BLACKPITTS STUDENT HOUSING
STUDENT ACCOMODATION
NEWMARKET, DUBLIN 8

APPLICANT:
Blackpitts Residence Unlimited Company

PROJECT No: 4994

CLIMATE ACTION & ENERGY STATEMENT

&

SUSTAINABILITY & M&E ENERGY REPORT

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0	Climate Action & Energy Statement	JM, DoB	23 July 2025	MB

Author(s) **Joanne Mitchell, Dathaí ó Bardáin**....

Signature ....

Date **23 July 2025**..

Approved By **Mark Bennett**.......................................

Signature ....

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Climate Energy Statement Index

Dynamic design consultants MECHANICAL & ELECTRICAL ENGINEERS

1.0 Introduction

1.1 Dynamic Design Consultants Ltd. (DDC) have been commissioned as Mechanical and Electrical Consultants to provide design guidance for typical Mechanical and Electrical system requirements, including but not limited to those requirements set out in TGD Part L 2022: Conservation of Fuel and Energy for Both Dwellings and Non-Dwellings.

1.2 To this end, DDC will advise on the appropriate technologies required to achieve TGD Part L 2022 Compliance and satisfy NZEB legislation.

1.3 As NZEB and Part L 2022 compliance is not achieved by Mechanical and Electrical systems alone, DDC have encouraged the design team to take a holistic approach to compliance and ensure that the building fabric and the thermal envelope are optimised to reduce energy usage. This will primarily limit the energy usage of the building regardless of what heating or ventilation technology is used and will in turn limit the amount of energy required to be offset by renewables or low energy technologies. Improvements in building fabric will also improve the performance and effectiveness of any given technology.

1.4 The document has been produced for the benefit of the developer of the property who shall be referred to as 'the client' or 'our client' throughout this document. The document shall be at the disposal of the client and parties that they deem privy to disclosure of same.

1.5 The information contained within this report is based on drawing packages received from various members of the design team which address site specific requirements. Statutory documents and best practice guides have also been referred to where applicable as have manufacturers data sheets and other NZEB reference documents.

1.6 All conclusions drawn or recommendations made in this document are the opinion of Dynamic Design Consultants Ltd. Where conclusions based upon statutory regulations are made, the document name and year shall be cited. Similarly, where conclusions based upon industry best practices are made, the name and year of publication reference document shall be cited.

2.0 Scope

2.1 This document identifies the criteria from the local council and Irish government which will be incorporated into the scheme to minimise the developments impact on the local & global climate. The report will focus on the several factors within the Blackpitts Student Housing residential development that could potentially affect the incorporation of renewable technologies and will address the advantages and disadvantages of proposed technologies whilst comparing them against each other to identify the most suitable solution for this project.

2.2 The proposed development will meet or exceed, where feasible, the requirements of TGD Part L 2022, which stipulates requirements on building fabric (U-Values), air permeability, maximum energy use (System Efficiency) and maximum carbon dioxide emissions as calculated using the NEAP methodology.

2.3 This document shall explore the proposed items with respect to TGD Part L 2022 Compliance:

1. Legislative Requirements
2. Calculation Requirements
3. Building Fabric Requirements
4. Proposed Technologies

3.0 Summary

This report investigates the proposed energy strategy for the development of a new student accommodation block offering 213no rooms in Blackpitts, Dublin 8. The report will investigate the legislative requirements in addition to the conditions and expectations of the local council to ensure that the energy strategy is compliant with both statutory and local authorities. This report shall be read in conjunction with the M&E energy report in which Several potential M&E systems are reviewed with the aim of selecting the most suitable system for this development. Advantages and disadvantages are provided for each system along with a further technology review, and Part L comparison for the most appropriate systems.

4.0 Nomenclature

AC	Alternating Current
ASHP	Air Source Heat Pump
CHP	Combined Heat and Power
COP	Coefficient of Performance
CPC	Carbon Performance Coefficient
DC	Direct Current
DHW	Domestic Hot Water
EAHP	Exhaust Air Heat Pump
EPC	Energy Performance Coefficient
HIU	Heat Interface Unit
IAQ	Indoor Air Quality
LTHW	Low Temperature Hot Water
MEV	Mechanical Extract Ventilation
MPCPC	Maximum Permitted Carbon Performance Coefficient
MPEPC	Maximum Permitted Energy Performance Coefficient
MVHR	Mechanical Ventilation Heat Recovery
NEAP	Non-Domestic Energy Assessment Procedure
NZEB	Nearly Zero Energy Building
PV	Photo Voltaic (Solar PV)
RER	Renewable Energy Ratio
SBEM	Simplified Building Energy Model
SFP	Specific Fan Power

5.0 <u>Site Location</u>

Residential Development on Lands at Newmarket and Liberties Area, Dublin 8

Planning permission is sought for a Large-Scale Residential Development delivering 217 student bed spaces (209no. single rooms and 4no. twin rooms, 213no. rooms in total), within one block. The block ranges in height up to 6 storeys with a basement below. All associated internal and external amenity space, including the provision of restaurant/café, on street carparking, cycle parking, landscaping, bin stores, service provision and all other associated site development works.

Figure 1 - Google Map of Site with approximate Building Boundary Highlighted in Red

6.0 Dublin City Council Policies

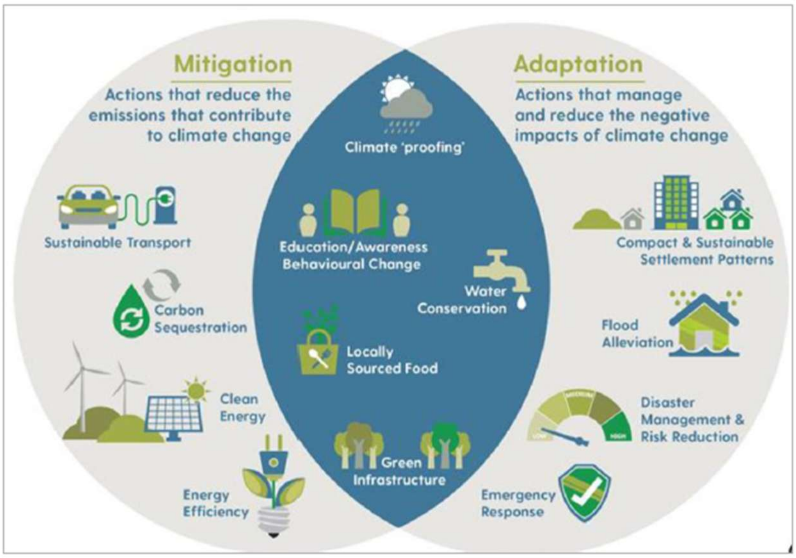
6.1 Our design will consider the current council policies and objectives of the Dublin County Development Plan 2022-2028 and Dublin City Council (DCC) Climate Change Action Plan 2025 – 2029 to ensure the development meets the council's requirements for sustainability, Greenhouse Gas Reduction and Energy Efficiency.

6.2 As "DCC works closely with Codema to continuously implement initiatives and projects to raise awareness of energy issues, monitor energy use, and increase the share of renewable energy and improve energy efficiency at work and in the home." Dynamic Design will ensure that energy strategy is in line with DCC requirements for providing an energy-efficient and renewable housing scheme.

6.3 This will ensure that the development adheres to the policies of Dublin City Council to ensure that homes are energy efficient and equipped for challenges anticipated from a changing climate. As part of this process, product selection shall consider the lifespan, renewable contribution, efficiency and embodied energy so as to limit the overall environmental impact of new homes as per DCC Climate Change Action Plan 2024 and Urban Design Manual: A Best Practice Guide' (2009).

6.4 This will ensure that the development adheres to the policies of Dublin City Council to ensure that the building adheres to the Climate Action Plan and incorporate mitigation and adaptation measures. Mitigation is a human intervention to reduce the sources or enhance the sinks of greenhouse gases; and adaptation is the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.

Figure 3-1: Examples of Climate Mitigation and Adaptation Measures



Source: Eastern and Midlands CARO

Figure 2 - Excerpt from the DCC Climate Action Plan

6.5 DCC aim to support the reduce our emissions by over 51% from the 2018 baseline ahead of the 2030 and are committed to a reduction of 40% CO_2 emissions by 2030 across the DCC area. "The plan will focus on the energy areas where actions can be taken to introduce energy efficiency measures and reduce CO_2 emissions, such as district energy systems and renewable energy technologies."

Figure 3-2: Action Areas identified in the Dublin City Climate Action Plan

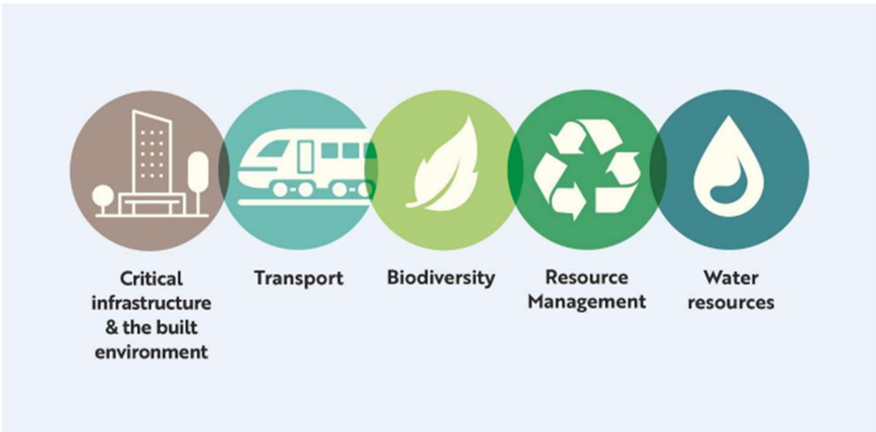


Figure 3 – Excerpt of identified action areas from Dubin City Council Climate Action Plan 2024-2029

6.6 To this end, the homes will be designed to make good use of the site to achieve natural lighting so as to limit energy requirements of artificial lighting (all of which shall be high efficiency LED). The building fabric will be enhanced to minimise heating/cooling demands and so that low energy technologies can be utilised to reduce fossil fuel requirements and reduce carbon emissions. Further to this, renewable technologies will be incorporated into the scheme.

6.7 Dublin City Council Requirements

- To promote more sustainable development through energy end-use efficiency, increasing the use of renewable energy, and improved energy performance of all new development throughout the city by requiring planning applications to be supported by information indicating how the proposal has been designed in accordance with the development standards set out in the development plan. To encourage responsible environmental management in construction.
- To promote sustainable approaches to developments by spatial planning, layout, design and detailed specification and to have regard to the DECLG Guidelines on 'Quality Housing for Sustainable Communities – Best Practice Guidelines for Delivering Homes Sustaining Communities' (2007); 'Delivering Homes Sustaining Communities – Statement on Housing Policy' (2007), 'Sustainable Urban Housing: Design Standards for New Apartments' (2015) and 'Sustainable Residential Development in Urban Areas' and the accompanying 'Urban Design Manual: A Best Practice Guide' (2009).
- To ensure high standards of energy efficiency and resource management in existing and new developments and encouraging developers, owners, and tenants to improve the environmental performance of the building stock, including the development of renewable energy.
- To ensure that the installation of renewable technologies adhere to The Planning and Development Regulations 2007 (S.1 No. 83 of 2007) set out planning exemptions for micro-renewable energy technologies for domestic houses including solar panels, heating systems and wind turbines.
- As Dublin City continues to grow, the need to sustainably manage water, land, transportation, energy, housing, and waste disposal will increase. The challenge will be to

reduce energy demand and greenhouse gas emissions and to encourage the development of decentralised, alternative sources of energy.

- Supports development which minimises resource consumption, reduces waste, conserves water, promotes efficient energy use and uses appropriate renewable technologies.

7.0 Energy Strategy

7.1 It is the intent of Dynamic Design Consultants Ltd to ensure that this development achieves, at minimum, the requirements set out in TGD L 2022 and The EU Energy Performance of Buildings Directive – EPBD (recast) (2010/31/EU of 19 May 2010), This includes:

- Ensuring Building fabric controls heat gain and heat loss as necessary to limit the requirement for external energy usage for heating or cooling.
- Ensuring that Oil or Gas plant has a seasonal efficiency >90%, if applicable.
- Production of a NEAP Calculation is provided for all non-dwellings and that the result shows:
  - A 60% improvement in energy performance on the former TGD Part L 2011
  - A MPEPC of 1.0
  - A MPCPC of 1.15
  - A RER of 0.2

7.2 As per the above requirements, the overall design of this residential development shall follow the principals of the "Be Lean > Be Clean > Be Green" energy hierarchy in order to ensure compliance or betterment of TGD Part L requirements. This hierarchy has been adopted by many international bodies and councils who are currently achieving or exceeding NZEB requirements.

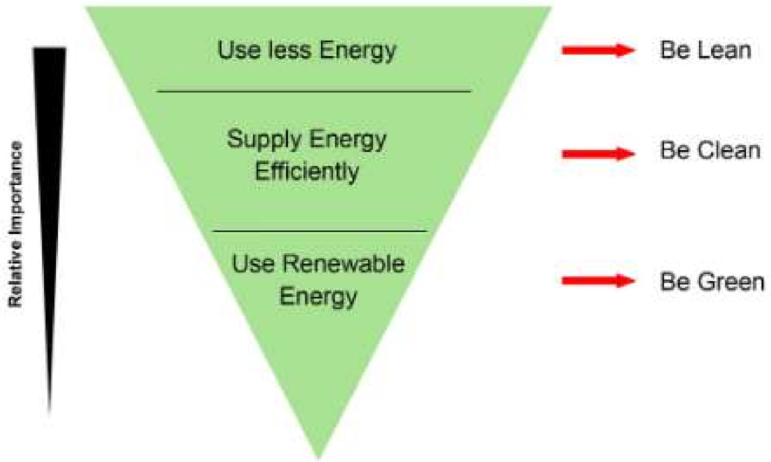


Figure 4 - Source: Interreg Europe ZEROCO2 Technology options towards NZEB.

7.3 This is therefore considered an acceptable strategy in achieving maximum carbon reduction and energy efficiency in new buildings by:

- Primarily using less energy through minimising heat loss and incorporating low energy technologies.
- Secondly, by ensuring that the energy source is efficient and uses Low Carbon production methods.
- Lastly, by means of incorporating renewable energy sources to offset the essential energy consumption for the running of the building.

7.4 Dynamic Design Consultants Ltd considers this hierarchy – proposed by a body representing Local Government in the UK and now endorsed by many local authorities – to be well considered and an appropriate set of principles to adhere to in tackling climate change. In adopting the hierarchy, the CO_2 savings at each stage are maximised before strategies at the next stage are considered.

7.5 The proposed development will meet the highest standards of sustainable design and construction solutions where possible. During design and construction, the following energy considerations will be inherently addressed to ensure the overall development.

- Makes most efficient use of land and existing buildings,
- Reduces carbon dioxide and other emissions that contribute to climate change,
- Makes most effective and sustainable use of water, aggregates, and other resources,
- Minimises energy use, including passive solar design and natural ventilation,
- Uses renewable energy where feasible,
- Reduces air and water pollution,
- Is comfortable and secure for its users,
- Promotes sustainable waste behaviour,
- Reduces adverse noise impacts internally and externally.

7.6 The new development shall be designed such as 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 CO_2 emissions associated with this energy insofar as is reasonably practicable. The new development will meet the current building regulations and particular attention will be paid to the requirements regarding the conservation of fuel and energy as laid out in Part L 2022 for Non-Domestic Buildings.

7.7 During the design process a NEAP calculation will be carried out to ensure that the proposed design is in compliance with TGD Part L 2022. The new development will be designed and constructed to limit heat loss and where appropriate, limit heat gains through the fabric of the building.

8.0 Legislative Requirements

The Energy Efficiency Directive (EED) is the main legislative mechanism through which energy efficiency policy at EU level is delivered. This was adopted by the EU Council in October 2012.

8.1 The EED will translate certain ambition elements of the European Energy Efficiency Plan into binding measures. The proposed legislative provisions set binding measures on member states, including an annual rate of renovation for central government building of 3%; an obligation on public bodies to procure products, services and building with high energy-efficiency performance; obligations on industry relating to energy audits and energy management systems, and a common framework for national energy savings obligation schemes equivalent to 1.5% of energy sales. The new directive entered into force on 4th December 2012 and must be transposed into law by each member state by 5th June 2014.

8.2 Ireland transposed the Energy Services Directive (ESD) through the Energy End Use Efficiency and Energy Services Regulations 2009 (S.I. 542 of 2009) which provided for national energy efficiency savings targets; energy services including the availability of energy audits to final customers; the exemplary role of the public sector, and the promotion of energy efficiency by energy suppliers.

8.3 A primary focus of EED is on domestic and commercial buildings, as these sectors account for 40% of total energy consumption in the EU. The Directive on Energy Performance in Buildings (EPBD), adopted in 2002, primarily affects energy use and efficiency in the building sector in the EU. Ireland transposed the EPBD through the Energy Performance of Buildings Regulations 2003 (S.I. 666 of 2006) which provided for the Building Energy Rating (BER) system to be administered and enforced by the Sustainable Energy Authority of Ireland (SEAI).

8.4 The recast EPBD, adopted in May 2010, states that reduction of energy consumption and the use of energy from renewable sources in the buildings sector constitute important measures needed to reduce the union's energy dependency and greenhouse-gas emissions. The directive aims to have the energy performance of building calculated on the basis of a cost-optimal methodology. Member states may set minimum requirements for the energy performance of buildings.

8.5 The recast EPBD requires Ireland to ensure, among other obligations, that building energy ratings are included in all advertisements for the sale or lease of buildings; that Display Energy Certificates (DECs) are displayed in public and privately owned buildings frequently visited by the public; that heating and air-conditioning systems are inspected; that consumers are advised on the optimal use of appliances, their operation and replacement, if by suitable qualified persons acting in an independent manner, and are underpinned by a robust regime of verification; and that a national plan is developed to increase the number of low – or nearly zero-energy buildings, with the public sector leading by example.

8.6 The directive was transposed by the European Unions (Energy performance of Buildings) Regulations 2012 (S.I. 243 2012). The Eco-design Directive (2009/125/EC) was transposed by the EU Regulations 2011 (S.I. No 203 of 2011) which extends the scope of an earlier directive to a wider variety of products that can contribute to energy saving.

8.7 The Energy Labelling Directive (2010/30/EU) was transposed by the EU (Energy Labelling) Regulations 2011 (S.I. No 366 of 2011), which extend the application of the directive to an increasing range of products which have a direct or indirect impact on energy consumption during use. The regulations oblige supplies of energy-using products covered by an EU measure to supply an energy label and fiche with product.

8.8 Part 2 of S.I. 666 (EPBD) deals with Alternative Energy Systems and applies to the design of any large new building, where a planning application is made, or a planning notice is published, on or after 1st January 2007. This calls for a report into the economic feasibility of installing alternative energy systems to be carried out during the design of the building.

Systems considered as alternative energy systems are as follows:

- Decentralised energy supply systems based on energy from renewables,
- District or block heating or cooling, if available, particularly where it is based entirely or partially on energy from renewable sources,
- Heat pumps

8.9 The EPBD framework lays down the following items which should be considered at minimum in the design of new buildings to help achieve EU targets.

(A) The Following Actual Thermal Characteristics of The Building Including Its Internal Partitions:
  (I) Thermal Capacity.
  (II) Insulation.
  (III) Passive Heating.
  (Iv) Cooling Elements; And
  (V) Thermal Bridges.
(B) Heating Installation and Hot Water Supply, Including Their Insulation Characteristics; (C) Air-Conditioning Installations.
(D) Natural and Mechanical Ventilation Which May Include Airtightness.
(E) Built-In Lighting Installation (Mainly in the Non-Residential sector).
(F) The Design, Positioning and Orientation of The Building, Including Outdoor Climate.
(G) Passive Solar Systems and Solar Protection.
(H) Indoor Climatic Conditions, Including the Designed Indoor Climate.
(I) Internal Loads.

The positive influence of the following aspects shall, where relevant in the calculation, be taken into account:

(A) Local Solar Exposure Conditions, Active Solar Systems and Other Heating and electricity Systems Based on Energy from Renewable Sources.
(B) Electricity Produced by Cogeneration.
(C) District or Block Heating and Cooling Systems.
(D) Natural Lighting.

9.0 Part L Requirements (Section 1: New Buildings other than Dwellings)

TGD Part L 2022 – Conservation of Fuel and Energy (Dwellings) has the following sub sections and requirements for all new dwellings where planning approval or permission is applied for after 15th June 2022. It is a requirement that all new building meet the NZEB criteria as part of these regulations.

9.1 Nearly Zero-Energy buildings

"Means a building that has a very high energy performance, as determined in accordance with Annex I of the EU Energy Performance of Buildings Directive Recast (EPBD Recast) 2010/31/EU of 19th May 2010. 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 onsite or nearby."

9.2 Limitation of Primary Energy Use and CO_2 Emissions

The primary energy consumption and CO_2 emissions of the proposed development including the services design, will be calculated using the NEAP methodology. In order to demonstrate that an acceptable primary energy consumption rate has been achieved, the calculated Energy Performance Coefficient will be no greater than the Maximum Energy Performance Coefficient (EPC) which is 0.3. Likewise, the Carbon Performance Coefficient (CPC) will be no greater than the Maximum Permitted Carbon Performance Coefficient (MPCPC) which is 0.35.

Limiting the primary energy consumption shall be achieved by means of reviewing all items laid down in the EPBD framework as highlighted in section 8.8 above and ensuring that energy reductions have been made using each item.

9.3 Renewable Energy Technology

"Means technology, products or equipment that supply energy derived from renewable energy sources (non-fossil Sources), e.g. solar thermal systems, solar photovoltaic systems, biomass systems, systems using biofuels, heat pumps, aerogenerators and other small scale renewable systems" …" wind, hydropower, biomass, geothermal, ambient energy, wave, tidal, landfill gas, sewage treatment plant gas and biogases."

Where the MPEPC of 0.3 and the MPCPC of 0.35 are achieved, a RER of 0.2 is required. This represents 20% of the primary energy from renewables to total primary energy as per calculation methodology within the NEAP software programme.

Where buildings contain multiple dwellings such as apartments, every individual dwelling should meet the minimum provision from renewable energy technologies specified in paragraph 1.2.3 of TGD Part L 2022; or - the average contribution of renewable technologies to all dwellings in the building should meet that minimum level of provision per dwelling.

As an alternative to providing an RER, a CHP unit could be utilised to contribute to space heating and hot water heating however the primary energy savings of the CHP system should be equivalent to an RER of 0.2. CHP units should be suitable for following the thermal and electrical load profile of the building and should be designed as per CIBSE AM12.

Renewable energy technologies are also subject to compliance with TGD Part D 2013 – Materials and workmanship and should be of suitable quality satisfy the requirements laid out therein. The SEAI database should be consulted for acceptable Renewable products before design and specification of systems.

As per Table E.2 of TGD L 2022, the most appropriate example buildings for this development include Example E and Example F where a Primary energy consumption of 37 kWh/m^2 yr and 40 kWh/m^2 are required, alongside a RER of 0.23 (achieved via Solar PV) and 0.34 (achieved using an ASHP) respectively.

Table E2 Example Dwellings - Results

	Example A – Semi-detached heated by mains gas and cMEV	Example B – Semi-detached heated by mains gas and NV with intermittent extract	Example C – Semi-detached heated by mains gas and MVHR	Example D – Semi-detached heated by heat pump and cMEV	Example E - Apartment heated by gas and MVHR	Example F - Apartment heated by heat pump and cMEV
Primary energy [kWh/m^2 yr]	42	42	38	39	37	40
CO_2 emissions [kg/m^2 yr]	8	8	7	8	7	8
EPC	0.29	0.29	0.26	0.27	0.28	0.295
CPC	0.26	0.26	0.24	0.26	0.26	0.29
RER	0.24	0.26	0.22	0.39	0.23	0.34

Figure 5 - Table E.2 of TGD L 2022

9.4 Building Fabric

TGD Part L 2022 outlines the minimal acceptable provisions in the building fabric to ensure that heat loss is limited as far as reasonably practicable. It is however recommended to improve on these valves where practicable to assist in minimising the overall primary energy consumption and improving the impact that renewables installations will have on the development.

The key issues where guidance is given on building fabric are as follows.

9.4.1 <u>Insulation levels to be achieved by the plane fabric elements.</u>

The stipulation on limiting U-Values' are given to minimise the direct heat loss trough the fabric of a building and also to minimise direct and indirect heat gains from adjacent buildings or ambient conditions. All new buildings must ensure that the area weighted U-Values of each element meet or exceed the values as given below to meet Part L requirements.

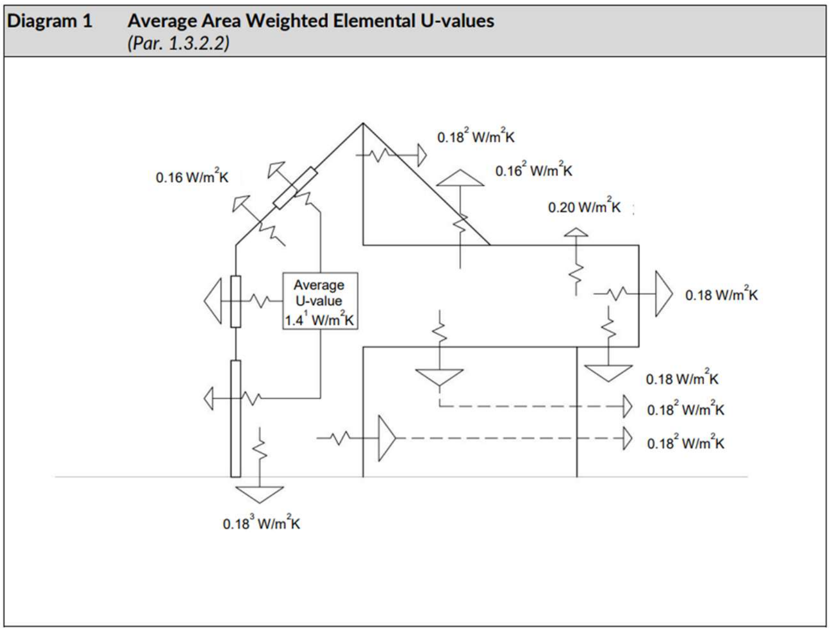


Figure 6 - Showing Average Area Weighted U-Values from Diagram 1 of TGD L 2022

Considerations should be made towards improving the U-Values first, and where feasible, before integrating renewable energy systems to the design. Data taken from TGDL 2022 Table 1 Maximum elemental U-value (W/m2K) and target U-Values for greater than 10% improvements on U-Values are shown below in ***Table 1***.

Table 1 - TGD Part L Table 1 Maximum Elemental U-value (W/m2K)

Element	Area weighted Average Elemental U-Value	Average Elemental U-Value – Individual Section or Element	Area Weighted Average Elemental U-Value (This Development - >10% Improvement)
Roofs			
Pitched Roofs	0.16	0.3	0.14
Flat Roof	0.20	0.3	0.14
Walls	0.18	0.6	0.16
Floors			
Ground Floors	0.18	0.6	0.16
Other Exposed Floors	0.18	0.6	0.16
External doors, windows, and roof lights	1.4	3.0	1.20

9.4.2 Thermal Transmittance (Bridging)

The key purpose of minimising thermal bridging coefficients is to avoid excessive heat loss and potential condensation issues at critical junctions and details, including, Wall to Wall, Wall to Roof, Windows and Doors, along with other penetrations for Services fixings. NEAP calculation methodology considers thermal bridging and attributes energy usage to this item in the primary energy section.

Architectural details should limit thermal bridging coefficients where possible by ensuring that they comply with those details as shown in TGD L supporting document – "Limiting thermal bridging and air Infiltration – Acceptable Construction Details."

9.4.3 Limitation of Air Permeability

Further to limiting fabric heat loss and thermal bridging, the reduction of air permeability in a given dwelling can have significant reductions in primary energy consumption and can enhance the efficiency of ventilation systems such as MVHR units.

Air infiltration can be caused by poor construction details or finishing around wall to wall, floor and ceiling joints, service openings, doors and windows amongst others. Where air permeability is reduced, it is important to ensure adequate ventilation is provided to ensure occupant comfort and condensation/mould prevention.

TGD Part L required that air pressure tests are conducted on all dwellings on development sites as per the procedure for testing specified in I.S. EN ISO 9972:2015 Thermal performance of buildings - determination of air permeability of buildings - fan pressurization method. When tested in accordance with the procedure referred to in Part L sub-section 1.5.4, a performance level of 5 m^3/ ($h.m^2$) represents a reasonable upper limit for air permeability.

9.4.4 Limiting Heat Gains

Reasonable provision to limit heat gains can be demonstrated by showing through the NEAP calculation that the dwelling does not have a risk of high internal temperatures. (revised NEAP methodology to be published). Where an overheating risk is indicated in NEAP, further guidance is provided in CIBSE TM59 to ensure overheating is avoided for normally occupied spaces. Openable windows, internal blinds and purge ventilation functions can offer reductions in thermal gains in dwellings however these are reactive measures, and the selection of building fabric elements will have the most beneficial impact in limiting heat gains.

Passive solar design is the aim for design that optimises the capture of free heat, daylight, and ventilation, and minimises unwanted solar gain. The proposed development of a new multi-tenant space offers opportunities to explore many of the good practice passive solar design options. The proposed development will have glazing specified that minimises unwanted solar gain without impacting on day lighting levels. To achieve this, we would recommend a glazing g-value of between 0.3 and 0.5. The design intent is to achieve internal daylight factors where possible of between 2% and 5% where the windows give a predominately daylit appearance without supplementary electric lighting being needed. This is usually the optimum range of day lighting for overall energy use.

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Sustainability and Energy Statement Index

10.0 Building Services Compliance

10.1 It is in TGD Part L 2022 Section 1.4; guidance is given on building service areas:

- Heat generator efficiency.
- Space heating and hot water supply system controls
- Insulation of hot water storage vessels, pipes, and ducts
- Mechanical ventilation and air conditioning systems
- Artificial Lighting
- Construction Quality and commissioning of services.
    - Commissioning of, Space and Water Heating systems, ACMV Systems and Renewable Systems

10.2 The mechanical plant strategy for this development shall be designed to maximise the efficiency of the system through the use of:

- Efficient heating/hot water production, distribution and storage.
- Intelligent control systems to optimise efficiency and provide the end user with appropriate energy usage information.
- Mechanical ventilation and air conditioning systems with heat recovery and SFPs in compliance with TGD L 2022
- Renewable heat sources and or incorporation of Solar PV systems
- Low Energy/High Efficacy LED lighting systems with energy saving switching and controls such and daylight sensors and presence detectors.

Various components shall be utilised as per below to ensure compliance with the relevant standards and regulations.

10.2.1 Heating and Hot Water Production: Distribution and Storage

The minimum acceptable heat generator seasonal efficiency for oil or gas fired boiler plant shall be 90%. Where biomass boilers are utilised, the minimum seasonal efficiency shall be 77%. All hot water storage vessels, pipes, and ducts (where applicable) will be insulated to minimise 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 1566-1:2002+A1:2011, Annex B. All distribution pipework shall also be insulated to standards as set out in BS 1566-1:2002+A1:2011, and frost protection shall be utilised where pipework crosses unheated or external spaces.

10.2.2 Intelligent Control systems

The controls proposed shall be capable of providing automatic control of space heating based on room temperature and shall automatically control of heat input to stored hot water based on stored water temperature.

Hot water production shall be via a dedicated time control system independent from the space heating controls and hot water storage vessels shall be fitted with a thermostatic control to shut off at set point temperature. The minimum requirements for controls to all other heating plant including heat pumps shall be as per those highlighted in Tables 3 & 4 of TGD L 2022 to achieve compliance.

10.2.3 Water Consumption

NEAP section 4.2.0 evaluates the BER and includes a new feature that rewards water efficient sanitary ware, such as showers, taps, wash hand basins, and baths, towards NZEB certification. A dwelling can lower its hot water usage by 5% if it meets a water use target of less than 125 litres per person per day (both hot and cold water combined). This will have a positive impact on the L/BER score, and the presence of baths and the flow rate for showers are the most significant factors in NEAP's water use calculations.

By using water efficient fittings and fixed low-flow restrictors, the 125 L/pp/d target can be achieved, and manufacturers' product information can be used to determine the consumption of each appliance. To achieve water efficiency, specific targets listed in a table below must be met, and any changes to this table should be communicated to the sustainability engineer at any stage of the building development process.

Table 2 - Sanitary Ware – Water Efficiency Targets

Sanitary Fitting	**Target Capacity/Flow Rate**	**Unit of Measure**
WC's (Dual Flush)	6 4	Full Flush - Volume (Litres) Part Flush - Volume (Litres)
Taps (excluding Kitchen/utility taps)	≤3.75	Flow Rate (Litres/min) @ 3Bar.
Taps (Kitchen/Utility Sink taps)	≤5	Flow Rate (Litres/min) @ 3Bar.
Bath	180	Capacity Overflow (Litres)
Dishwasher	≤1	Litres/Place setting
Washing Machine	≤6	Litres/Kg dry load
Shower	≤6	Flow Rate (Litres/min) @ 3Bar.

10.2.4 Mechanical Ventilation & Air Conditioning

All ductwork will be appropriately sized and service routes shall be optimised to minimise fan power requirements and improve system efficiency. All SFPs will be in compliance with TGD L 2022 and NEAP minimum requirements, and the appropriate ventilation system shall be selected based on the buildings designed air pressure test.

Building fabric shall be designed to ensure that the loads required for MVAC are kept to a minimum. Where cooling plant is required, the products shall be as provided for in the Eco-design Regulations. Where appropriate, Natural Ventilation, Mixed Mode Ventilation & Free Cooling shall be considered and installed to limit the energy attributed to MVAC.

Results show that full MVHR systems do not perform adequately in residential spaces that have air pressure tests greater than $3m^3/(h.m^2)$ at 50Pa and use more energy in fan power than the savings achieved. In instances such as this, demand-controlled ventilation can offer a more cost effective and efficient solution.

The specific fan power for any ventilation systems shall be no greater than the requirements of Table 6 & 6a of TGD L 2022 where a centralised balanced system shall have an SFP no greater than 1.6.

10.2.5 Renewable Heat Sources or Incorporation of Solar PV

There are many readily available technologies that can provide renewable heat such as Air source and Ground Source heat pumps, Biomass Boilers, Solar Thermal systems, Exhaust air heat pumps, Biogas boilers, amongst others. Various systems will be explored in the below chapter with comparisons made and suitability for this development highlighted or questioned.

The installation of Solar PV panes should never be overlooked in any project given the low cost of the technology and ease of install. Solar PV also generates electricity which is the highest grade of energy with the most versatility in application. Further to this the high service life and low maintenance requirements make PV a feasible option for many projects as the energy generated from solar PV can be utilised to offset electricity demand, generate hot water or be exported to the grid (where grid infrastructure permits) to lower carbon emissions.

10.2.6 Low Energy Lighting Solutions

Energy efficient lighting should maximise the use of natural daylight, avoid unnecessarily high illuminance, incorporate the most efficient luminaires, control gear and lamps and include effective lighting controls. These good practice design principles will be followed during the detailed design stage of the proposed development works.

The lighting systems in the model are set at a power consumption rate of 6 W/m^2 for the building. It is setting a measure of the power demand of the lighting in a given area. PIR occupancy control will be used for lighting in areas that will have intermittent occupancy.

10.2.7 Building User Guide

After the completion of the proposed units the end user(s) will be provided with sufficient information about the building, its installed services, and their maintenance requirements so that the Units can be operated in such a manner as to use no more fuel and energy than is reasonable. Anecdotal evidence shows that many new buildings lose up to 30% of their energy efficiency in the first year due mainly to a lack of understanding by the users / occupants on its M&E systems and their operation, A comprehensive and easy to interpret building user guide will help to prevent these unnecessary energy losses.

11.0 Energy Efficient Heating and ventilation Systems and Renewables

The following low and zero carbon technologies will be reviewed and considered in terms of their applicability for this development. Traditional Gas and oil-fired boilers will not be discussed in length due to complexities in gas distribution and flue termination and advances in alternative technologies and NZEB requirements. It is expected that any new solid fuel boiler systems for commercial units would be a condensing type with a system efficiency to Table 2 of TGD Part L 2022.

11.1 Solar Thermal

Solar water heating systems use the energy from the sun to heat water, DHW requirements in a building. Solar heating systems use a heat collector that is usually mounted on a roof in which a fluid transfers energy absorbed from sunlight to a hot water cylinder. A controller compares the temperature of the water in the collectors with the temperature of the water in the cylinder and activates a circulating pump whenever the water in the collector is around 8C hotter than that of the cylinder. The indirectly heated water in the tank is then supplied to hot water outlets. A secondary system is used to boost the stored hot water when required as solar water typically only capable of providing 50% of DHW requirements in Ireland.

Solar collectors can be categorised into the following two types.

- Glazed flat plate collectors (lower cost)
- Evacuated tube collectors (Higher cost but more suitable for cloudy climates such as Ireland)


Figure 7 - Flat Plate (Left) and Evacuated Tube (Right) Solar Thermal Panels

Advantages

a. Low running and Maintenance Costs
b. Simple technology
c. Reduces carbon emissions for DHW production.

Disadvantages

a. High capital cost compared to other more effective technologies.
b. Long Payback
c. Drastic drop in efficiencies if not mounted withing 10 degrees of south.
d. Requires a secondary source for DHW production in winter months.
e. Complex distribution for multi tenancy complexes
f. Can only produce heat (a low-grade energy source)

Applicability to this Development

In the Dublin area there is an annual average solar energy availability of 1MWh/m² at the optimum (south facing) angle of 35-45 from the horizontal plane. This development does have access to south facing roofs which could be utilised for mounting panels.

The effective distribution of thermal energy from these panels to a multi tenancy building such would provide many challenges in the following areas: unbalanced ratio of apartment DHW demand to available roof area, complex distribution networks for end user connection, excessive pipe funs, all of which would contribute to an unjustified material usage, significant heat losses and inefficiency in distribution. This technology is therefore not considered appropriate for the accommodation block.

Valid Technology for this Development	Recommended for this Development
Yes	No

11.2 Wind Power

Wind turbines convert kinetic energy from wind into mechanical energy that is then converted to electricity. Turbines are available in a range of sizes and can either be free standing, mounted on a building or integrated into the building structure.

Applicability to this Development

Wind turbines were not considered for the site as the scale of the turbine that would be required would not be suitable for an urban environment like this one. Building mounted turbines create structural, vibration and noise implications. Also, the proximity of the site to the surrounding residential developments deemed it impractical. The appropriate installation of wind turbines is also subject to environmental impact studies and wind speed feasibility studies. Alternative renewables are better suited to this site as described in this chapter.

Valid Technology for this Development	Recommended for this Development
No	No

11.3 Biomass Heating

Biomass is any plant-derived organic material that renews itself over a short period. Biomass energy systems are based on either direct or indirect combustion of fuels derived from those plant sources. The most common form of biomass is the direct combustion of wood in treated or untreated forms. Other possibilities include the production and subsequent combustion of biogas produced by either gasification or anaerobic digestion of plant materials. Liquid biofuels such as bio ethanol can also be used. The environmental benefits relate to the significantly lower amounts of energy used in biomass production and processing compared to the energy released when they are burnt. This can range from a four-fold return for biodiesel to an approximate twenty-fold energy return for woody biomass.

Applicability to this Development

Biomass heating was discounted on the basis that the development will take up to 100% site coverage to satisfy other planning conditions and the requirement for a large wood fuel storage area, truck access and the number of truck movements required for the supply of biomass material and the security of the biomass supply would be prohibitive.

Valid Technology for this Development	Recommended for this Development
No	No

11.4 Photovoltaic Cells (PV)

Photovoltaic (PV) modules convert sunlight to electricity. The solar cells consist of a thin semiconductor material, typically silicon and through a process called doping, two different silicone membranes called n-type and p-type layers are created, which, when energised by photons of electromagnetic radiation, educe an electron transfer and a potential deference. This flow of electrons produces a DC current which can be converted to AC by means of an Inverter to produce 230V of 400V AC electricity which can easily be used in any domestic or commercial environment or exported to the grid network.

Panels connected in large strings can generate high DC currents before being inverted to AC. This can require large cabling and can induce large copper losses in the panel to inverter distribution.

For this reason, Micro inverters on each panel are often preferred in large scale installs as each PV module can be controlled independently. This option would also help to achieve compliance with Section 1.2.4 of TGL Part L 2022 which states that "every individual building should meet the minimum provision from renewable energy technologies specified in paragraph 1.2.3; or - the average contribution of renewable technologies to all buildings in the building should meet that minimum level of provision per building."

Figure 8 - PV Solar Array

Advantages

a. Low running and Maintenance Costs
b. High equipment lifespan of 30 years with guarantees often lasting 20 years and above.
c. Simple and proven technology
d. Reduces carbon emissions and can offset electricity consumption.
e. Option to export to grid during high production and low usage (TBC by ESB)
f. Produces Electricity (a high-grade energy) which can power vast items of equipment.
g. Electricity generation can be easily predicted based on historical data (powered by UV irritation, not light)
h. Technology is falling significantly in cost.
i. Battery technology can be stored for later use at times of high demand.
j. Efficiency is directly related to orientation, but PV can still provide acceptable yield at east/west orientation.

Disadvantages

a. Complex distribution for multi tenancy complexes if micro inverters are not used and if number of panels does not match the number of developments.
b. Can be impacted significantly by shading, dirt and bird droppings.

Applicability to this Development

Solar PV Panels are suitable for this development as to generate renewable energy to be used by the development holistically. For example, when electricity is at peak generation midday, the building load would be low and the ASHPs should run to load up the hot water storage system. This will offset the need for importing from the grid. Control strategy for main plant and equipment should be considered here to utilise the solar PV generated electricity to reduce the amount of electricity imported.

Valid Technology for this Development	Recommended for this Development
Yes	Yes

11.5 Air Source Heat Pumps

ASHPs utilise naturally occurring low grade, low temperature heat from the atmosphere into useful high temperature heat via means of the vapour compression refrigeration principle. The high temperature heat produced (35 °C to 55 °C) can be used to heat DHW or internal spaces via radiators or under floor heating systems.

The energy taken from the ambient air via an evaporator is used to increase the temperature of refrigerant in the system to boiling point. During the temperature change of the refrigerant, a significant energy is gained. This is often referred to as the free energy in an ASHP as it requires very little work from the unit.

The boiling refrigerant is then compressed to further increase the temperature and pressure allowing the temperature to ride to a suitable level. The refrigerant is then passed through a heat exchanger to transfer the energy from the refrigerant to an LTHW system by heating the water. This portion of the process requires work in the form of electric energy used to drive the compressor. The ratio of work in (from the compressor) to heat out (via the heat exchanger) is referred to as the coefficient of performance (Often wrongly referred to the efficiency). Typically, ASHPs in Ireland climate operate at a COP of 3.0 to 4.5 thus giving up to 4.5kW heat output for every 1.5 kW of electricity input.

The final stage of the cycle allows the refrigerant to return to its original temperature and pressure, which then re-enters the evaporator to absorb more free energy from the atmosphere and continue the cycle.

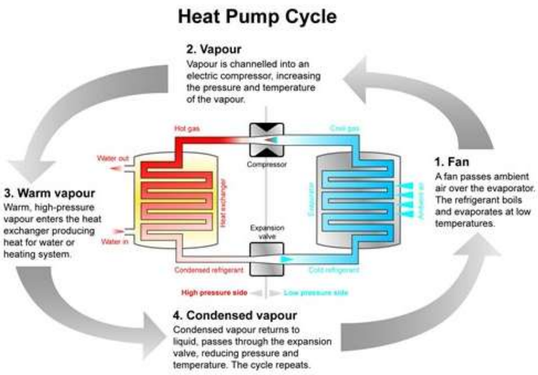

Image above showing ASHP refrigeration

Roof Mounted ASHP Cascade

ASHPs operate at maximum efficiencies in mild conditions as the free energy available from the atmosphere is dependent on external air temperatures and humidity. The COP also drops of when heating water to a temperature greater than 35°C as the compressor requires more work input to achieve higher refrigerant temperatures. In order to heat DHW effectively, the LTHW needs to be 55°C to allow stored DHW to reach at least 50°C. When these two situations are combined, e.g. the external air temperature is below freezing and the desired LTHW set point is 55°C, the ASHP would be expected to run at quite low efficiencies (typically at a COP of 2.0). Even at these low efficiencies however, ASHPs are still able to provide a 1 kW saving over alternative systems and the further saving offered during normal, mild Irish weather conditions when the COP would be greater than 3.0, help to offset the loss during the rare situations when weather drops below freezing for long periods.

Advantages

a. Very high Coefficient of Performance achieves a system efficiency comparable to 200% – 400% of a conventional system.
b. Low running and Maintenance Costs
c. High equipment lifespan of 20+ years with guarantees often lasting 5-10 years.
d. Simple and proven technology with many trained and accredited installers available
e. Reduces carbon emissions (ASHPs are a renewable heat source)
f. Further savings can be achieved when used in conjunction with solar PV to offset electricity usage.
g. No requirements for Gas, Tenant only requires an electric supply (i.e., no landlord plant or landlord billing systems)
h. ASHPs alone can help to achieve A2 – A3 BER ratings.
i. Technology is falling in cost and becoming more understood and available.
j. Small footprint of unit
k. Large scale ASHPs can be used to supplement LTHW production in large, centralised plant thus effectively replacing the use of CHP units.
l. Effective for heating and hot water production all year round
m. No distribution losses or overheating of corridors when compared to a central Plant system.

Disadvantages

a. Inappropriate unit selection/Specification can lead to corrosion issues in salt air environments if units are not enamel coated, this can reduce efficiency and increase cost.
b. Efficiency is dependent on external conditions (This is only a very slight disadvantage in Ireland)
c. Require continual operation for high efficiency and noise could cause problem if units are not selected or located appropriately.
d. A suitable location can be difficult to find in large cities & they can often pose noise and aesthetic problems.
e. Must be mounted externally.
f. A dedicated ventilation system is required such as MVHR, MEV or Continuous MEV
g. Low temperature of LTHW network requires oversized radiators or underfloor heating for space conditioning.
h. Still required additional renewables in the form of solar PV to pass NEAP calculation
i. Low temperature of DHW production of 55°C (this is still an acceptable temperature for hot water usage in the home)

Applicability to this Development

ASHP technology is well suited to this development for many of the advantage highlighted above. High output ASHPs can be located in the plant room space on the roof. Access for maintenance and replacement must be considered.

Valid Technology for this Development	Recommended for this Development
Yes	Yes

11.6 VRF Air Conditioning with Heat recovery

Variable Refrigerant Flow/Volume (VRF/VRV) is a type of air conditioning and heating system that maximises the efficiency of the AC system based on demand & can provide simultaneous heating & cooling with heat recovery. In this mode the heat generated from cooling one zone is used to assist the heating required in another zone. A VRF system uses an outdoor heat pump unit connected via piping to multiple indoor units, allowing for individual zone control. The "variable refrigerant flow" part refers to the ability of the system to adjust the amount of refrigerant sent to each indoor unit, meeting the specific heating or cooling needs of each zone & maximum efficiency from inverter driven scroll compressors. When compared with traditional fixed speed piston style compressors.

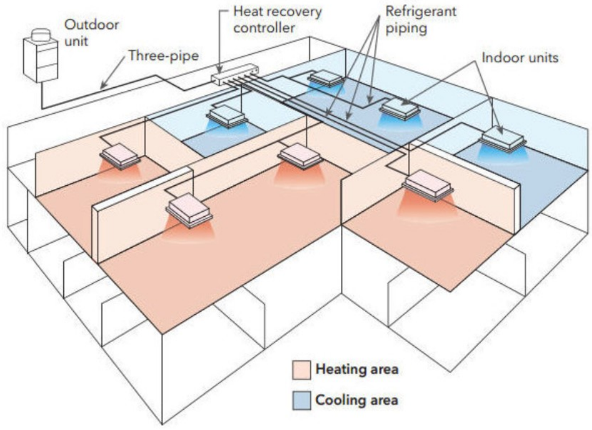

Figure 9 - Image above showing a typical VRF (VRV) Air Conditioning System

Advantages

a. VRF systems modulate the flow of refrigerant according to the specific needs of each zone, reducing energy consumption and lowering utility costs.
b. With the ability to connect multiple indoor units, VRF systems can effectively provide heating and cooling in different zones simultaneously, offering tailored comfort.
c. VRF systems often have sophisticated control options, allowing for remote management and monitoring of each indoor unit.
d. One VRF system can simultaneously heat some zones while cooling others, offering greater flexibility and efficiency.
e. COPs in line with ASHP technology available on the market.

Disadvantages

a. Initial Cost of VRF systems can be more expensive to install than traditional HVAC systems due to their complexity and the need for specialized components.
b. Complex install of VRF systems require specialized knowledge and installation expertise.
c. Long refrigerant lines and flare fittings can increase the risk of refrigerant leaks, which can be challenging to diagnose and fix.
d. VRF systems require specialized maintenance and knowledge to ensure proper performance.
e. VRF systems may not be suitable for all applications, particularly in environments with very high temperatures or humidity.
f. Integration with Other Systems: Integrating VRF systems with other building systems, such as building management systems (BMS) or energy management systems (EMS), can be complicated and may require additional customization.

Applicability to this Development

A VRF air conditioning system is suited to the reception, cafes, multi-use rooms, cinema room, library, and gym (7no spaces) onsite this development, which are located in the basement and ground floor. The spaces require individual zoning flexibility and VRF can provide the climate controls required in an energy efficient way if utilising heat recovery technology. Heat recovery in VRF system extract the heat energy from one space, in so cooling this one, and directs it to a space that is cool and requires heating. Consideration must be given to controls and if this system must be placed on BMS or EMS systems, depending on the requirements this can increase the complexity of this service.

Valid Technology for this Development	Recommended for this Development
Yes	Yes

11.7 Mechanical Ventilation Heat Recovery

MVHR systems have become an industry standard in recent years as homes become more airtight to improve energy efficiency and BER ratings it is essential that adequate ventilation is provided to ensure the indoor air quality does not become stale or harmful to the inhabitants. MVHR is a whole house ventilation system that recovers the latent energy within warm moist air in wet rooms such as kitchens, utility rooms and bathrooms and transfers this energy in the form of heat to fresh air which is brought into the building by dedicated ductwork. Typical modern units can achieve heat recovery of up to 92%. This recovered heat preheats the fresh air which means that there is minimal supplementary heat required to maintain a comfortable internal environment. This is more efficient that continuous MEV systems where this the heated air is simply dumped to atmosphere.

Advantages

a. Fresh air is preheated to comfortable conditions reducing demand of LTHW system.
b. Provides a high level of IAQ, prevents condensation and mould formation and promotes good occupant health.
c. Recovers waste heat when compared with MEV systems.
d. Ventilation can be controlled by the occupant for boost or night cooling in warmer months to remove heat gains and improve comfort.

Disadvantages

a. Requires additional material compared and expertise when compared to MEV or EAHP systems which adds unnecessary expensive.
b. Requires deep ceiling void space for ductwork crossover.
c. Units with air permeability above $3m^3/ (h.m^2)$ at 50Pa do not benefit from MVHR system efficiencies.
d. Adds another technology to the project and increases system complication which requires further end user awareness for the system to remain effective.

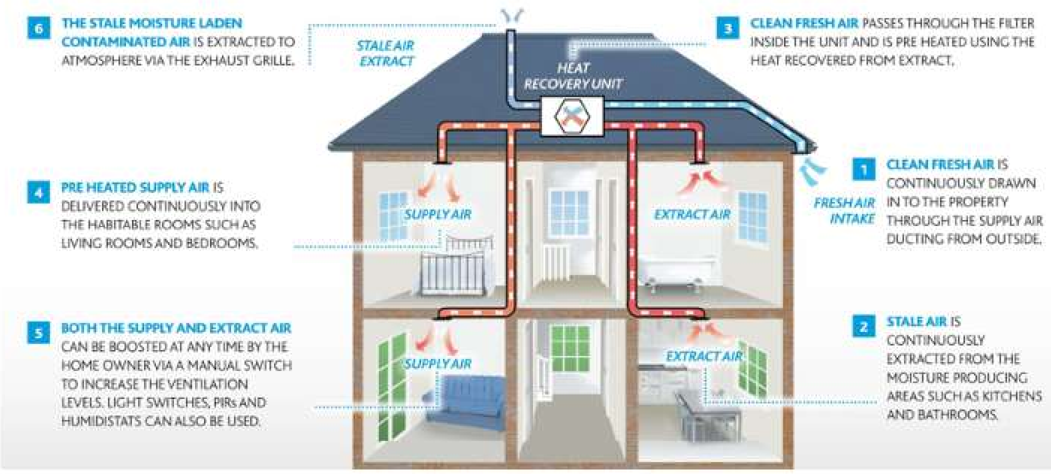

Figure 10 - Image above showing MVHR system operation in a typical building.

Applicability to this Development

If EAHP technology is not incorporated into a building, then an MVHR system would be suitable provided that the building design and layouts permit the routing of ductwork and that the air permeability remains below $3m^3/ (h.m^2)$ at 50Pa. Where the above permeability is not met, MEV would be a more cost-effective install with minimal complexity or complication.

Valid Technology for this Development	Recommended for this Development
Yes	Yes

11.8 Centralised Heating Systems

Centralised systems typically incorporate a large central boiler plant with high efficiency condensing gas fired boilers. The gas boilers produce LTHW in excess of 75°C which is then distributed the building a network of flow and return pipework contains in landlord corridors and ceiling voids. Each unit is then fitted with a HIU that contains 2no heat exchangers to generate secondary side LTHW for space heating and DHW for washing and cleaning. The central boiler plant limits the gas distribution required with conventional boilers in unit and also increases system efficiencies where the total boiler load in kW for central boiler plant allows for system diversity and is much lower than the total boiler demand of every unit summed together. The low return temperatures in heat networks also induce condensing mode in the central boilers and ensure high system efficiencies are maintained.

Advantages

a. Improved system efficiencies and single point of gas supply when compared to individual standalone boilers.
b. Single flue termination.

c. Renewables in the form of CHP or commercial ASHPs can be incorporated into the system for Renewable energy input.
d. High temperature LTHW is available for rapid space and water heating with standard sized radiators.
e. Almost silent operation with no external plant.
f. Hot water production is Instant and at 65°C.
g. Radiators can be sized normally and heated to as high as 75°C for rapid warmup and space saving.
h. Can be easily connected to district heating schemes as a retrofit.

Disadvantages

a. High boiler efficiencies are often offset through distribution losses in heat network pipework.
b. Overheating in landlord corridors is common due to distribution losses as central plant network must circulate 24/7 to ensure end user demand heating and hot water demand is satisfied.
c. Requires deep Landlord ceiling void space for pipework and insulation.
d. Heat loss in ceilings can cause overheating of mains water pipework.
e. Complex system design and costly installation and commissioning requirements.
f. Landlord or management company is responsible for regular maintenance of central plant.
g. Expensive building management system required for control and monitoring.
h. Dedicated heat metering and billing system is required with annual overheads for management as the landlord needs to act as the energy supply company.
i. Central plant needs to be supplemented with renewables to meet RER.
j. A large gas connection to site is required.
k. Require tenant plant/utility cupboards for HIUs.
l. Dedicated mechanical ventilation is required.

Applicability to this Development

When proper design and selection of central heating plant is carried out, it can offer several advantages as mentioned above. Namely all the benefits of an individual heating system with on demand heating and hot water requirements easily satisfied and versatility in radiator size and type. The incorporation of external renewables, such as high-capacity ASHPs and onsite electricity generation, can also help to contribute to the RER and offset any distribution losses. The system will be required a high-level of design to distribute heat throughout the 212no individual accommodation rooms and communal areas.

Valid Technology for this Development	Recommended for this Development
No	No

11.9 C02 Hot Water Heat Pump Systems

Hot Water Heat pumps have been optimised to cater for hot water generation rather than space heating. Typically heat pumps operate most efficiently when the temperature differential between the heat pump system & atmospheric temperatures are closer, such as in an UFH system with a system flow temperature of 30C and an average climate of 10C, requiring an average 20C temperature increase from the ASHP. Whereas hot water is must be heated to over 60C for legionella mitigation. As such, the ASHP must deliver a 50C temperature increase in the average climate. These conditions can cause significant efficiency reductions conventional heat pumps due to the increased temperatures demanded and can also cause high defrost times. As a heat pump is continually extracting heat from atmosphere, when conditions are such that the air expelled from the heat pump is below 0C, the heat pump will commence freezing over.

This then requires the heat pump to operate in reverse mode, effectively stealing heat from the LTHW system to defrost the coils. This process results in a loss of heating performance, reduction in system efficiency & increased downtime. DHW Heat pumps such as CO2 heat pumps have been designed to overcome the above-mentioned issues.

Advantages

a. Very high Coefficient of Performance achieves a system efficiency comparable to 270% – 430% over a conventional system.
b. High equipment lifespan of 20+ years with guarantees often lasting 5-10 years.
c. Simple and proven technology with many trained and accredited installers available
d. Lower running cost than conventional hot water systems
e. Reduces carbon emissions (ASHPs are a renewable heat source)
f. No requirements for Gas/Fossil Fuel
g. Large scale ASHPs can be used to supplement LTHW production in large, centralised plant thus effectively replacing the use of CHP units.
h. Effective for hot water production all year round
i. High Hot water delivery temperatures & Anti Legionella cycles as standard
j. Constant operation with 100% capacity down to -7C

Disadvantages

j. Efficiency is dependent on external conditions (This is only a slight disadvantage in Ireland)
k. Require continual operation for high efficiency.
l. Acoustics can be a problem if units are not selected or located appropriately.
m. Must be mounted externally and cannot be boxed in

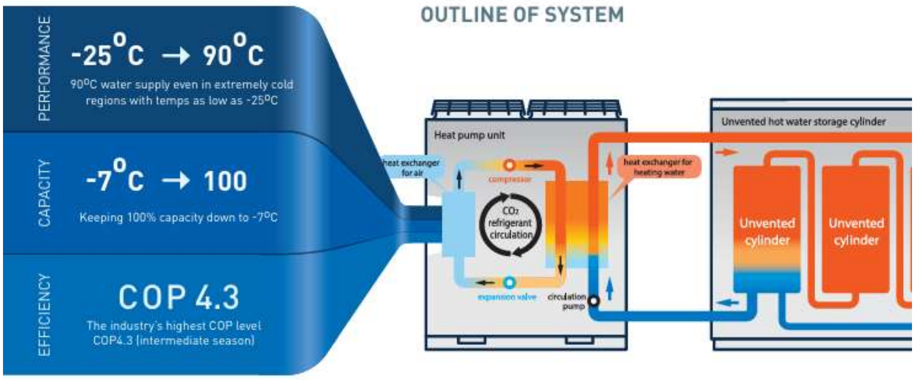

Figure 2 - Image above showing Typical CO2 DHW system operation.

Applicability to this Development

Given the high hot water demand from this building type, a hot water heat pump system is best suited to delivering the domestic hot water for this building in an efficient & environmentally manor.

Valid Technology for this Development	Recommended for this Development
Yes	Yes

12.0 Non-Domestic Energy Assessment Procedure (BRIRL)

BRIRL calculators attribute energy usage for heating, hot water, ventilation, air conditioning & lighting etc. based on specific notional building usages.

Prior to development stage, "As Designed" NEAP BER / BRIRL calculations have been carried out for the commercial units in accordance with TGD L 2022 to demonstrate compliance with NZEB and SDCC requirements and recommendations based on their envisaged use. This will ensure the most appropriate M&E systems are selected for these units.

The below model of Blackpitts Student Housing can achieve an EPC rating of 0.99 when the following material constructions and MEP systems are installed.

It is recommended that a low g-value glazing is installed, particularly on the South Facing windows to minimise the overheating risk of the spaces. The incorporation of openable windows and ventilation systems with purge operations can help to improve space comfort and mitigate risk of overheating.

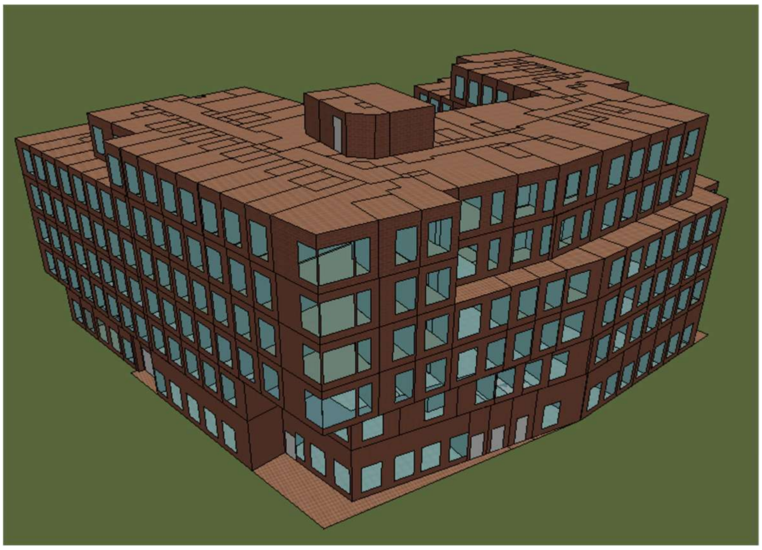

Figure 11 - Blackpitts Student Housing; front of building.

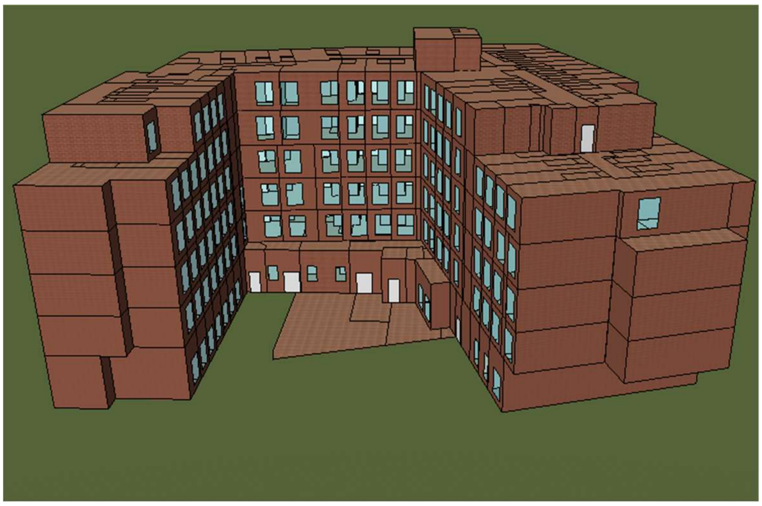

Figure 12 - Blackpitts Student Housing; rear of building.

12.1 NEAP Parameters

System Proposals	System		
Building		Blackpitts	
Technologies Used	ASHP (Rads)	ASHP (DHW)	VRF
Minimum U-Values		**NEAP Parameters**	
Floors		0.20	
Pitched Roof		0.20	
Flat Roof		0.20	
Walls		0.18	
Doors		1.40	
Windows		1.40	
Global Factors			
Thermal Mass		Medium - High	
Thermal Bridging (Acceptable Details)		(0.08 W/m2K)	
Solar Transmission		0.3 South & South West Facing / 0.4 North & East Facing	
Frame Factor		0.15	
Ventilation			
Mechanical System		From MVHR Unit	
SFP (W/l/s)		0.8	
Heat Recovery Efficiency (%)		85%	
Air Tightness (m3/m2/hr @50Pa)		5	
Accommodation Spaces		10 l/s background / function for boost	
Dedicated Supply Fans SFP (W/l/s)		0.3	
Dedicated Extract Fans SFP (W/l/s)		0.4	
Space Heating			
System	ASHP (Rads)	ASHP (DHW)	VRF
Controls	Time & Temperature	Time & Temperature	Time & Temperature
Emitters	Radiators at 45C	Taps/Showers	Indoor Units
Pumps	A Rated Circulator	A Rated Circulator	Integral
System Max available Heating Capacity (kW)	250	480	75
NEAP Seasonal Efficiency % (*ns*)	330	280	400
Secondary Systems Required	No	Yes	No
System Type	N/A	N/A	N/A
Secondary System Proportion of Total (%)			
Secondary System Seasonal Efficiency % (*ns*)			
Water heating			
Storage Volume (L)		7500 (5no 1500 tanks)	
Manufacturer Jacket Insulation		50mm	
Storage Losses (kWh/24h)		0.0047	
Cylinder Stat/Dedicated Controls		Yes/Yes	
DHW Temperature (oC)		60	
Lighting			
Type		LED	
Total Wattage (W/m2)		8	
Efficacy (lm/W)		>95	
Renewables			
Additional Renewables Required		Yes	
System Type		ASHP - Radiators and DHW	
NEAP Output			
BER		B1	
EPC		0.95	
CPC		0.67	
RER		0.32	
Actual Building Carbon (kgCO2/m2/Year)		22.48	
Actual Building Priary Energy (kWh/m2/Year)		175.66	
Compliance		PASS	

13.0 Conclusion

From the BRIRL and BER assessment results it can be seen that the options applicable to this development can be made Part L 2022 compliant with proper design and the introduction of secondary systems and/or renewables. The below systems have been assigned to the development in the model space.

- CO_2 DHW ASHP (High temperature)
- ASHP for radiator/Underfloor LTHW System (Low temperature)
- MVHR per block/group of single accommodation rooms
- Electric Resistance Heating to Backof House, Corridors & Low heat loss areas
- AC in reception/café/gym/cinema/multi-use rooms
- Dedicated Mechanical Extract to toilets and laundry, Kitchens & Bin store.

Centralised DHW and space heating best suited due to the large demand for sanitary hot water for the 212no residents, and restaurant/café areas on site. This provides a high peak demand and consumption, the need for storage capacity optimised at design stages. Commercial systems available can maintain high efficiency and significantly improves the performance of providing hot water at cold outside air temperatures. Commercial equipment can achieve a coefficient of performance (COP) of >2.8 and are highly suited to hotels and accommodation blocks.

Mechanical ventilation heat recovery should be provided as a central system to a group of single accommodation rooms. Consideration must be given to appropriately sizing ductwork and review of service routes shall be optimised to minimise fan power requirements and improve system efficiency. Groups are to be determined by capacity of equipment available and suitable installation layouts. Mechanical Extract Ventilation is required at the toilets and laundry areas. Dedicated extract systems can be controlled with PIR sensors to optimise running operations.

VRF systems can effectively provide heating and cooling in different zones simultaneously, offering tailored comfort. One VRF system can simultaneously heat zones while cooling others, offering greater flexibility and efficiency. The spaces that require individual climate controls will benefit from the zoning flexibility that VRF can provide.

For these reasons, along with the advantages and disadvantages of each system as laid out in Section 11 above, it is recommended that the commercial ASHP for DHW shall be the chosen system for all accommodation rooms and in the core of the building. It is not essential for this system be to be utilised behind house areas, however, it does provide an improvement on BER rating and can provide an A3 rating for the development if the ASHP is used to condition all heated spaces. Consideration has been given to the farthest most common rooms and electric under sink water heaters should be used to reduce DHW return leg and improve efficiency of the system.

Design of the LTHW system shall be done to ensure that radiators are sizes appropriately for LTHW at 50°C with a mean water temperature of no less than 40°C. Alternatively and where applicable, UFH shall be utilised to mitigate the need for oversized radiators & maintain system flow temperatures of <35°C for optimum ASHP efficiency.

It is also essential that the lighting throughout the commercial units is via high efficiency LED lighting with power consumption of no greater than $8W/m^2$ to achieve the BER rating in this report.

The BRIRL and BER reports of the preliminary development design show that the student accommodation can be heated with a mix of ASHP and air conditioning units, so as to achieve a B1 BER rating whilst meeting the requirements of TGD Part L BRIRL.

It is our intention to ensure that the proposed M&E design will meet all the requirements of TGD part L 2022 and DCC.

APPENDICES

BRIRL Output Document

Compliance Assessment with the Building Regulations (Ireland) TGD-Part L 2017

This report demonstrates compliance with specific aspects of Part L of the Building Regulations. Compliance with all aspects of Part L is a legal requirement. Demonstration of how compliance with every aspect is achieved may be sought from the Building Control Authority.

Blackpitts Student Accomo

Date: Mon Jun 23 15:37:22 2025

Administrative information

Building Details

Address: Blackpitts, Merchants Quay, Dublin 8, Ireland, Co. Dublin, DO8

NEAP

Calculation engine: SBEMIE

Calculation engine version: v5.6.a.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: 7.0.27

BRIRL compliance check version: v5.6.a.0

Client Details

Name: GDPR Confidential

Telephone number: Phone

Address: Street Address, Co. Dublin, Eircode

Energy Assessor Details

Name: Dathai O'Bardain

Telephone number: 02840623377

Email: dathai@dynamicdesign.org

Address: Dynamic Design Consultants LTD, 7A Dromore St, Banbridge, Co. Louth, BT32 4BS

Primary Energy Consumption, CO2 Emissions, and Renewable Energy Ratio

The compliance criteria in the TGD-L have been met.

Calculated CO2 emission rate from Reference building	33.4 kgCO2/m2.annum
Calculated CO2 emission rate from Actual building	22.6 kgCO2/m2.annum
Carbon Performance Coefficient (CPC)	0.68
Maximum Permitted Carbon Performance Coefficient (MPCPC)	**1.15**
Calculated primary energy consumption rate from Reference building	184.9 kWh/m2.annum
Calculated primary energy consumption rate from Actual building	176.4 kWh/m2.annum
Energy Performance Coefficient (EPC)	0.95
Maximum Permitted Energy Performance Coefficient (MPEPC)	**1**
Renewable Energy Ratio (RER)	0.32
Minimum Renewable Energy Ratio	**0.2**

Heat Transmission through Building Fabric

Element	$U_{a-Limit}$	U_{a-Calc}	$U_{i-Limit}$	U_{i-Calc}	Surface with maximum U-value*
Walls**	0.21	0.18	0.6	0.18	L0000000_W1
Floors (ground and exposed)	0.21	0.2	0.6	0.6	L0000006_F_A2
Pitched roofs	0.16	-	0.3	-	"No heat loss pitched roofs"
Flat roofs	0.2	0.16	0.3	0.6	B_000002_C_A2
Windows, roof windows, and rooflights	1.6	1.4	3	1.4	R_000004_W3_O2
Personnel doors	1.6	1.4	3	1.4	R_000003_W2_O0
Vehicle access & similar large doors	1.5	-	3	-	"No ext. vehicle access doors"
High usage entrance doors	3	-	3	-	"No ext. high usage entrance doors"

$U_{a-Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
U_{a-Calc} = Calculated area-weighted average U-values [W/(m2K)]
$U_{i-Limit}$ = Limiting individual element U-values [W/(m2K)]
U_{i-Calc} = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface with the maximum U-value. ** Automatic U-value check by the tool does not apply to curtain walls whose area-weighted average and individual limiting standards are 1.8 and 3 W/m2K, respectively.

Air Permeability	Upper Limit	This Building's Value
m3/(h.m2) at 50 Pa	5	5

BER

Virtual Environment 7.0.27 (SBEMIE v5.6.a.0)

Provisional Building Energy Rating (BER)

Provisional BER for the building detailed below is: **B1**

Blackpitts
Merchants Quay
Dublin 8
Co. Dublin
DO8

The Building Energy Rating (BER) is an indicator of the energy performance of this building. It covers energy use for space heating and cooling, water heating, ventilation and lighting, calculated on the basis of standard operating patterns. It is accompanied by a CO_2 emissions indicator. These indicators are expressed as respective ratios of primary energy use and CO_2 emissions, relative to what would apply for a similar building generally satisfying the Building Regulations 2005. 'A' rated properties are the most energy efficient and will tend to have the lowest energy bills.

BER Number:	voidvoidvoid	Date of Issue:	23 Jun 2025
Useful Floor Area (m^2):	8271	Valid Until:	22 Jun 2027
Main Heating Fuel:	Grid Supplied Electricity	BER Assessor No.:	108843
Building Environment:	Heating and Mechanical Ventilation	Assessor Company No.:	108843
Building Type:	Residential spaces	Assessor Scheme:	SEAI

Building Energy Rating (Indicator)

MOST EFFICIENT

< 0.17	A1
≥ 0.17	A2
≥ 0.34	A3
≥ 0.50	B1
≥ 0.67	B2
≥ 0.84	B3
≥ 1.00	C1
≥ 1.17	C2
≥ 1.34	C3
≥ 1.50	D1
≥ 1.75	D2
≥ 2.00	E1
≥ 2.25	E2
≥ 2.50	F
≥ 3.00	G

LEAST EFFICIENT

B1 176 kWh/m^2/yr 0.50

Carbon Dioxide (CO_2) Emissions Indicator

BEST 0 — 1.0 — 2.0 — WORST >3.0

Calculated annual CO_2 emissions: 23 $kgCO_2/m^2/yr$ 0.38

The less CO_2 produced, the less the building contributes to global warming.

IMPORTANT: This provisional BER is calculated on the basis of pre-construction plans and specifications provided to the BER assessor, and using the version of the assessment software quoted above. The BER assigned to this building on completion may be different, in the event of changes to those plans or specifications, or to the assessment software.