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Sustainability Energy Statement to accompany a planning application for the development of a mixed-use residential scheme, Broomhill Road, Tallaght, Dublin 24.

Prepared by:
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For:
Garyaron Homes.

Revision	Date	Prepared By	Checked By / Approved By
Issue 1	26/08/2021	S. O' Connor	J. Fogarty
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	Title	Senior Engineer	Senior Partner

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Table of Contents

1.0 Introduction.

Garyaron Homes intends to apply to An Bord Pleanála for a 5 year planning permission for a Strategic Housing Development scheme on lands at Broomhill Road, Tallaght, Dublin 24, D24 XA52 and Unit 51, Broomhill Road, Tallaght, Dublin 24, D24E124 on a site of approximately 1.4 ha.

The proposed development will consist of: (a) the demolition (total area approx. 4,319.9 sqm) of the existing buildings on site and the existing front boundary treatment; and (b) the construction of a new residential and mixed use scheme of 242 no. apartment units in 5 no. blocks (Blocks A to E) ranging from 4 to 7 storeys in height as follows:

- Block A (5 storeys) comprising 40 no. apartments (4 no. 1 bed, 31 no. 2 bed and 5 no. 3 bed units)
- Block B and C (7 storeys) comprising 102 no. apartments (45 no. 1 bed and 57 no. 2 bed units)
- Block D (5 - 7 storeys) comprising 36 no. apartments (16 no. 1 bed and 20 no. 2 bed units)
- Block E (4 - 5 storeys) comprising 64 no. apartments (31 no. 1 bed and 33 no. 2 bed units)

Block D will accommodate a Childcare Facility/creche of approx. 465sqm at ground floor level.

The proposal will also provide for a café of approx. 50.9 sqm at the ground floor of Block C. Residential amenity areas will be provided in the form of a reception of approx. 125.1sqm, resident lounge of approx. 45sqm, a letting office of approx. 11.8sqm, a rentable room/studio space of 39sqm, a public gym of approx. 128.5sqm and a public co-working space of approx. 128.4sqm, all at the ground floor level of Blocks B & C.

Each residential unit will be afforded with private open space in the form of a balcony or terrace. Communal open space of 1,797.4sqm is proposed in the form of 2no. roof top terraces at Blocks D and E, courtyard space at ground level, outdoor seating and planting and pedestrian and cyclist links. Public open space of 1,400sqm is also proposed in the form of outdoor seating, paved areas, a lawn area, play areas and an outdoor seating area to the front of the proposed café at Block C.

A total of 136no. car parking spaces are provided at ground floor level, including 7 no. Accessible spaces at surface level; and 426 no. bicycle spaces (Visitor and Resident in bike stands and secure stacked bike spaces) are proposed.

The development shall be served via a new vehicular access point from Broomhill Road. Upgrade works are proposed to the vehicular access point to facilitate the proposed development and to provide for improved access and egress for the overall development. New pedestrian and cyclist access points will be provided on to Broomhill Road from the site.

The associated site and infrastructural works include provision for water services; foul and surface water drainage and connections; attenuation proposals; permeable paving; all landscaping works; boundary treatment; internal roads and footpaths; waste storage areas and electrical services and all associated site development works.

Executive Summary.

This report compiled by Environmental Design Partnership Consulting Engineers on behalf of Garyaron Homes, provides a summary of the statutory requirements and aspirations of South Dublin County Council and their energy and carbon reduction strategies and aspirations that will be applied in the design development of the Mechanical Electrical Engineering and Plumbing services.

This report demonstrates the compliance strategy for Technical Guidance Document Part L and Conservation of Fuel and Energy - Amended 2017 and NZEB compliance.

1.1 Design Aspirations

Apartments:

The proposed development will exceed the requirements of the current building regulations, Part L 2011 – Amended January 2017 (Dwellings effective 31st December 2020) requiring the following:

Minimum fabric and air permeability requirements: 5 m^3/ ($h.m^2$)

Maximum permitted energy performance coefficients (MPEPC): 0.3

Maximum permitted carbon performance coefficients (MPCPC): 0.35

A minimum BER of A3 will be achieved through the use of good construction practice and energy efficient system design.

Commercial Units:

The commercial units will exceed the requirements of the current building regulations, Part L 2017 (Buildings other than Dwellings effective 1st January 2019) requiring the following:

Minimum fabric and air permeability requirements: 5 m^3/($h.m^2$)

Energy performance coefficients: < 1

Maximum permitted energy performance coefficients: 1

Carbon dioxide performance coefficients < 1.15
Maximum permitted carbon performance coefficients: 1.15

A minimum BER of A3 will be capable of being achieved following tenant fit out through the use of good construction practice and energy efficient system design.

By 31st December 2020 all new buildings will be required to be nearly zero energy (NZEB) buildings irrespective of start date. The proposed development will be in full compliance with these requirements.

1.2 National Level Plans/Strategies

1.3 National Climate Change Strategy 2007 – 2012

The National Climate Change Strategy aimed to reduce energy consumption to meet its target under the Kyoto protocol, i.e. to limit greenhouse gas emissions to 13% above 1990 levels by 2012. Since then, Ireland has agreed to reduce national greenhouse gas emissions by 20% compared to 2005 emissions levels by 2020, as part of the EU Climate and Energy Package for the post-Kyoto period 2013 – 2020.

1.4 National Climate Change Adaptation Framework – Building Resilience to Climate Change (2012)

This provides the policy framework for a strategic national adaptation response to climate change. It seeks the preparation for local and sectoral adaptation plans and recommends a format and process for this work, with reference to relevant information and advice.

1.5 South Dublin County Council - Development Plan, 2016 - 2022

Environmental Design Partnership will evaluate and consider the South Dublin County Council policies and objectives.

Climate Change

Core Strategy (CS) Policy 8 National Climate Change Strategy

It is the policy of the Council to support the implementation of the National Climate Change Strategy and the National Climate Change Adaption Framework Building Resilience to Climate Change 2012 through the County Development Plan and through the preparation of a Climate Change Adaptation Plan in conjunction with all relevant stakeholders.

Residential Design & Layout

Housing (H) Policy 11 Residential Design and Layout
It is the policy of the Council to promote a high quality of design and layout in new residential development and to ensure a high-quality living environment for residents, in terms of the standard of individual dwelling units and the overall layout and appearance of the development.

H11 Objective 1:
To promote a high quality of design and layout in new residential development and to ensure a high-quality living environment for residents, in terms of the standard of individual dwelling units and the overall layout and appearance of the development in accordance with the standards set out in Chapter 11 Implementation.

H11 Objective 2:
To promote new residential developments taking account of energy efficiency, prioritising passive house construction standards, as well as renewable energy opportunities, including solar energy where appropriate, in accordance with Part L of the Building Regulations.

Internal Residential Accommodation

Dwellings should be of sufficient size and sufficiently adaptable to enable people to live comfortably through different stages of their lives and changing household needs.

Housing (H) Policy 14 Internal Residential Accommodation

It is the policy of the Council to ensure that all new housing provides a high standard of accommodation that is flexible and adaptable, to meet the long-term needs of a variety of household types and sizes.

H14 Objective 1:

To ensure that all residential units and residential buildings are designed in accordance with the relevant quantitative standards, qualitative standards and recommendations contained in Sustainable Urban Housing: Design Standards for New Apartments (2015), the Guidelines for Planning Authorities on Sustainable Residential Development in Urban Areas (2009), the companion Urban Design Manual and have regard to the standards and targets contained in Quality Housing for Sustainable Communities (2007), particularly the standards and recommendations that relate to internal amenity/layout, overall unit size, internal room sizes, room dimensions, aspect, sound insulation, communal facilities, storage, sustainability and energy efficiency.

Energy

Energy (E) Policy 1 Responding to European and National Energy Policy & Legislation

It is the policy of the Council to respond to the European and National Energy Programme through the County Development Plan – with policies and objectives that promote energy conservation, increased efficiency and the growth of locally based renewable energy alternatives, in an environmentally acceptable and sustainable manner.

Energy (E) Policy 2 South Dublin Spatial Energy Demand Analysis

It is the policy of the Council to implement the recommendations of the South Dublin Spatial Energy Demand Analysis (SEDA) in conjunction with all relevant stakeholders, promoting energy efficiency and renewable energy measures across the County.

E2 Objective 1:

To develop planning policies and objectives in relation to energy planning on a spatial understanding of the existing and future energy demands of the County.

E2 Objective 2:

To seek to reduce reliance on fossil fuels in the County by reducing the energy demand of existing buildings, in particular residential dwellings.

E2 Objective 3:

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.

E2 Objective 4:

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) and City of Dublin Energy Management Agency (CODEMA).

E2 Objective 5:

To ensure that the recommendations of the South Dublin Spatial Energy Demand Analysis (SEDA) are carried out in accordance with environmental safeguards and the protection of natural or built heritage features, biodiversity and views and prospects.

E2 Objective 6:

To require, where feasibly practical and viable, the provision of PV solar panels in new public buildings (eg Council buildings, school buildings, hospitals, health centres, community centres, sports facilities, libraries, Garda stations etc), for electricity generation/storage and/or water heating so as to reduce energy costs, minimise carbon emissions and reduce our dependence on imported fossil fuels.

E2 Objective 7:

To require, where feasibly practical and viable, the provision of PV solar panels in new housing and apartment builds, for electricity generation/storage and/or water heating, so as to reduce the long-term energy/heating costs of residents living in such dwellings, to minimise carbon emissions and to reduce Ireland's dependency on imported energy derived from fossil fuels.

E2 Objective 8:

To require, where feasibly practical and viable, the provision of green roofs for all new public buildings (Council buildings, school buildings, hospitals, community centres, sports facilities, libraries, Garda stations etc), to assist in flood alleviation, insulation and improved biodiversity, and to actively promote these measures where appropriate in new commercial and industrial buildings.

Energy (E) Policy 3 Energy Performance in Existing Buildings

It is the policy of the Council to promote high levels of energy conservation, energy efficiency and the use of renewable energy sources in existing buildings.

E3 Objective 1:

To ensure that medium to large scale residential and commercial developments are designed to take account of the impacts of climate change, including the installation of rainwater harvesting systems and that energy efficiency and renewable energy measures are incorporated in accordance with national building regulations, policy and guidelines.

Energy (E) Policy 4 Energy Performance in New Buildings

It is the policy of the Council to ensure that new development is designed to take account of the impacts of climate change, and that energy efficiency and renewable energy measures are considered in accordance with national building regulations, policy and guidelines.

E4 Objective 1:
To ensure that medium to large scale residential and commercial developments are designed to take account of the impacts of climate change, including the installation of rainwater harvesting systems, and that energy efficiency and renewable energy measures are incorporated in accordance with national building regulations, policy and guidelines.

E4 Objective 2:
To support the passive house standard or equivalent for all new build in the County.

Energy (E) Policy 5 Waste Heat Recovery & Utilisation

It is the policy of the Council to promote the development of waste heat technologies and the utilisation and sharing of waste heat in new or extended industrial and commercial developments, where the processes associated with the primary operation on site generates waste heat.

E5 Objective 1:
To promote the development of waste heat technologies and the utilisation and sharing of waste heat, in new or extended industrial and commercial developments, where the processes associated with the primary operation on site generates waste heat.

E5 Objective 2:
To promote the development of local energy partnerships among businesses in the County.

E5 Objective 3:
To promote increased energy self-sufficiency across business sectors.

Energy (E) Policy 6 Low Carbon District Heating Networks

It is the policy of the Council to support the development of low carbon district heating networks across the County based on technologies such as combined heat and power (CHP), large scale heat pumps, and renewable energy opportunities including geothermal energy, energy from waste, biomass and bio-gas.

It is the policy of the Council to support the development of both deep and shallow geothermal energy sources throughout the County. Deep geothermal projects are particularly suited to areas demonstrating high heat densities.

E6 Objective 1:
To prioritise the development of low carbon district heating networks in Low Carbon District Heating Areas of Potential.

E6 Objective 2:
To future proof the built environment in Low Carbon District Heating Areas of Potential to aid the future realisation of local energy networks and a move towards de-centralised energy systems.

E6 Objective 3:
To ensure that all development proposals in Low Carbon District Heating Areas of Potential carry out an Energy Analysis and explore the potential for the development of low carbon district heating networks.

E6 Objective 4:
To support deep and shallow geothermal projects at appropriate locations across South Dublin County and in accordance with the South Dublin Spatial Energy Demand Analysis (SEDA).

Energy (E) Policy 7 Solar

It is the policy of the Council to promote the development of solar energy infrastructure in the County, for on-site energy use, including solar PV, solar thermal and seasonal storage technologies. Such projects will be considered subject to environmental safeguards and the protection of natural or built heritage features, biodiversity and views and prospects.

E7 Objective 1:
To encourage and support the development of solar energy infrastructure for on-site energy use, including solar PV, solar thermal and seasonal storage technologies.

E7 Objective 2:
To encourage and support the development of solar energy infrastructure for local distribution, including solar PV, solar thermal and seasonal storage technologies.

Energy (E) Policy 8 Small Scale Hydro-Electricity Projects

It is the policy of the Council to encourage the roll-out of small-scale hydroelectric projects on the rivers, watercourses, dams and weirs across the County, where they do not impact negatively on freshwater species (including protected aquatic species), birds and mammals, biodiversity and natural or built heritage features.

E8 Objective 1:
To support the roll-out of small-scale hydroelectric projects on the rivers, watercourses, dams and weirs across the County, where projects do not impact negatively on freshwater species (including protected aquatic species), birds and mammals, biodiversity and natural or built heritage features.

Energy (E) Policy 9 Wind Energy

It is the policy of the Council to restrict large scale wind energy infrastructure in the rural hinterland and mountain areas of the County, to protect the overriding visual and environmental value of these landscapes.

E9 Objective 1:
To restrict large scale wind energy infrastructure from rural and mountain areas of the County.

Energy (E) Policy 10 Small to Medium Scale Wind Energy Schemes

It is the policy of the Council to encourage small to medium scale wind energy developments within industrial or business parks and support small community-based proposals in urban areas provided they do not negatively impact upon the environmental quality, and visual or residential amenities of the area.

Energy (E) Policy 11 Service Providers and Energy Facilities

It is the policy of the Council to ensure that the provision of energy facilities is undertaken in association with the appropriate service providers and operators, including ESB Networks, Eirgrid and Gas Networks Ireland. The Council will facilitate the sustainable expansion of existing and future network requirements, in order to ensure satisfactory levels of supply and to minimise constraints for development.

E11 Objective 1:
To work in conjunction with EirGrid to prioritise the undergrounding of the 220kv power line between Foxborough and the County boundary, including in the Balgaddy and Ronanstown areas.

Energy (E) Policy 12 Energy and Communications Infrastructure in Sensitive Landscapes

It is the policy of the Council that all planning applications for energy and communications infrastructure on lands located in rural, high amenity and mountain areas (Zoning Objectives RU, HA-LV, HA-DV and HA–DM) shall include a Landscape Impact Assessment of the proposed development on the landscape and shall be subject to screening for potential impacts on Natura 2000 sites.

E12 Objective 1:
To safeguard Natura 2000 sites and the sensitivity, open character and amenities of rural, high amenity and mountain areas within the County.

E12 Objective 2:
To ensure that proposals for energy and communications developments integrate with their surroundings and mitigate against negative impacts on visual amenity.

Irish Water: Water Services Strategic Plan

Irish Water the state-owned utility have now introduced a Water Services Strategic Plan (WSSP) that will apply for the next 25 years. The document addresses six key themes:

- Customer service
- Clean safe drinking water
- Effective management of wastewater
- Protect and enhance the environment
- Supporting social and economic growth
- Investing in our future.

The WSSP is an essential part of ensuring the availability of safe drinking water. It will ensure that we have an environment that is protected from the impacts of wastewater discharges, and that we have efficient modern systems that meet the needs of customers, contribute to economic growth and development, and provide value for money. The WSSP sets out the challenges we face as a country in relation to the provision of water services and identifies strategic national priorities. It includes Irish Water's short-, medium- and long-term objectives and identifies strategies to achieve these objectives

The fifth assessment report by the Intergovernmental Panel on Climate Change (IPCC) in 2014 confirmed that warming of the atmosphere and ocean system is happening and that there is clear human influence on the climate. The concentration of greenhouse gases in the atmosphere has increased to unprecedented levels, and there is evidence that the extent of sea level rise since the mid-1800s has been greater than the mean sea level rise of the previous two millennia.

Environmental Design Partnership will evaluate and consider the South Dublin County Council policies and objectives regarding Water.

Infrastructure and Environmental Quality (IE) Policy 1 Water & Wastewater

It is the policy of the Council to work in conjunction with Irish Water to protect existing water and drainage infrastructure and to promote investment in the water and drainage network to support environmental protection and facilitate the sustainable growth of the County.

IE1 Objective 1:
To work in conjunction with Irish Water to protect, manage and optimise water supply and foul drainage networks in the County.

IE1 Objective 2:
To work in conjunction with Irish Water to facilitate the timely delivery of ongoing upgrades and the expansion of water supply and wastewater services to meet the future needs of the County and the Region.

IE1 Objective 3:

To support Irish Water in delivering key water service projects. Key Projects to be progressed in South Dublin County include:

Completion of the Saggart to Leixlip Watermain Scheme to provide resilience and flexibility of water supply in the County.

Upgrade of the 9B Foul Sewer to increase drainage capacity in the north of the County.

Upgrade of the Dodder Valley Sewerage Scheme to increase drainage capacity in the south of the County.

Construction of a Saggart/Rathcoole/Newcastle Sewerage Scheme to increase drainage capacity in the west of the County.

IE1 Objective 4:
To promote and support the implementation of the Greater Dublin Strategic Drainage Study, Dublin Region Local Authorities (2005) to include the upgrade of Ringsend Sewerage Treatment Works and the construction of a new treatment plant at Clonshaugh and all associated works to increase drainage capacity throughout the Dublin Region.

IE1 Objective 5:
To promote and support the implementation of the Irish Water, Water Supply Project to increase water supply capacity throughout the Dublin Region.

IE1 Objective 6:
To protect the natural resources of the County which are the foundation for the Green Infrastructure network and a basis for growth and competitive advantage in the tourism, food and fisheries sectors.

IE1 Objective 7:
To prohibit the connection of surface water outflows to the foul drainage network where separation systems are available.

IE1 Objective 8:
To work in conjunction with the relevant authorities to seek to provide a new public drainage system to serve houses at Old Lucan Road (between Hermitage Clinic and The King's Hospital).

IE1 Objective 9:
To liaise with the relevant stakeholders, to ensure the implementation of BS8515-2009 rain & grey water harvesting, subject to class of use (SI 600 2001) and the economic viability for the end user.

IE1 Objective 10:
To promote water conservation and best practice water conservation practices in all developments, including rainwater harvesting, grey water recycling and supporting the implementation of BS8515: 2009 Rainwater harvesting systems – Code of practice.

E1 Objective 11:
To support the provision of integrated and sustainable water services through effective consultation with Irish Water on the layout and design of water services in relation to the selection and planning of development areas and the preparation of Masterplans/LAPs/ SDZ Planning Schemes.

E1 Objective 12:
To support the provision of additional strategic covered storage areas for treated drinking water in the County to provide resilience and flexibility in the drinking water supply in the Greater Dublin Area.

Actions

South Dublin County Council will liaise with Irish Water to promote the sustainable development of water supply and drainage infrastructure in the County and the Region, in accordance with the objectives and recommendations set out in the Greater Dublin Drainage Study, Water Services Strategic Plan and Water Supply Project. South Dublin County Council will present business cases to Irish Water to secure capital investment for required infrastructural projects in the County based

on the growth strategy outlined in the Core Strategy.

Environmental Design Partnership will include the South Dublin County Council policies and objectives regarding Water to the design of the new Broomhill Road development.

2.0 Energy Efficient Design & Strategy

2.1 Design Standards

Environmental Design Partnership will ensure full compliance with all relevant Building regulations, Irish Standards etc during detailed design stage for the development and as generally outlined below.

The Chartered Institute of Building Services Engineers.
Electrical Technical Council of Ireland guides.
Emergency Lighting IS 3217.
Fire Detection IS 3218.
Fire Engineering Safety Certificate

Energy Compliance Standards – Building Regulations

TGD Building Regulations 2019 Technical Guidance Document L Conservation of Fuel and Energy – Dwellings

TGD Building Regulations 2017 Technical Guidance Document L Conservation of Fuel and Energy – Buildings other than Dwellings

Nearly Zero Energy Buildings (NZEB)

In accordance with Directive 2010/31/EU of the European Parliament and the Council of 19 May 2010 on the energy performance of buildings (recast), all new dwellings will be nearly zero energy dwellings by 31 December 2020.

2.2 Part L - Conservation of Fuel and Energy

The requirements regarding conservation of fuel and energy for dwellings are laid out in Part L of the Second Schedule to the Building Regulations 1997 (S.I. No. 497 of 1997) as amended by the Building Regulations (Part L Amendment) Regulations 2011 (S.I. No. 259 of 2011).

The Second Schedule, insofar as it relates to works relating to dwellings, is amended to read as follows: -

L3 for **new dwellings**, the requirements of L1 shall be met by: -

(a) providing that the energy performance of the dwelling is such as to limit the calculated primary energy consumption and related carbon dioxide (CO2) emissions insofar as is reasonably practicable, when both energy consumption and carbon dioxide (CO2) emissions are calculated using the Dwelling Energy Assessment Procedure (DEAP) published by Sustainable Energy Authority of Ireland;

(b) providing that, for new dwellings, a reasonable proportion of the energy consumption to meet the energy performance of a dwelling is provided by renewable energy sources;

(c) limiting heat loss and, where appropriate, availing of heat gain through the fabric of the building;

(d) providing and commissioning energy efficient space and water heating systems with efficient heat sources and effective controls;
(e) providing that all oil and gas fired boilers shall meet a minimum seasonal efficiency of 90%;

(f) providing to the dwelling owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and energy than is reasonable.

General Guidance

The aim of Part L of the Second Schedule to the Building Regulations is to limit the use of fossil fuel energy and related carbon dioxide (CO2) emissions arising from the operation of buildings, while ensuring that occupants can achieve adequate levels of lighting and thermal comfort. Buildings should be designed and constructed to achieve this aim as far as is practicable.

The guidance in this document applies to works to dwellings only.

For new dwellings, the key issues to be addressed to ensure compliance are: -

Whole dwelling performance.

Primary energy consumption and related CO2 emissions: providing that the calculated primary energy consumption associated with the operation of the dwelling and the related CO2 emissions when calculated using the Dwelling Energy Assessment Procedure (DEAP) published by the Sustainable Energy Authority of Ireland.

Individual minimum performance levels

The performance levels specified for items (b) to (i) below are backstop minimum performance levels to ensure reasonable levels of performance for all factors affecting energy use, irrespective of the measures incorporated to achieve compliance with Regulation L3(a).

Meeting the performance levels specified for items (b) to (i) will not necessarily mean that the level specified for primary energy consumption and related CO2 emissions
[item (a)] will be met. One or more of the performance levels specified, for items (b) to (i), will need to be exceeded to achieve this.
(b) Use of renewable energy sources: providing that the contribution of low or zero carbon energy sources to the calculated primary energy requirement meets the target for such contribution.
(c) Fabric insulation: providing for fabric insulation, including the limitation of thermal bridging, which satisfies the guidance in this regard.
(d) Air tightness: limiting air infiltration.
(e) Boiler efficiency: providing an efficient boiler or other heat source.
(f) Building Services Controls: controlling, as appropriate, the demand for, and output of, space heating and hot water services provided.
(g) Insulation of pipes, ducts and vessels: limiting the heat loss from pipes, ducts and vessels used for the transport or storage of heated water or air.
(h) Mechanical Ventilation Systems: providing that, where a mechanical ventilation system is installed, the system meets reasonable performance levels.
(i) Performance of completed dwelling: ensure design and construction process are such that the completed building satisfies compliance targets and design intent.

Nearly Zero Energy Buildings (NZEBs)

Environmental Design Partnership Consulting Engineers are developing their design to achieve at a minimum the compliance requirements of the NZEB building regulations described below and calculated using the DEAP method.

Nearly Zero Energy Building means a building that has a very high energy performance, as determined in accordance with Annex I to Directive 2010/31/EU of the European Parliament and the Council of 19 May 2010 on the energy performance of buildings (recast) (O.J. No. L 153, 18.6.2010, page 13). 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.
To achieve the acceptable primary energy consumption rate for a nearly zero energy dwelling, the calculated energy performance coefficient (EPC) of the dwelling being assessed should be no greater than the Maximum Permitted Energy Performance Coefficient (MPEPC). The MPEPC for a nearly zero energy dwelling is 0.302.

To demonstrate that an acceptable CO2 emission rate has been achieved for a nearly zero energy dwelling, the calculated carbon performance coefficient (CPC) of the dwelling being assessed should be no greater than the Maximum Permitted Carbon Performance Coefficient (MPCPC). The MPCPC for a nearly zero energy dwelling is 0.305.

New dwellings

The building shall be designed and constructed to ensure that the energy performance of the building is such as to limit the amount of energy required for the operation of the building and the amount of carbon dioxide (CO2) emissions associated with this energy use insofar as is reasonably practicable.

Limitation of Primary Energy Use and Co2 Emissions.

Environmental Design Partnership Consulting Engineers are applying a holistic design strategy to reduce primary energy consumption and reduce Co2 emissions the strategy will include a complete thermal modelling of the entire project.
A holistic review of the model results will be undertaken to determine optimum insulation parameters for all elements of the proposed building.
The review will include the extreme operating conditions to address all heating challenges.

Confirmation of achievements and results for limitation of Primary energy consumption and Co2 emissions.

This Section provides guidance on how to show compliance with the requirements in relation to primary energy consumption and CO2 emissions specified in Regulation L3(a). The methodology for calculation to be used is specified in the Regulation as the Dwelling Energy Assessment Procedure (DEAP) methodology. This methodology is published by the Sustainable Energy Authority of Ireland (SEAI) and calculates the energy consumption and CO2 emissions associated with a standardised use of a dwelling.

The energy consumption is expressed in terms of kilowatt hours per square metre floor area per year (kWh/m2/yr) and the CO2 emissions expressed in terms of kilograms of CO2 per square metre floor area per year (kg CO2/m2/yr). Full details of the methodology are available on the SEAI website at http://www.seai.ie.

The DEAP manual, also available on that website, describes the DEAP methodology. The calculation is based on the energy balance considering a range of factors that contribute to annual energy usage and associated CO2 emissions for the provision of space heating, water heating, ventilation and lighting of a dwelling. These factors include: -

- size, geometry and exposure of the dwelling;
- materials used for construction of the dwelling;
- thermal insulation of the different elements of the building fabric;
- ventilation characteristics of the dwelling and ventilation equipment;
- efficiency, responsiveness and control characteristics of the heating system(s);
- solar gains through glazed openings of the dwelling;
- thermal storage (mass) capacity of the dwelling;
- the fuel used to provide space and water heating, ventilation and lighting;
- renewable and alternative energy generation technologies incorporated in the dwelling;
- air permeability of the dwelling.

The performance criteria are based on the relative values of the calculated primary energy consumption and CO2 emissions of a dwelling being assessed, and similar calculated values for a reference dwelling. The criteria are determined as follows: -

- primary energy consumption and CO2 emissions for both the proposed dwelling and the reference dwelling are calculated using DEAP;
- the calculated primary energy consumption of the proposed dwelling is divided by that of the reference dwelling, the result being the energy performance coefficient (EPC) of the proposed dwelling. To demonstrate that an acceptable primary energy consumption rate has been achieved, the calculated EPC of the dwelling being assessed should be no greater than the Maximum Permitted Energy Performance Coefficient (MPEPC). The MPEPC is 0.4;

- the calculated CO2 emission rate of the proposed dwelling is divided by that of the reference dwelling, the result being the carbon performance coefficient (CPC) of the proposed dwelling.
- To demonstrate that an acceptable CO2 emission rate has been achieved, the calculated CPC of the dwelling being assessed should be no greater than the Maximum Permitted Carbon Performance Coefficient (MPCPC). The MPCPC is 0.46. The DEAP software will calculate the EPC and CPC of the dwelling being assessed and clearly indicate whether compliance with the requirements of Regulation L3(a) has been achieved.

Where a building contains more than one dwelling (such as in a terrace of houses or a block of apartments), reasonable provision would be to show that: -

- every individual dwelling has an EPC and CPC no greater than the MPEPC and MPCPC respectively; or
- the average EPC and CPC for all dwellings in the building is no greater than the MPEPC and MPCPC respectively.

Where the latter approach is used, the average EPC and CPC are calculated by multiplying the EPC and CPC for each individual dwelling by the floor area of that dwelling, adding together and dividing the results by the sum of the floor areas of all dwellings. Common areas in the building are not included in this calculation.

The requirement that the calculated EPC and CPC do not exceed the calculated MPEPC and MPCPC respectively, applies to the constructed dwelling. It is considered good practice for designers to calculate the EPC and CPC at early design stage to ensure that the requirements can be achieved by the constructed building. It is also open to professional bodies or other industry interests to develop model dwelling designs that can confidently be adopted without the need to calculate the EPC and CPC at design stage.

However, the use of constructions and service systems which have been assessed at design stage, or other model designs, does not preclude the need to verify compliance by calculating the EPC and CPC when all relevant details of the final construction are known.

The use of renewable and low carbon technologies, such as solar hot water, biomass (e.g. wood and wood pellets) and heat pumps, whether provided to meet the requirements of this Part of the Building Regulations or provided as additional to meeting that requirement, can facilitate compliance with the requirements in relation to primary energy use and CO2 emissions.

As defined, primary energy does not include energy derived from on-site renewable energy technologies. In addition, as renewable energy technologies generally are characterised by zero, or greatly reduced, CO2 emissions, the calculated EPC and CPC are reduced by the extent that they replace traditional fossil fuels.

As the performance of the reference dwelling is not affected by the incorporation of these technologies in a dwelling being assessed, this has the effect of making it easier to achieve compliance with this Part of the Building Regulations when these technologies are used.

For certain dwelling types, use of renewables may prove the most practical approach to achieving compliance. The use of centralised renewable energy sources contributing to a heat distribution system serving all dwelling units in a development or apartment block may prove to be more practicable than providing separate renewable energy for each dwelling individually.

Summary of Design Strategy Intent for Consideration and Application on the Broomhill Road Mixed Use Residential Development.

Environmental Design Partnership Consulting Engineers are undertaking their design in recognition of SDCC requirements and aspirations and to the recommendations and requirement standards and practices of the Chartered Institute of Building Services Engineers.

Minimum design aspirations and ratings.

- A 3. Building Energy Rating.
- Near Zero Carbon Building Achievement.

Design approach analysis and evaluation.

- Complete thermal modelling of the entire project.
- Dwelling Energy Assessment Procedure modelling.

Analysis Review.

- A holistic review of the model results will be undertaken to determine optimum insulation parameters for all elements of the proposed building.
- The review will include the extreme operating conditions to address all heating challenges.

Solar Influences.

- A solar influence performance to reduce or address overheating resulting from solar penetration.

Outcome

The evaluation and selection of the optimum characteristics will allow the reduction of the primary energy consumption and reducing CO2 discharge to atmosphere and at a minimum compliance with the: -

- Maximum Energy Performance Coefficient.
- Maximum Carbon Performance Coefficient.
- Design aspirations actual Energy and Carbon Performance below allowable Max standards.

Initial review and assessments of plant capacity requirements indicate that the project will require substantial capacity with a high capacity turn down ability to allow load shedding and optimum control efficiency. To achieve optimum results 3 no. individual systems will be considered suitable to achieve and comply with all current standard

Option 1.
Central Plant Boiler & CHP or Heat pump outdoor condenser units. This would require 1 No. Central heat pump unit per Block. A.B.C.D & E. Each complete pumps and Headers or Centralised Boiler house and CHP unit.

Option 2.
Local Air source heat pump unit per apartment.

Option 3.
Local indoor exhaust air heat pump unit per apartment.

At this early stage and prior to detailed evaluation and design It is our design intent to select and utilise the highest efficient plant available that will be compatible with our overall design and building layout and limitations while achieving all energy compliance requirements.

Electrical Vehicle Charging Facilities

Capacity and facilities will be allowed for the provision of electrical vehicle charging for 10% of all car parking spaces.

Control Automation and Energy Management.

Any and all heating systems as mentioned for detailed design consideration will be complete with multizone energy control systems to provide comfort and energy efficiency for the relevant tenants.
Should it be decided that the buildings are best serviced and suited for centralised plant application the overall management and operation of the central plant will be achieved by a centralised Electronic Building Management System.

Electronic centralised Building Management System.

The system will be designed and manufactured to provide fully automatic operation and management of the centralised plant ensuring plant operation report status for all centralised landlord plant.
The system will be capable of automatic selection and control of all plant and equipment and adjusting the optimum start and stop of main plant and scheduling heat output as required.

A full set of energy meters will allow maximum monitoring of all available energy sources.

Metering and Sub Metering

Metering is an effective way to raise awareness of energy use and to bring about behavioural change by the building owners and occupiers. It can form part of a site Monitoring & Targeting (M&T) system whereby energy savings targets can be set and the measurement of these savings can be quantified.

Sub metering of all major energy uses also allows for the detection of equipment which is not performing adequately and may be in need of maintenance.

Sub metering will follow CIBSE TM39 2009 Building Energy Metering which is a necessary step in the effective calculation of Display Energy Certificates or actual building operational rating.
All apartments and commercial units will be separately metered for primary energy sources.

Display Energy Certificates are mandatory for Public Sector buildings with floor areas greater than 500m^2 and for buildings frequently visited by the public.

The energy being distributed throughout the entire facility will be measured and recorded to allow individual costs to be prepared for the various tenants and this will allow and encourage a thrifty approach from the various tenants/apartment occupiers.

The Building management front end will be capable of providing complete energy readout information for the entire facility.

The mechanical services distribution system will monitor and calculate the consumed energy for the various tenants throughout the facility thus allowing and encouraging thrifty management of individual accounts throughout facility.

2.3 Water Consumption

During the detailed design stage of the proposed development Environmental Design Partnership will evaluate the storage and consumption of potable water and general application particularly in sanitary applications which will be reviewed to ensure compliance with SDCC and water authority recommendations and compliance requirements.

The review and application of rainwater harvesting will be undertaken to achieve optimum reclamation of

rainwater. The detailed design stage calculations will evaluate the suitability of this type of system for the benefit of the design team / client;

- Rainwater yield for the catchment area
- Predicted WC/Urinal flushing demand
- Size (litres) of the rainwater collection tank

2.4 Building Fabric

Environmental Design Partnership will specify all building elements u-values, in order to limit the heat loss through the building fabric of the project the thermal insulation for each of the plane elements of the development will be equal or better than the area weighted average elemental U-Values (Um) as specified in Table 1 of section 1.3.2.5 of TGD Part L 2019 – Dwellings and as specified in Table 1 of section 1.3.2.5 of TGD Part L 2017 – Buildings other than Dwellings..

2.5 Building Envelope Air Permeability

To avoid excessive heat loss, reasonable care will be taken, during the design and construction to limit the air permeability of the proposed commercial and residential areas. High levels of infiltration can contribute to uncontrolled ventilation. Infiltration is unlikely to provide ventilation as required in the correct location. It will be important as air permeability is reduced that purpose provided ventilation is maintained. The design intent will be to achieve an air permeability of $3m^3/hour.m^2$ which represents a reasonable upper limit of air tightness and an improvement on the requirement set out in Part L of $5m^3/hour.m^2$. Should a lower level of air tightness be achieved then care will be taken to ensure that purpose provided ventilation is maintained.

2.6 Building Services Compliance

Specific Fan Power Reduction

All ductwork will be generously sized and service routes optimised so as to minimise fan power requirements. All SFPs will be in compliance with the TGD Part L 2019 – Dwellings and as specified in TGD Part L 2017 – Buildings other than Dwellings. For new buildings with a centralised air distribution system the recommended SFP is 1.6W/l/s, with an additional allowance of 0.3W/l/s for heat recovery and 1.0W/l/s for HEPA filters where applicable. Extract fans will be designed with a maximum SFP of 0.5 W/l/s.

Variable Speed Pumps and Ventilation Fans

All pumps and fans will be specified with variable speed drives and constant pressure/flow control. This means that these items of mechanical plant will run at partial load most of the year rather than at the peak design load. This has obvious energy savings. Pumps will comply with the Energy related Products (Earp) Directive. All electric drives will be classed as IE3 ‘Premium efficiency' under EN60034-30: 2009 which will be a legal requirement from 1st January 2015.

Insulation of Hot Water Storage Vessels, Pipes and Ducts

All hot water storage vessels, pipes and ducts (where applicable) will be insulated to prevent heat loss. Adequate insulation of hot water storage vessels will be achieved by the use of a storage vessel with factory applied insulation tested to BS 1566, part 1:2002 Appendix B.

Water pipes and storage vessels in unheated areas will be insulated for the purpose of protecting against freezing. Technical Guidance Document G and Risk report BR 262, Thermal insulation avoiding risks, published by the BRE will be followed.

Heat Recovery

Any HRV specified will have optimum heat recovery systems applied. This will reduce the overall heat energy consumption, as we are recuperating in excess of 75 % of the heat within the occupied space. This will be following the Eco-design Directive (1253/2014) which requires a dry heat recovery efficiency of 73% for plate heat exchangers and thermal wheels and 68% for run-around coils from 1st January 2018.

2.7 Low Energy Lighting Solutions

Energy efficient lighting design and luminaires will be applied and will control and maximize the use of natural daylight, occupancy requirements and avoid unnecessary high illuminance.

Only LED lighting will be considered as the most energy efficient and practical solutions for the development.

PIR occupancy control will be used for lighting in areas that will have intermittent occupancy. Perimeter lighting control / daylight linking will be considered for large open plan areas where the internal zoning permits.
Good lighting design has a double benefit as it can help reduce internal heat gains, thus reducing the need for air conditioning.

3.0 Sustainability and Renewable Energies

The following low & zero carbon technologies and opportunities will be reviewed and considered by Environmental Design Partnership during the detailed design stage in terms of their applicability for this development.

3.1 Combined Heat and Power

Technology Description

Combined heat and power (CHP), also known as co-generation, is the simultaneous generation of both useable heat and electrical power from the same source. CHP systems can be used in applications where there is a significant year-round demand for heating in addition to the electricity generated.

A CHP unit comprises of an engine (referred to as the prime mover) in which fuel is combusted. The mechanical power produced by the engine is used to generate electricity using an integral electrical generator. The heat emitted from the engine (waste heat) is used to provide space heating and domestic hot water. For CHP engines to be economic they must run for between 4,500 and 5,000 hours per annum therefore are usually sized on or below the base loads.

3.2 Air Source Heat Pumps (ASHPs)

Technology Description

ASHPs upgrade naturally occurring low temperature heat into useful high temperature heat and vice versa. The operational characteristics differ from a gas boiler, where 1 kilowatt of thermal energy gives less than 1 kilowatt of heat to the building due to efficiency losses. With a typical electrically driven heat pump, 1 kilowatt of electrical energy will give 3 or 4 kilowatts or more of heat I cooling to the building.

3.3 Solar Photovoltaic

Technology Description

A photovoltaic system employs solar modules, each comprising a number of solar cells, which generate electrical power from sun light. PV installations may be ground-mounted, rooftop mounted, wall mounted or floating. The mount may be fixed or use a solar tracker to follow the sun across the sky.

3.4 Exhaust Air source heat pumps

An exhaust air heat pump will re-cycle the heat from the apartment ventilation system. Air is drawn through ducts to the heat pump from the bathrooms, utility and kitchen areas. The heat pump works on the same principal as the Air source heat pump without the requirement for an outdoor condenser unit. The cold waste air is discharged to outside through another duct, and condensation to a drain. As a result additional heat generated internally from lighting, people and domestic appliances is also utilised through heat recovery.

4.0 Domestic/Non-Domestic Energy Assessment Procedure (NEAP & SBEM) & NZEB Achievability Calculations

During full detail design development Environmental Design Partnership will carry out complete thermal modelling of the building integrating and using the DEAP & NEAP system of calculations. This will be used to select optimum design strategy and equipment to demonstrate compliance and achievability of an A3 Building Energy Certificate rating and compliance with Part L 2017 and to guide the design of the fabric and Mechanical and Electrical systems and application and achieve an NZEB building rating.

4.1 Building Energy Rating Certificate

A Building Energy Rating (BER) Certificate is an indication of the energy performance of a building. A BER certificate is accompanied by an Advisory Report which identifies how you might improve the energy performance of a building.

BER is the calculated energy use for space and hot water heating, ventilation and lighting based on standard occupancy. A BER is like the energy label for an electrical appliance. The label has a scale of A-G. A-rated buildings are the most energy efficient and will tend to have the lowest energy bills.

A BER is compulsory for all building offered for sale or rent. A BER is also required before a new building is occupied for the first time.

4.2 Nearly Zero Energy Building

NZEB is a very high energy performance where 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 NZEB regulations will be equivalent to a 60% improvement in energy performance from previous regulations.

The European Energy Performance of Buildings Directive Recast 2010 (EPBD) requires all new buildings to be nearly Zero Energy Buildings (NZEB) by 31st December 2020 and all buildings acquired by public bodies by 31st December 2018. Any building completed after these dates must be NZEB irrespective of construction start date.

4.3 Conclusions.

The Design strategy and proposals as outlined in the preceding paragraphs when applied to the Broomhill Road Mixed Use Residential Development will fully comply with the South Dublin County Council - Development Plan, 2016 – 2022, part L of the building regulations and NZEB requirements for energy performance and renewable energy contributions.

Appendix A: Preliminary BER and Part L compliance

The following preliminary BER and Part L compliance check was carried out by Environmental Design Partnership for a typical north facing 2 Bedroom apartment located on the top floor of the development. The provisional inputs used are subject to confirmation at detailed design stage.

Property details

MPRN	0	**Shared MPRN**	No
BER Number	N/A	**BER number assigned to shared dwelling**	N/A
Address line 1	Broomhill Road	**Type of Rating**	New Dwelling - Provisional
Address line 2	Tallaght	**Purpose of Rating**	Other
Address line 3		**Building Regulations**	2019 TGD L
County	Co. Dublin	**Planning Reference**	
Eircode		**Date of Plans**	
Dwelling Type	Top-floor apartment	**Assessor Name**	
Year of construction	2021	**Date of Assessment**	25/08/2021
Dwelling Extension	N/A	**Assessor Comments**	Environmental Design Partnership
Storeys	1	**Assessor Description**	Broomhill Road, Tallaght

Dimension details

	Area [m^2]	Height [m]	Volume [m^3]
Ground floor	77.90	3.00	233.70
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	77.90		233.70

Living Area	31.50 m^2	**Living Area Percentage**	40.44 %

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?**	No
Infiltration rate due to structure [ac/h]	0.15	**Draught lobby air change [ac/h]**	0.05
Intermediate infiltration rate	0.24	**Openings infiltration [ac/h]**	0.09
Number of sides sheltered	2	**Structure type**	N/A
Adjusted infiltration rate	0.21	**Is there a suspended wooden ground floor?**	No
Effective air change rate [ac/h]	0.26	**Windows/doors/attic hatches draught stripped [%]**	N/A
Ventilation heat loss [W/K]	19.77	**Ventilation method**	Balanced whole-house mechanical ventilation with heat recovery
Adjusted result of air permeability test [ac/h]	0.15		

Manufacturer and Model name	N/A	**How many wetrooms (inc. kitchen)? Is the vent. ducting flexible/rigid/both?**	N/A
Specific fan power [W/(l/s)]	0.80	**Is MVHR ducting uninsulated where outside of insulated envelope?**	No
Heat exchanger efficiency [%]	90.00	**Adjusted heat exchanger efficiency**	90.00
Electricity for ventilation fans [Kwh/y]	228.09		
Heat gains from ventilation fans [W]	11.22		

Building Elements - Roofs

Type	Description	Insulation Thickness [mm]	Age Band	Area [m^2]	U-Value [W/m^2K]	Heat Loss (AU) [W/K]
Flat Roof	Roof		2010 onwards	77.90	0.20	15.58
Total area [m^2]						77.90

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	Floor	N/A	No	2010 onwards	N/A	77.90	0.00	0.00
Total area [m^2]								77.90

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]
425 mm Cavity Wall	External	No	Yes	2010 onwards	50.55	0.18	9.10
Total area [m^2]							50.55

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	Triple-glazed, air filled (low-E, en = 0.2, hard coat)	Wood/PVC	0.700	0.700	No	Average or Unknown	North	4.20	1.00
1	Triple-glazed, air filled (low-E, en = 0.2, hard coat)	Wood/PVC	0.700	0.700	No	Average or Unknown	East	5.00	1.00
1	Triple-glazed, air filled (low-E, en = 0.2, hard coat)	Wood/PVC	0.700	0.700	No	Average or Unknown	East	9.80	1.00
1	Triple-glazed, air filled (low-E, en = 0.2, hard coat)	Wood/PVC	0.700	0.700	No	Average or Unknown	North	10.00	1.00
Total area [m^2]									29.00

Heat loss details

Total glazed area [m^2]	29.00	**Glazing ratio**	0.14
Total glazed heat loss [W/K]	27.88	**Summer solar gain [W/m^2]**	1091.63
Total effective collection area [m^2]	9.85	**Total element area [m^2]**	157.45
Total plane heat loss [W/K]	52.56	**Thermal bridging factor [W/m^2K]**	0.1500
Fabric heat loss [W/K]	76.18		
Total heat loss [W/K]	95.95	**Per m2**	1.23

Lighting and Internal Gains

Lighting Design Calculation Method	Bulb type only	**Average Efficacy [lm/W]**	66.90
Fixed lighting provision [klmh/y]	2837.94	**Top up lighting requirement [klmh/y]**	0.00
Energy required for fixed lighting [kWh/y]	75.67	**Energy required for top up lighting [kWh/y]**	0.00
Energy required for portable lighting [kWh/y]	118.83		
Basic energy consumption for lighting [kWh/y]	706.23	**Water heating (In watts [W])**	92.08
Annual energy used for lighting [kWh/y]	194.50	**Occupants (In watts [W])**	121.09
Internal gains from lighting during heating season [kWh/hs] (In watts [W])	148.79 (25.51)	**Mechanical ventilation (In watts [W])**	11.22
Lighting (In watts [W])	25.51	**Heat loss to the cold water network (In watts [W])**	-35.80
Appliance and cooking (In watts [W])	176.49	**Net internal gains (In watts [W])**	390.60

Lights

Count	Name	Description	Type	Efficiency	Power [W]
1	Default LED/CFL		LED/CFL	66.90	
2	Default LED/CFL		LED/CFL	66.90	
1	Default LED/CFL		LED/CFL	66.90	

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]**	1740.93
Standard number of occupants	2.42	**Temperature factor unadjusted**	0.60
Number of mixer showers	0	**Temperature Factor Multiplier**	1.00
Number of electric showers	0	**Hot water storage loss factor [kWh/l d]**	0.00
Number of baths	1	**Volume factor**	0.00
Daily hot water use [Litres/d]	111.02	**Combi-boiler electricity consumption [kWh/y]**	0.00
Hot water energy reqs. at taps [kWh/y]	1479.79	**Adjusted storage loss [kWh/y]**	284.70
Distribution losses [kWh/y]	261.14	**Adjusted primary circuit loss [kWh/y]**	0.00
Water storage volume [Litres]	180.00	**Heat gains from water heating system [W]**	92.08
Is manufacturers declared loss factor available?	Yes	**Output from supplementary heater [kWh/y]**	0.00
Declared loss factor [kWh/d]	1.30		
Manufacturer and Model name			
Insulation type	None		
Insulation thickness [mm]	0		

Combi-boiler Type	None	**Output from main water heater [kWh/y]**	2025.63
Combi-boiler loss [kWh/y]	0.00	**Annual Heat gains from water heating system [kWh/y]**	806.62
Keep Hot facility	None	**WWHRS input to main system [kWh/y]**	0.00
Storage Loss	284.70	**WWHRS input to supplementary system [kWh/y]**	0.00
Storage Type	Cylinder, indirect		

Primary Circuit loss type	Boiler and thermal store within a single casing (cylinder thermostat present)

Primary circuit loss [kWh/y]	0.00	**Heat Pump Type of DHW**	Integral 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	40.44	**Heat use during heating season [kWh/y]**	2132.10
Required mean internal temperature [C]	19.21	**Heat use for full year [kWh/y]**	2150.31
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]	15.58	8.57

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	17.87	1206	506	0.45	0.98	681	525	146
February	5.5	17.89	1188	365	0.57	0.95	544	645	287
March	7.0	18.03	1058	216	0.84	0.86	291	768	499
April	8.3	18.16	946	92	1.20	0.72	127	818	742
May	11.0	18.42	712	19	1.93	0.50	26	686	983
June	13.5	18.66	495	3	2.88	0.34	5	490	1033
July	15.5	18.85	322	1	4.17	0.24	1	321	951
August	15.2	18.82	348	1	3.50	0.28	2	346	826
September	13.3	18.64	512	13	1.94	0.50	18	494	605
October	10.4	18.36	764	115	1.00	0.80	154	610	370
November	7.5	18.08	1015	337	0.57	0.95	468	547	184
December	6.0	17.93	1145	482	0.44	0.98	648	497	118

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, Ecodesign	Heat pumps	I.S. EN 14825	Electricity	20	16	1670.22	256.44	Yes

Heating System Test data: I.S. EN 14825

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)	7.00	4.20	3.30	3.90	6.90
Coefficient of Performance (kW/kW)	2.77	4.35	6.49	8.52	2.14

Test Condition - Medium (45°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	W43	W37	W33	W28	W45
Heating Capacity (kW)					
Coefficient of Performance (kW/kW)					

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)	6.90	4.40	3.30	4.10	7.10
Coefficient of Performance (kW/kW)	1.96	3.20	4.64	6.22	1.64

Heating System Test data: I.S. EN 16147

Source of Data Coefficient of Performance, COP
Co-efficient of Performance [kW/kW] 3.30
Water heating energy efficiency, nwh [%]
Reference Hot water Temperature [°C] 52.50
Capacity of Heat Pump [kW] 8.00
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]	2132.10
Heating system responsiveness category	1	Mean internal temperature [C]	18.09
Mean internal temperature during heating hours [C]	19.21		

	Number present	Boiler controlled by thermostat	Inside dwelling	Electricity consumption [kWh/y]	Heat gain [W]
Central heating pumps	1	No	Yes	169	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				169	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	0.84	U-Value of ground floor [W/m^{2}K]	0.00
Useful net gain [kWh/y]	49	Fraction of heating system output from ground floor	1.00
Net heat emission to heated space [kWh/y]	2083	Additional heat loss via envelope element	0.00
		Annual space heating requirement [kWh/y]	2083

Energy Requirements: Individual Heating Systems

Efficiency of main heating system [%]	1670.22	Fraction of heat from secondary system	N/A
Manufacturer name	Daikin	Efficiency of secondary system [%]	N/A
Model name	Ecodesign	Energy required for main heating system [kWh/y]	124.71
Efficiency adjustment factor	1.00	Energy required for secondary heating system [kWh/y]	0
Adjusted efficiency of main heating system [%]	1670.22		

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 [%]	256.44
Efficiency of main water heating system [%]	256.44	Water Heating Efficiency, ηwh	133
Manufacturer name	Daikin	Energy req. for main water heater [kWh/y]	1643.00
Model name	Ecodesign	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

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]	233.700	Total gains in summer [W]	1482.23
Effective air change rate for summer period [ac/h]		Temperature increment due to gains [C]	19.46
Ventilation heat loss coefficient [W/K]	0.00	Summer mean external temperature [C]	15
Fabric heat loss coefficient [W/K]	76.18	Heat capacity parameter	0.20
Heat loss coefficient under summer conditions [W/K]	76.18	Temperature increment related to thermal mass [C]	0.60
Total Solar Gains from Summer Period	1091.63	Threshold internal temperature [C]	35.06
Internal gains [W]	390.60		

Results

	Delivered energy [kWh/y]	Primary energy [kWh/y]	CO_2 emissions [$kgCO_2/y$]
Main space heating system	125	259	51
Secondary space heating system	0	0	0
Main water heating system	790	1643	323
Supplementary water heating system	0	0	0
Pumps and fans	397	826	162
Energy for lighting	195	405	80
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	1506	3133	616
Per m^2 floor area	19.34	40.22	7.91
Energy Rating	A2		

Summary for Part L Conformance (Applies to TGD L 2008/2011/2019 for new dwellings only)

BER Number		Building Regulations	2019 TGD L
BER Result	A2	Energy Value kWh/m^2/yr	40.22
CO_2 emissions [$kg/m^2/yr$]	7.91		
EPC	0.229	EPC Pass/Fail	Pass
CPC	0.221	CPC Pass/Fail	Pass