Appendix E**

Temperature	55	°C of the hot water
Temperature	10	°C of the cold water
Volume	278	litres
Energy Stored	**14.5**	**kWh**

E4.4 Heat Pump Capacity

Hours Recovery	2	hrs	i.e. On at 1am off 3am
thermal capacity of the heat pump	7.3	kw	

Design Capacity	**Table E.16**		Note Max External Noise	45	dB(A)
Space Heating	3.1	kW	ISEN 15450:2007 Table F.1		
DHW	7.3	kW			
Design Capacity	**7.3**	kW			

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

Project	21_0706-BBSC-CALC-APARTMENT-D2 RATOATH BEO SHD	By	Barry O'Neill CEng 18Sep2021

U-Value Inputs

Element	w/mK	
Wall1	0.18	Part L: 2019
Wall2	0.18	Part L: 2019
Wall3	0.18	Part L: 2019
Party Wall	0.9	
Floor	0.18	Part L: 2019
Roof	0.16	Part L: 2019 table 5
Door	1.4	Part L: 2019
Window1	1.4	Part L: 2019
Roof Light	1.4	Part L: 2019

Heat Losses Based on SEAI calculation Spreadsheet

Room		**Heat Loss Watts**	**Area m²**	**Volume m³**	
Hall					
HALL		352	11.69	32.15	
UTILITY		91	3.30	7.92	
BEDROOM 1		550	16.27	44.74	
BEDROOM (2)		353	12.00	33.00	
KITCHEN-DINING ROOM		2384	40.40	111.10	82.61802
A-1-L02-BATHROOM		240	4.30	10.32	
Totals		**3,971**	87.96	239.23	
Plus margin	**10%**	**4.37**	KW		

SR50:4 2021 HEAT PUMP SIZING METHOD

E4.2 Hot Water Storage (accumulation method.)

Vdp60 allowance	25	**l/person**
nr of Persons	4	**persons**
Total	200	**litres**

E4.3 Tank Sizing — **SR50-4:2021 Appendix E**

Temperature	55	°C of the hot water
Temperature	10	°C of the cold water
Volume	222	litres
Energy Stored	**11.6**	**kWh**

E4.4 Heat Pump Capacity

Hours Recovery	4	hrs
thermal capacity of the heat pump	2.9	kw

On at 1am off 5am

Design Capacity	**Table E.16**	
Space Heating	4.4	kW
DHW	2.9	kW
Design Capacity	**4.4**	kW

Note Max External Noise 45 dB(A)
ISEN 15450:2007 Table F.1

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

Project	21_0706-BBSC-CALC-APARTMENT-D4 RATOATH BEO SHD	By	Barry O'Neill CEng 18Sep2021

U-Value Inputs

Element	w/mK	
Wall1	0.18	Part L: 2019
Wall2	0.18	Part L: 2019
Wall3	0.18	Part L: 2019
Party Wall	0.9	
Floor	0.18	Part L: 2019
Roof	0.16	Part L: 2019 table 5
Door	1.4	Part L: 2019
Window1	1.4	Part L: 2019
Roof Light	1.4	Part L: 2019

Heat Losses Based on SEAI calculation Spreadsheet

Room	**Heat Loss Watts**	**Area m²**	**Volume m³**	
Hall				
HALL	370	16.24	38.98	
UTILITY	118	4.55	10.91	
BEDROOM 1	601	18.83	51.77	
BEDROOM (2)	277	9.00	24.75	
BEDROOM (3)	336	11.72	32.22	
KITCHEN-DINING ROOM	1897	35.46	97.52	74.90632
ENSUITE	262	3.99	9.56	
BATHROOM	230	4.34	10.42	
Totals	**4,092**	104.12	276.13	
Plus margin **10%**	**4.50**	KW		

SR50:4 2021 HEAT PUMP SIZING METHOD

E4.2 Hot Water Storage (accumulation method.)

Vdp60 allowance	25	**l/person**
nr of Persons	5	**persons**
Total	250	**litres**

E4.3 Tank Sizing **SR50-4:2021 Appendix E**

Temperature	55	°C of the hot water
Temperature	10	°C of the cold water
Volume	278	litres
Energy Stored	**14.5**	**kWh**

E4.4 Heat Pump Capacity

Hours Recovery	4	hrs	On at 1am off 5am
thermal capacity of the heat pump	3.6	kw	

Design Capacity	**Table E.16**		Note Max External Noise	45	dB(A)
Space Heating	4.5	kW	ISEN 15450:2007 Table F.1		
DHW	3.6	kW			
Design Capacity	**4.5**	kW			

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

ROOM L00-HALL

Design Room Temp	18	Notes:
External Design Temp	-3	
Design Temp Difference	21	

Ventilation Heat Loss	No. of air changes per hour ac/h	Room Volume (meters) Length (m)	Width (m)	Height (m)	Amount of air to be heated per hour m^3/h	Air change factor $W/m^3.K$	Design Temp Diff °C	Heat Loss Watts
	0.5	1	7.3	2.75	10.0375	0.33	21	69.559875
Additional air changes due to Chimneys or Flues	0	For additional air changes see table in section 2.2. Ventilation Heat Loss			0	0.33	21	0

Fabric Heat Loss	Length (m)	Width (m)	Height (m)	Area m^2	U-Value $W/m^2.K$	Design Temp Diff °C	
External Floor	1	7.3		7.3	0.18	21	27.594
External Wall (Gross area)	7.5		2.75	20.625			
Window				0	1.4	21	0
Window				0	1.4	21	0
External Door		1.05	2.56	2.688	1.4	21	79.0272
External Wall (Nett area)	**(Subtract glazing and door areas from gross external wall area)**			17.937	0.18	21	67.80186
External Roof (Gross area)				0			
Rooflights		0	0	0	1.4	21	0
External Roof (Nett area)	**(Subtract roof glazing area from gross roof area)**			0	0.39	21	0.000
Party Wall Adjoining unheated space			2.6	0	0.9	8	0.000
Other	-	-	-	-	-	-	-

Design Heat Loss from Room (Sum of Watts for all elements)		243.983
Thermal Bridging		13.954
Exposed Location? (If yes, 10% is added to the heat loss)	No	0.000
High Ceiling - Is the room served by underfloor heating	No	0.000
Total room Heat Loss		**257.9**

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

ROOM L00-UTILITY

Design Room Temp	18	Notes:
External Design Temp	-3	
Design Temp Difference	21	

Ventilation Heat Loss	No. of air changes per hour ac/h	Room Volume (meters) Length (m)	Width (m)	Height (m)	Amount of air to be heated per hour m^3/h	Air change factor $W/m^3.K$	Design Temp Diff °C	Heat Loss Watts
	0.5	1	4.1	2.75	5.6375	0.33	21	39.067875
Additional air changes due to Chimneys or Flues	0	For additional air changes see table in section 2.2. Ventilation Heat Loss			0	0.33	21	0

Fabric Heat Loss	Length (m)	Width (m)	Height (m)	Area m^2	U-Value $W/m^2.K$	Design Temp Diff °C	
External Floor	1	4.1		4.1	0.18	21	15.498
External Wall (Gross area)	2.88		2.75	7.92			
Window				0	1.4	21	0
Window				0	1.4	21	0
External Door				0	1.4	21	0
External Wall (Nett area)	**(Subtract glazing and door areas from gross external wall area)**			7.92	0.18	21	29.9376
External Roof (Gross area)				0			
Rooflights		0	0	0	1.4	21	0
External Roof (Nett area)	**(Subtract roof glazing area from gross roof area)**			0	0.39	21	0.000
Party Wall Adjoining unheated space			2.7	0	0.9	8	0.000
Other	-	-	-	-	-	-	-

Design Heat Loss from Room (Sum of Watts for all elements)		84.503
Thermal Bridging		3.635
Exposed Location? (If yes, 10% is added to the heat loss)	No	0.000
High Ceiling - Is the room served by underfloor heating	No	0.000
Total room Heat Loss		**88.1**

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

ROOM L00-WC

Design Room Temp	18	Notes:
External Design Temp	-3	
Design Temp Difference	21	

Ventilation Heat Loss	No. of air changes per hour ac/h	Room Volume (meters) Length (m)	Width (m)	Height (m)	Amount of air to be heated per hour m^3/h	Air change factor $W/m^3.K$	Design Temp Diff ^oC	Heat Loss Watts
	0.5	1	3.2	2.75	4.4	0.33	21	30.492
Additional air changes due to Chimneys or Flues	0	For additional air changes see table in section 2.2. Ventilation Heat Loss			0	0.33	21	0

Fabric Heat Loss	Length (m)	Width (m)	Height (m)	Area m^2	U-Value $W/m^2.K$	Design Temp Diff ^oC	
External Floor	1	3.2		3.2	0.18	21	12.096
External Wall (Gross area)	1.55		2.75	4.2625			
Window		0.85	1.67	1.4195	1.4	21	41.7333
Window				0	1.4	21	0
External Door				0	1.4	21	0
External Wall (Nett area)	**(Subtract glazing and door areas from gross external wall area)**			2.843	0.18	21	10.74654
External Roof (Gross area)				0			
Rooflights		0	0	0	1.4	21	0
External Roof (Nett area)	**(Subtract roof glazing area from gross roof area)**			0	0.39	21	0.000
Party Wall Adjoining unheated space			2.7	0	0.9	8	0.000
Other	-	-	-	-	-	-	-

Design Heat Loss from Room (Sum of Watts for all elements)		95.068
Thermal Bridging		5.166
Exposed Location? (If yes, 10% is added to the heat loss)	No	0.000
High Ceiling - Is the room served by underfloor heating	No	0.000
Total room Heat Loss		**100.2**

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

ROOM	L00-KITCHEN-DINING ROOM

Design	21	Notes:
External Design Temp	-3	
Design Temp Difference	24	

Ventilation Heat Loss	No. of air changes per hour ac/h	Room Volume (meters) Length (m)	Width (m)	Height (m)	Amount of air to be heated per hour m^3/h	Air change factor $W/m^3.K$	Design Temp Diff °C	Heat Loss Watts
	1.5	1	47.6	2.75	196.4	0.33	24	1555.1
Additional air changes due to Chimneys or Flues		For additional air changes see table in section 2.2. Ventilation Heat Loss			0.0	0.33	24	0.0

Fabric Heat Loss	Length (m)	Width (m)	Height (m)	Area m^2	U-Value $W/m^2.K$	Design Temp Diff °C	
External Floor	1	47.6		47.6	0.18	24	205.6
External Wall (Gross area)	7.4		2.75	20.4			
Window		2.3	2.53	5.8	1.4	24	195.5
Window		1.63	21.18	34.5	1.4	24	1160.0
Window				0.0	1.4	0	0.0
External Door		1.05	2.18	2.3	1.4	24	76.9
External Wall (Nett area)	**(Subtract glazing and door areas from gross external wall area)**			-22.3	0.18	24	-96.3
External Roof (Gross area)				0.0			
Rooflights				0.0	1.4	24	0.0
External Roof (Nett area)	**(Subtract roof glazing area from gross roof area)**			0.0	0.39	24	0.0
Party Wall Adjoining unheated space	19.1		2.7	51.6	0.9	11	510.5
Other	-	-	-	-	-	-	-

Design Heat Loss from Room (Sum of Watts for all elements)		3607.4
Thermal Bridging		164.2
Exposed Location? (If yes, 10% is added to the heat loss)	No	0.0
High Ceiling - Is the room served by underfloor heating	No	0.0
Total room Heat Loss		**3771.6**

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

ROOM L01-LANDING

Design Room Temp	18	Notes:
External Design Temp	-3	
Design Temp Difference	21	

Ventilation Heat Loss	No. of air changes per hour ac/h	Room Volume (meters) Length (m)	Width (m)	Height (m)	Amount of air to be heated per hour m^3/h	Air change factor $W/m^3.K$	Design Temp Diff °C	Heat Loss Watts
	0.5	1	10.17	2.75	13.98375	0.33	21	97
Additional air changes due to Chimneys or Flues	0	For additional air changes see table in section 2.2. Ventilation Heat Loss			0	0.33	21	0

Fabric Heat Loss	Length (m)	Width (m)	Height (m)	Area m^2	U-Value $W/m^2.K$	Design Temp Diff °C	
External Floor				0	0.18	21	0
External Wall (Gross area)	3.6		2.75	9.9			
Window		0.85	1.65	1.4025	1.4	21	41
Window				0	1.4	21	0
External Door				0	1.4	21	0
External Wall (Nett area)	**(Subtract glazing and door areas from gross external wall area)**			8.4975	0.18	21	32
External Roof (Gross area)				0			
Rooflights		0	0	0	1.4	21	0
External Roof (Nett area)	**(Subtract roof glazing area from gross roof area)**			0	0.39	21	0
Party Wall Adjoining unheated space	8.975		2.7	24.2325	0.9	8	174
Other	-	-	-	-	-	-	-

Design Heat Loss from Room (Sum of Watts for all elements)		345
Thermal Bridging		20
Exposed Location? (If yes, 10% is added to the heat loss)	No	0
High Ceiling - Is the room served by underfloor heating	No	0
Total room Heat Loss		**365**

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

ROOM	L01-BEDROOM (1)

Design	18	Notes:
External Design Temp	-3	
Design Temp Difference	21	

Ventilation Heat Loss	No. of air changes per hour ac/h	Room Volume (meters) Length (m)	Width (m)	Height (m)	Amount of air to be heated per hour m^3/h	Air change factor $W/m^3.K$	Design Temp Diff °C	Heat Loss Watts
	0.5	1	12.9	2.75	17.7	0.33	21	123
Additional air changes due to Chimneys or Flues	0	For additional air changes see table in section 2.2. Ventilation Heat Loss			0.0	0.33	21	0

Fabric Heat Loss	Length (m)	Width (m)	Height (m)	Area m^2	U-Value $W/m^2.K$	Design Temp Diff °C	
External Floor				0.0	0.18	21	0
External Wall (Gross area)	2.85		2.75	7.8			
Window		1.35	1.65	2.2	1.4	21	65
Window				0.0	1.4	21	0
Window				0.0	1.4	0	0
External Door				0.0	1.4	21	0
External Wall (Nett area)	**(Subtract glazing and door areas from gross external wall area)**			5.6	0.18	21	21
External Roof (Gross area)				0.0			
Rooflights				0.0	1.4	21	0
External Roof (Nett area)	**(Subtract roof glazing area from gross roof area)**			0.0	0.39	21	0
Party Wall Adjoining unheated space	4.35		2.75	12.0	0.9	8	86
Other	-	-	-	-	-	-	-

Design Heat Loss from Room (Sum of Watts for all elements)		296
Thermal Bridging		14
Exposed Location? (If yes, 10% is added to the heat loss)	No	0
High Ceiling - Is the room served by underfloor heating	No	0
Total room Heat Loss		**310**

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

ROOM	L01-BEDROOM (2)

Design	18	Notes:
External Design Temp	-3	
Design Temp Difference	21	

Ventilation Heat Loss	No. of air changes per hour ac/h	Room Volume (meters) Length (m)	Width (m)	Height (m)	Amount of air to be heated per hour m^3/h	Air change factor $W/m^3.K$	Design Temp Diff °C	Heat Loss Watts
	0.5	1	11.9	2.75	16.4	0.33	21	113.4
Additional air changes due to Chimneys or Flues	0	For additional air changes see table in section 2.2. Ventilation Heat Loss			0.0	0.33	21	0.0

Fabric Heat Loss	Length (m)	Width (m)	Height (m)	Area m^2	U-Value $W/m^2.K$	Design Temp Diff °C	
External Floor				0.0	0.18	21	0.0
External Wall (Gross area)	8.64		2.75	23.8			
Window		1.35	1.65	2.2	1.4	21	65.5
Window		0.85	1.65	1.4	1.4	21	41.2
Window				0.0	1.4	0	0.0
External Door				0.0	1.4	21	0.0
External Wall (Nett area)	**(Subtract glazing and door areas from gross external wall area)**			20.1	0.18	21	76.1
External Roof (Gross area)	1	3		3.0			
Rooflights				0.0	1.4	21	0.0
External Roof (Nett area)	**(Subtract roof glazing area from gross roof area)**			3.0	0.39	21	24.6
Party Wall Adjoining unheated space	4.25		2.7	11.5	0.9	8	82.6
Other	-	-	-	-	-	-	-

Design Heat Loss from Room (Sum of Watts for all elements)		403.4
Thermal Bridging		23.2
Exposed Location? (If yes, 10% is added to the heat loss)	No	0.0
High Ceiling - Is the room served by underfloor heating	No	0.0
Total room Heat Loss		**426.6**

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

ROOM L01-BATHROOM

Design	22	Notes:
External Design Temp	-3	
Design Temp Difference	25	

Ventilation Heat Loss	No. of air changes per hour ac/h	Room Volume (meters) Length (m)	Width (m)	Height (m)	Amount of air to be heated per hour m^3/h	Air change factor $W/m^3.K$	Design Temp Diff °C	Heat Loss Watts
	1.5	1	4.6	2.7	18.6	0.33	25	153.7
Additional air changes due to Chimneys or Flues		For additional air changes see table in section 2.2. Ventilation Heat Loss			0.0	0.33	25	0.0

Fabric Heat Loss	Length (m)	Width (m)	Height (m)	Area m^2	U-Value $W/m^2.K$	Design Temp Diff °C	
External Floor				0.0	0.18	25	0.0
External Wall (Gross area)			2.7	0.0			
Window				0.0	1.4	25	0.0
Window				0.0	1.4	25	0.0
Window				0.0	1.4	0	0.0
External Door				0.0	1.4	25	0.0
External Wall (Nett area)	**(Subtract glazing and door areas from gross external wall area)**			0.0	0.18	25	0.0
External Roof (Gross area)				0.0			
Rooflights				0.0	1.4	25	0.0
External Roof (Nett area)	**(Subtract roof glazing area from gross roof area)**			0.0	0.39	25	0.0
Party Wall Adjoining unheated space			2.7	0.0	0.9	12	0.0
Other	-	-	-	-	-	-	-

Design Heat Loss from Room (Sum of Watts for all elements)		153.7
Thermal Bridging		0.0
Exposed Location? (If yes, 10% is added to the heat loss)	No	0.0
High Ceiling - Is the room served by underfloor heating	No	0.0
Total room Heat Loss		**153.7**

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

ROOM L01-BEDROOM (3)

Design	18	Notes:
External Design Temp	-3	
Design Temp Difference	21	

Ventilation Heat Loss	No. of air changes per hour ac/h	Room Volume (meters) Length (m)	Width (m)	Height (m)	Amount of air to be heated per hour m^3/h	Air change factor $W/m^3.K$	Design Temp Diff °C	Heat Loss Watts
	1.5	1	17.7	2.75	73.0	0.33	21	506.0
Additional air changes due to Chimneys or Flues	0	For additional air changes see table in section 2.2. Ventilation Heat Loss			0.0	0.33	21	0.0

Fabric Heat Loss	Length (m)	Width (m)	Height (m)	Area m^2	U-Value $W/m^2.K$	Design Temp Diff °C	
External Floor				0.0	0.18	21	0.0
External Wall (Gross area)	5.4		2.75	14.9			
Window		1.35	1.65	2.2	1.4	21	65.5
Window				0.0	1.4	21	0.0
Window				0.0	1.4	0	0.0
External Door				0.0	1.4	21	0.0
External Wall (Nett area)	**(Subtract glazing and door areas from gross external wall area)**			12.6	0.18	21	47.7
External Roof (Gross area)				0.0			
Rooflights				0.0	1.4	21	0.0
External Roof (Nett area)	**(Subtract roof glazing area from gross roof area)**			0.0	0.39	21	0.0
Party Wall Adjoining unheated space	4.85		2.7	13.1	0.9	8	94.3
Other	-	-	-	-	-	-	-

Design Heat Loss from Room (Sum of Watts for all elements)		713.5
Thermal Bridging		16.6
Exposed Location? (If yes, 10% is added to the heat loss)	No	0.0
High Ceiling - Is the room served by underfloor heating	No	0.0
Total room Heat Loss		**730.1**

SR50-4:2021 Heat Pump Heat Loss Calculation Summary

BBSC

ROOM L01-ENSUITE

Design	22	Notes:
External Design Temp	-3	
Design Temp Difference	25	

Ventilation Heat Loss	No. of air changes per hour ac/h	Room Volume (meters) Length (m)	Width (m)	Height (m)	Amount of air to be heated per hour m^3/h	Air change factor $W/m^3.K$	Design Temp Diff °C	Heat Loss Watts
	1.5	1	3.8	2.75	15.7	0.33	25	129.3
Additional air changes due to Chimneys or Flues		For additional air changes see table in section 2.2. Ventilation Heat Loss			0.0	0.33	25	0.0

Fabric Heat Loss	Length (m)	Width (m)	Height (m)	Area m^2	U-Value $W/m^2.K$	Design Temp Diff °C	
External Floor				0.0	0.18	25	0.0
External Wall (Gross area)				0.0			
Window				0.0	1.4	25	0.0
Window				0.0	1.4	25	0.0
Window				0.0	1.4	0	0.0
External Door				0.0	1.4	25	0.0
External Wall (Nett area)	**(Subtract glazing and door areas from gross external wall area)**			0.0	0.18	25	0.0
External Roof (Gross area)				0.0			
Rooflights				0.0	1.4	25	0.0
External Roof (Nett area)	**(Subtract roof glazing area from gross roof area)**			0.0	0.39	25	0.0
Party Wall Adjoining unheated space	2.65		2.75	7.3	0.9	12	78.7
Other	-	-	-	-	-	-	-

Design Heat Loss from Room (Sum of Watts for all elements)		208.0
Thermal Bridging		6.3
Exposed Location? (If yes, 10% is added to the heat loss)	No	0.0
High Ceiling - Is the room served by underfloor heating	No	0.0
Total room Heat Loss		**214.3**

APPENDIX 2 – PV CALCULATIONS

- SEAI DEAP calculation model
- Average calculation for dwellings based on typical plans types, subject to full solar PV analysis as per SEAI BER DEAP requirements

PV Calculations, subject to Final BER Calculations **SEAI PV CALCULATION METHOD** BEO SHD

Unit Description	Qty.	Beds	Average Orientation	Watts per Panel	Nr of Panels	kWp	S (KW/yr)	zpv	result (KW/yr)	Total Panels	Total for Units (KW/yr)
Rowhouse A.1	12	3 Bed	South	310	8	2.48	1036	1	2055	96	24,665
Rowhouse A.1	13	3 Bed	E/W	310	8	2.48	929	1	1843	104	23,961
Rowhouse A.1	13	3 Bed	SE/SW	310	8	2.48	1005	1	1994	104	25,921
Rowhouse A.1	23	3 Bed	SE/SW	310	8	2.48	1005	1	1994	184	45,860
Rowhouse A.2	11	3 Bed	SE/SW	310	8	2.48	1005	1	1994	88	21,933
Rowhouse A.2	17	3 Bed	South	310	8	2.48	1036	1	2055	136	34,942
Rowhouse B.1	4	3 Bed	SE/SW	310	8	2.48	1005	1	1994	32	7,976
Rowhouse B.1	5	3 Bed	South	310	8	2.48	1036	1	2055	40	10,277
Rowhouse B.1	21	3 Bed	E/W	310	8	2.48	929	1	1843	168	38,706
Rowhouse B.2	5	3 Bed	SE/SW	310	8	2.48	1005	1	1994	40	9,970
Rowhouse B.2	6	3 Bed	E/W	310	8	2.48	929	1	1843	48	11,059
Rowhouse B.2	20	3 Bed	South	310	8	2.48	1036	1	2055	160	41,108
Maisonette Corner Ground M.1	3	3 Bed	SE/SW	310	8	2.48	1005	1	1994	24	5,982
Maisonette Corner Ground M.1	8	3 Bed	E/W	310	8	2.48	929	1	1843	64	14,745
Maisonette Corner Ground M.1	8	3 Bed	SE/SW	310	8	2.48	1005	1	1994	64	15,951
Maisonette Corner Ground M.1	23	3 Bed	South	310	8	2.48	1036	1	2055	184	47,275
Maisonette Corner Upper M.2	3	3 Bed	SE/SW	310	8	2.48	1005	1	1994	24	5,982
Maisonette Corner Upper M.2	8	3 Bed	E/W	310	8	2.48	929	1	1843	64	14,745
Maisonette Corner Upper M.2	8	3 Bed	SE/SW	310	8	2.48	1005	1	1994	64	15,951

Unit Description	Qty.	Beds	Average Orientation	Watts per Panel	Nr of Panels	kWp	S (KW/yr)	zpv	result (KW/yr)	Total Panels	Total for Units (KW/yr)
Maisonette Corner Upper M.2	23	3 Bed	South	310	8	2.48	1036	1	2055	184	47,275
Maisonette Mid-Terrace Ground M.3	4	3 Bed	SE/SW	310	8	2.48	1005	1	1994	32	7,976
Maisonette Mid-Terrace Ground M.3	6	3 Bed	SE/SW	310	8	2.48	1005	1	1994	48	11,964
Maisonette Mid-Terrace Ground M.3	8	3 Bed	E/W	310	8	2.48	929	1	1843	64	14,745
Maisonette Mid-Terrace Ground M.3	16	3 Bed	South	310	8	2.48	1036	1	2055	128	32,887
Maisonette Mid-Terace Upper M.4 & M.6	4	3 Bed	SE/SW	310	8	2.48	1005	1	1994	32	7,976
Maisonette Mid-Terace Upper M.4 & M.6	6	3 Bed	SE/SW	310	8	2.48	1005	1	1994	48	11,964
Maisonette Mid-Terace Upper M.4 & M.6	8	3 Bed	E/W	310	8	2.48	929	1	1843	64	14,745
Maisonette Mid-Terace Upper M.4 & M.6	15	3 Bed	South	310	8	2.48	1036	1	2055	120	30,831
Maisonette Mid-Terace Upper M.4 & M.6	2	3 Bed	SE/SW	310	8	2.48	1005	1	1994	16	3,988
Maisonette Mid-Terace Upper M.4 & M.6	2	3 Bed	E/W	310	8	2.48	929	1	1843	16	3,686
Maisonette Mid-Terace Upper M.4 & M.6	12	3 Bed	South	310	8	2.48	1036	1	2055	96	24,665
Maisonette 1-Bed Mid-Terrace UD M.5	2	1 Bed	SE/SW	310	8	2.48	1005	1	1994	16	3,988
Maisonette 1-Bed Mid-Terrace UD M.5	2	1 Bed	E/W	310	8	2.48	929	1	1843	16	3,686
Maisonette 1-Bed Mid-Terrace UD M.5	11	1 Bed	South	310	8	2.48	1036	1	2055	88	22,610
Apartments 2-bed D.1	20	2 Bed	South	310	4	1.24	1036	1	1028	80	20,554
Apartments 2-bed D.1	20	2 Bed	E/W	310	4	1.24	929	1	922	80	18,431
Apartments 2-bed D.1	20	2 Bed	SE/SW	310	4	1.24	1005	1	997	80	19,939

Unit Description	Qty.	Beds	Average Orientation	Watts per Panel	Nr of Panels	kWp	S (KW/yr)	zpv	result (KW/yr)	Total Panels	Total for Units (KW/yr)
Apartments 2-bed D.2	10	2 Bed	SE/SW	310	4	1.24	1005	1	997	40	9,970
Apartments 2-bed D.2	10	2 Bed	SE/SW	310	4	1.24	1005	1	997	40	9,970
Apartments 2-bed D.3	5	2 Bed	South	310	4	1.24	1036	1	1028	20	5,139
Apartments 2-bed D.3	5	2 Bed	SE/SW	310	4	1.24	1005	1	997	20	4,985
Apartments 2-bed D.3	5	2 Bed	South	310	4	1.24	1036	1	1028	20	5,139
Apartments 2-bed D.3	5	2 Bed	SE/SW	310	4	1.24	1005	1	997	20	4,985
Apartments 3-bed D.4	5	3 Bed	SE/SW	310	4	1.24	1005	1	997	20	4,985
Apartments 3-bed D.4	5	3 Bed	E/W	310	4	1.24	929	1	922	20	4,608
Apartments 3-bed D.4	5	3 Bed	SE/SW	310	4	1.24	1005	1	997	20	4,985
Apartments 3-bed D.4	5	3 Bed	South	310	4	1.24	1036	1	1028	20	5,139
Total	**452**									**3,136**	**778,820**

Notes

All PV Calculations are based on most likely PV panels at Final BER stage

Most Average Orientation has been applied

Total results are plus or minus 15% of presented figure

All PV Calculations are based on SEAI formulas