CHERRYWOOD LEHAUNSTOWN HOUSING	HOMAN O'BRIEN *Engineering Excellence.*

Project Ref.	Document Title	Rev	Prepared by:	Issue Date	Checked by:
2343	MECHANICAL, ELECTRICAL AND SUSTAINABILITY REPORT For PLANNING SUBMISSION	PL1	BH	12-04-24	BH

CONTENTS

1 INTRODUCTION

This report outlines the mechanical and electrical systems and building regulation compliance criteria at planning stage for the 109 apartments, duplex units and houses at Lehaunstown, Cherrywood, Co. Dublin.

This report has been prepared as a compliance requirement for planning applications made in accordance with national and local guidelines.

The dwellings have been designed for compliance with TGD L 2022 (NZEB)

The report includes the following elements;

- Performance Details for the Mechanical and Electrical Services
- BER and TGD L Compliance
- Water Conservation Report

Key Energy Reduction and Sustainable Design Features include:

1. BER minimum of A-3.

2. Reduction in Primary Energy compared to a Building Regulation Compliant Residential Building

3. Reduction in CO_2 Emissions compared to a Building Regulation Compliant Residential Building to Part L 2019

Element	Building Regulation (w/m^2 °k)	Lehaunstown (w/m^2 °k)	Comment
Walls	0.18	0.18	Compliant
Floors	0.18	0.18	Compliant
Windows	1.4	1.4	Compliant
Roofs	0.2	0.2	Compliant

4. Air Tightness Test to achieve $3m^3/m^2/hr$ a 60% improvement on the Building Regulations advised upper limit figure.

5. Thermal Bridging Factor 0.08 (equivalent to ACDs applied throughout or better).

6. Use of LED Lights. LED lights in the Dwellings and in the Landlords areas.

2 MECHANICAL & ELECTRICAL BUILDING SERVICES PERFORMANCE REQUIREMENTS

NO.	ITEM
1.0.	**MECHANICAL**
1.1	**Design Criteria**
	The Mechanical Services shall be designed to comply with the Irish Building Regulations and the Chartered Institution of Building Services Engineers (CIBSE) Guidelines and all other relevant International and Local Authority Standards. **<u>Indoor Climate:</u>** Operative temperature: Winter mode: min. *21 °C* **<u>Outside Design Conditions:</u>** ▪ Winter: Temperature -3°C 100% RH ▪ Summer: Temperature 26°C (dry bulb) Humidity 19.5°Cwb (wet bulb) **<u>Air Quality:</u>** Rooms such as toilets, shall be put in under negative pressure towards surrounding room spaces. Exhaust air discharge points shall be placed in compliance with CIBSE Guidelines.
1.2	**Heating System:**
	In Apartments and Duplex units LPHW panel radiators will provide the required heat output in each room. The heat source is being provided by an individual exhaust air heat pump system. The houses will also be heated by LPHW panel radiators served from an individual heat pump with indoor unit and external condenser unit. Hot water will be generated by the dedicated air to water heat pumps in all cases. The landlord spaces will be heated by electric panel radiators. The heating installations will be designed in accordance with the Chartered Institution of Building Services Engineers (C.I.B.S.E.) Guidelines and Part J of the Building Regulations Technical Guidance documents and amendments where applicable.
1.3	**Water Services:**
	24-hour apartment water storage shall be provided based on Building Regulations and Irish Water Requirements and will be centrally stored for all the apartments and individual storage for duplex units and houses. Potable water shall be provided to each kitchen in each unit. W.C. cisterns shall have a maximum flushing capacity of 6 litres.
1.4	**Fire Fighting:**
	First aid firefighting will be provided in accordance with building regulation requirements to include dry riser and extinguishers and fire blankets in each apartment.
1.5	**Sanitary:**
	The soils and waste installation shall be in lead free µPVC.

1.6	Renewables
	The Heat Pump Systems proposed for all unit types will provide sufficient renewable energy without the need to supplement with PVs. PVs will be provided for Landlord areas.
1.7	Sustainability Target
	BER Target is NZEB Part L Compliance.
2.0	**ELECTRICAL**
2.1	**Design Criteria**
	The Electrical Services shall be designed to comply with the Irish Building Regulations, The Electro Technical Council of Ireland (ETCI) Guidelines and the latest IEE Regulations. The general services provision shall be in accordance with DCC social and affordable housing guide, requirements, where required.
2.2	**Incoming Power Supply**
	Two dedicated ESB Substation switch rooms will be sited in the development. The supply to all units will be at LV. Switchgear shall be located in areas protected from flooding or water ingress.
2.3	**Switchgear and Distribution Boards**
	ESB metering for each dwelling will be provided. The apartments will be provided with meters rooms at ground floor level in each core block. The duplex units and houses will be provided with wall mounted meters on each unit. All main distribution boards will be Form 4b with Local Board Form 3b. Separate ESB metered landlord distribution boards will be provided.
2.4	**Voltage Equalising Equipment**
	The apartment buildings will be equipped with lightning arresters in the form of roof leads, down-leads, ring leads and foundation earth points. The buildings will be equipped with a leading-in protector to eliminate transient over voltages that may enter the building through the external cable network.
2.5	**Cable Distribution (Duct Systems)**
	The duct system in apartment common areas will include for four separate cable runways. • One for LV power, control and supervisory equipment • One for the data network • One for ELV functions • One for Fire Alarm

2.6	**General and Emergency Lighting**
	The lighting installation will be designed according to the current EU Directive on interior lighting and the C.I.B.S.E. / SLL Code for Lighting 2012. Lighting in plant areas will be provided by surface LED battens with vapour resistant polycarbonate diffusers. They will be IP65 rated. External lighting will be provided in car park and access areas in compliance with design standards. The emergency lighting installation will comply with IS3217. Emergency lighting shall be independent LED and provided via independent battery packs. In the event of power failure these battery packs will power the fittings for 3 hours and will provide adequate light for safe escape. An emergency lighting central test unit shall be installed.
2.7	**Fire Alarm Installation**
	The fire alarm system will comply with IS3218. The system will be designed for L3X for common areas & LD2 for the dwellings coverage as defined in IS3218. The fire alarm system will be fully addressable and capable of interfacing with other systems.
2.8	**Earthing & Bonding**
	Equipment such as window frames, bathroom fixtures, all incoming services pipework and lightning protection installation shall all be bonded. Bonding shall be carried out across non-metallic apparatus.
2.9	**Security and Cableway Provision**
	The building will come complete with access control, CCTV and intruder alarm systems installed at main cores, main entrance, car park and exit points to the building. These systems will be IP type adaptable to an open network.
3.0	**LIFTS**
3.1	**Passenger Lifts** One passenger lift will be provided to comply with EN 81 in each apartment core. The passenger lift will provide a level of service which meets or exceeds the following: - Internal lift car dimensions - 8 person capacity. Lift door clear height 2100mm Lift serves basement, ground, first, second and third floor levels quality internal car finish Customer display in car
3.2	**Fire Fighting Lift**
	To be provided in accordance with BS 9999:2008, if and where required.

4.0.	**Satellite**
4.1	Space for 1 no. 1.2m (nominal diameter) satellite dish is allowed for on the roof of each apartment block. The dish needs to be able to see an arc of the sky from southeast to southwest, above an angle of 20 degrees elevation.
5.0	**PUBLIC UTILITIES**
5.1	Telecoms All Telecom Providers are available in the area. A dedicated telecom system provider's communications space is provided centrally within the development.
6.0	**TESTING AND COMMISSIONING**
6.1	All systems shall be commissioned in accordance with CIBSE and BSRIA codes. All systems will be demonstrated to the tenants Engineers prior to acceptance of PC. The O&M Manuals and Record Drawings should be available in Draft form at PC with the final documents submitted within 4 weeks of PC.

3 PART L & NZEB COMPLIANCE

3.1. Introduction

This section sets out to review the method of compliance with building regulations to the dwellings in this project. It is important to note that the input data currently used is very preliminary, and the design will develop as the project progresses.

At this early stage of the project, a number of assumptions have been made regarding fabric performance. All types of dwellings have been initially analysed in this report:

The dwelling has been analysed for compliance with the 2022 TGD for Part L (NZEB).

There are five main criteria that this report aims to demonstrate compliance with

- Building Energy Rating
- Energy Performance Coefficient (NZEB)
- Carbon Performance Coefficient (NZEB)
- Renewable contribution
- Maximum elemental U-Values

3.2. Building Energy Rating (BER)

There is no specific BER rating that is required to comply with Part L. However, dwellings compliant with Part L 2022 / NZEB will usually achieve a BER of A2-A3.

3.3. Energy Performance Coefficient (EPC) & Carbon Performance Coefficient (CPC)

The EPC and CPC are the two figures that are used to determine whether the dwelling complies with Part L on an overall basis.

The EPC is the calculated primary energy consumption of the proposed dwelling, divided by that of a reference building of the same size. To comply with Part L and NZEB requirements, the EPC must be better than the Maximum Energy Performance Coefficient (MPEPC) which is 0.30.

The CPC is the calculated carbon dioxide emissions of the proposed dwelling, divided by that of a reference building of the same size. To comply with Part L and NZEB requirements, the CPC must be better than the Maximum Carbon Performance Coefficient (MPCPC) which is 0.35.

3.4. Renewable Contribution

To satisfy part L, there are targets for the amount of energy which must be provided via renewable sources. These targets are as follows:

a) *A RER of 0.2 represents 20 % of the primary energy from renewable energy technologies to total primary energy as defined and calculated in DEAP.*

b) *This simply means of the primary energy used for space heating, hot water heating and lighting power, 20% of this has to be generated on site by renewables.*

Maximum Elemental U-Values

Technical Guidance Document Part L 2022 sets out maximum U-Values which may not be exceeded for each construction type:

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

TGD Part L 2022

3.5. Thermal Bridging

0.08 W/m²K represents the use of ACDs (Acceptable Construction Details) throughout. Any junction that does not correspond to a known ACD will need to be modelled by an approved Thermal Modeller on the NSAI thermal model register. The dwelling will then require a Y value calculation to be carried out.

3.6. Input Data

It should be noted that this report and the accompanying calculations are based on preliminary information and a number of assumptions have had to be made at this stage. As the project progresses, the model will be refined when HOB is advised of changes to criteria set out in this report, and the results will be advised accordingly.

The backstop values for fabric performance in Part L 2022 were used for the purposes of this analysis.

Fabric performance

All apartments	
Elements	**U Values (W/m²K)**
External wall	0.18
Roof	0.2
Ground	0.18
Windows	1.4
Solar Transmittance of windows	0.71
Thermal Bridging (W/m²K)	0.08

Air tightness test according to CIBSE TM 23 best practice standards to achieve **3 $m^3/m^2/hr$ at 50 Pa** or **0.15 air changes per hour**.

The thermal mass of each apartment varies between low-medium.

The following heating systems are proposed, analysed and checked for NZEB Compliance for the apartments and duplex units.

- **Exhaust Air Heat Pump**

  The general principal of heat pump technology is the use of electrical energy to drive a refrigerant cycle capable of extracting heat energy from one medium at one temperature and delivering this heat energy to a second medium at the desired temperature. This process can be used for cooling in the form of air conditioning or refrigerators, or heating in the form of a heat pump boiler.

  In this case, an exhaust air type heat pump is proposed which is a form of air to water heat pump. This means that heat transfers from the extracted stale air to the refrigerant pipes in the condenser. The refrigerant is then compressed, increasing the temperature. The heat in the refrigerant is then passed into the central heating circulating water, to provide space heating and hot water.

  This is a self-contained air to water heat pump unit located within the Apartments and Duplex Units.

  A constant volume of air is drawn through the Dwellings and used as the air heat source for the heat pump. On extracting heat from this air, the air is exhausted to outside.

  This system ensures a constant air extract rate from each space within the Dwellings as the air is require for proper operation.

  External wall vent units are provided within each occupied room and are set at commissioning stage to ensure an even extract air rate from all spaces.

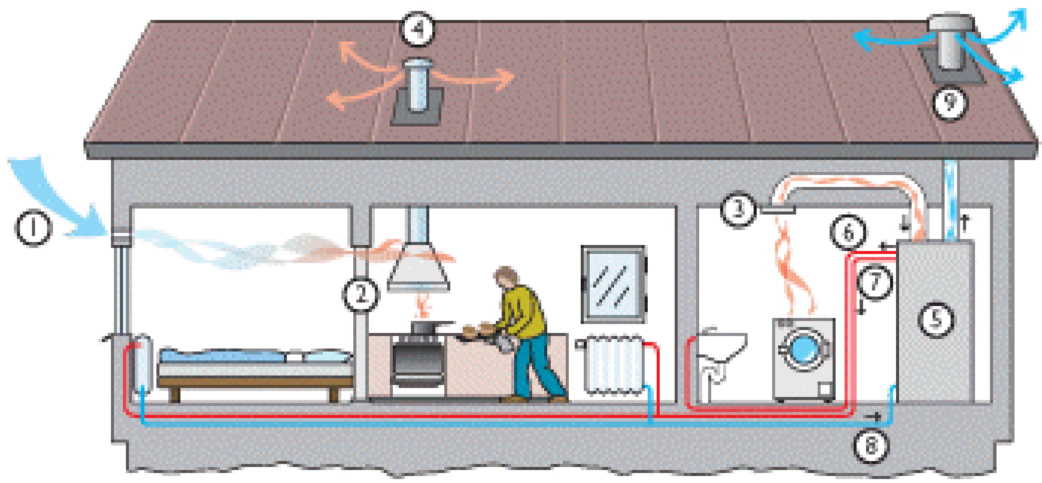


Diagram of Exhaust air heat pump operation

Typical exhaust air heat pump installation

It should be taken into account that a heat pump produces hot water at a lower temperature than traditional gas-fired boilers, so a larger area is needed for heat convection. This is in the form of larger radiators or underfloor heating.

The high efficiency of these units can provide great savings in terms of carbon emissions and running costs. A NIBE unit has been selected for the purpose of these calculations.

Since the efficiency is higher than 190%, heat pumps are considered to be renewable technology, and a portion of the heat provided counts towards the renewable contribution necessary for full compliance of Part L.

- **Ventilation**

  The ventilation will be provided by an Exhaust Air Heat Pump. The calculations have been based on the NIBE F730 Exhaust Air Heat Pump, which has Exhaust air flow rate of 180 m^3/h a specific fan power of 0.62 W/ (l/s).

- **Heat Pump**

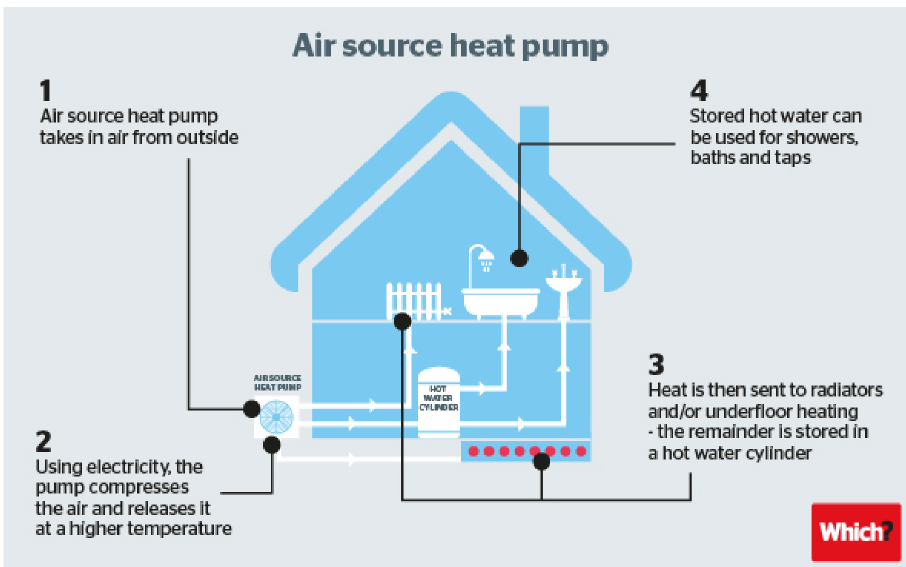
  - Model: NIBE F730
  - Storage Volume : 180L
  - Manufacturer Declared Loss Factor: 1.22
  - Nominal Ventilation Rate: 180 m^3/h
  - Nominal space heating efficiency: 172%
  - Integrated Circulation Pump Energy Consumption: 27kWh/yr
  - SFP: 0.62 W/ (l/s).

The following heating system is proposed, analysed and checked for NZEB Compliance for the house units.

A heat pump boiler has been included in the design. Heat pumps are classified as renewable energy by SEAI, and heat produced by heat pumps contributes to the renewable energy of the building.

The general principal of heat pump technology is the use of electrical energy to drive a refrigerant cycle capable of extracting heat energy from one medium at one temperature and delivering this heat energy to a second medium at the desired temperature. This process can be used for cooling in the form of air conditioning or refrigerators, or heating in the form of a heat pump boiler.

In this case, an air-to-water type heat pump will be reviewed. This means that heat transfers from the outside air to the refrigerant pipes in the condenser outside. The refrigerant is then compressed by the pump, increasing the temperature. The heat in the refrigerant is then passed into the central heating system, to provide space heating and hot water.



Source: www.which.co.uk

It should be taken into account that heat pump boilers produce hot water at a lower temperature than traditional gas-fired boilers, so a larger area is needed for heat convection. This could come in the form of larger radiators or underfloor heating. Radiators are suggested for the purposes of this design, but underfloor heating is a perfectly viable alternative.   This design is based on the Daikin ERLQ04CAV3 system for calculation purposes.

Hot water

The heat pump boiler suggested for the heating system is an integrated unit containing a 200-litre hot water cylinder. The hot water is primarily produced in by the heat pump system, but there is an electric immersion included in the system as a backup. The hot water is stored at 48°C and boosted once a week by the immersion to 60°C for one hour to purge bacteria from the system. This immersion can also be used to aid in a rapid refill of the tank if the client requires.

Ventilation

The current calculations are based on an MVHR unit. This proposed system has a relatively low specific fan power, which helps achieve the target EPC and CPC.

4 RESULTS

The Table on the next page outlines the results achieved.

An assessment was carried out for the landlord spaces using the TGD Part L (NZEB) NEAP assessment method with compliance being achieved and an A3 energy rating using Electric Panel Heaters and Photovoltaic Panels.

An assessment was also carried out on a number of dwellings using the TGD Part L (NZEB) DEAP assessment method with compliance being achieved for all units with energy ratings varying between A2-A3.

5 CONCLUSION

Compliance is being achieved for the landlord areas and all apartments incorporating the following systems;

Apartment Landlord Spaces

- Wall mounted electric panel heaters
- Roof mounted PVs.

Apartments

- Wall mounted LPHW panel heating
- Individual air to water exhaust air heat pump system heating domestic hot water and space heating requirement.
- Mechanical Ventilation via exhaust air heat pump system
- Low energy LED lighting throughout

Duplex Units and Houses

- Wall mounted LPHW panel heating
- Individual air to water heat pump system heating domestic hot water and space heating comprising indoor unit and outdoor unit.
- Mechanical Ventilation via MVHR system
- Low energy LED lighting throughout

The following table confirms the results for 8 unit types examined.

Dwelling Reference	Block	Floor Area	Total heat loss (W/K) taken from DEAP	Total heat loss in W	EPC	CPC	RER	BER Rating	Energy kWh/m2/yr	Co2 kg/m2/yr	PV kWH/yr	TGDL PART L Compliance
APT_A1_L00_2B4P	A1	78.4	112.899	2709.576	0.281	0.181	0.546	**A3**	52.02	6.66	0	**PASS**
APT_A1_L03_2B4P	A1	79.88	103.944	2494.656	0.296	0.194	0.541	A2	47.89	6.13	0	**PASS**
APT_A2_L00_2B3P	A2	67.38	96.575	2317.8	0.288	0.188	0.543	**A3**	53.09	6.8	0	**PASS**
APT_B_L03_2B4P	B	77.95	85.938	2062.512	0.280	0.185	0.530	A2	42.44	5.43	0	**PASS**
APT_C_L00-1B2P	C	48.35	68.551	1645.224	0.264	0.172	0.536	**A3**	57.29	7.33	0	**PASS**
APT_C_L03_3B5P	C	95.72	119.451	2866.824	0.292	0.198	0.542	A2	44.85	5.74	0	**PASS**
APT_D_L00_DUPLEX_3B6P	D	117.16	119.9	2877.6	0.279	0.181	0.537	A2	37.69	4.82	0	**PASS**
APT_E_L00_HOUSE_3B6P	E	114.95	144.101	3458.424	0.279	0.179	0.548	A2	43.88	5.62	0	**PASS**

6 ENERGY EFFICIENCY & SUSTAINABILITY

Reducing Energy Consumption – Building Fabric

In order to reduce the energy consumption of the heating and lighting systems integration between the architects, services engineer and structural engineer is required. This approach ensures the form of the building seeks to minimise heat gains in summer and heat loss in winter and also ensures that the choice of heating and ventilation systems will complement the building design and vice versa.

Elemental U-Values

The U-Value of a building element is a measure of the amount of heat energy that will pass through the constituent element of the building envelope. Increasing the insulation levels in each element will reduce the heat lost during the heating season and this in turn will reduce the consumption of fuel and the associated carbon emissions and operating costs.

It is the intention of the design team to meet the requirements of the current building regulations Part L 2022. Target U-Values are identified below.

Element	Building Regulation (w/m² °k)	Paddocks Apartments (w/m² °k)	Comment
Walls	0.18	0.18	Compliant
Floors	0.18	0.18	Compliant
Windows	1.4	1.4	Compliant
Roofs	0.2	0.2	Compliant

Air Permeability

A major consideration in reducing the heat losses in a building is the air infiltration. This essentially relates to the ingress of cold outdoor air into the building and the corresponding displacement of the heated internal air. This incoming cold air must be heated if comfort conditions are to be maintained. In a traditionally constructed building, infiltration can account for 30 to 40 percent of the total heat loss; however, construction standards continue to improve in this area.

With good design and strict on-site control of building techniques, infiltration losses can be significantly reduced, resulting in equivalent savings in energy consumption, emissions and running costs.

In order to ensure that a sufficient level of air tightness is achieved, air permeability testing will be specified in tender documents, with the responsibility being placed on the main contractor to carry out testing and achieve the targets identified in the tender documents.

A design air permeability target of **$3m^3/m^2/hr$** has been identified.

Air testing specification will require testing to be carried out in accordance with

- BS EN 13829:2001 'Determination of air permeability of buildings, fan pressurisation method'
- CIBSE TM23: 2000 'Testing buildings for air leakage"

Low Carbon & Renewable Energy Solutions

The building services design on any project is ultimately responsible for how a building will consume energy. The design of heating, ventilation and lighting systems will determine the energy consumption characteristics of the building.

The approach that has been adopted to delivering a development which is both highly efficient and sustainably designed has been to involve all members of the design team from the earliest possible stage in the design process. This integrated design approach will be continued throughout the design process.

This approach ensures that the knowledge and expertise of each member of the design team was available from the outset. The goals for sustainable design were identified at this early stage and each element of the design was progressed accordingly.

Several renewable and low carbon technologies were considered during the preliminary design process. Life cycle costing analysis and technical feasibility studies were conducted.

Combined Heat & Power

The inclusion of combined heat and power plant in any building scheme must be given very careful consideration due to the large capital costs involved and the potential risk of higher running costs than would be incurred if separate heating plant and grid electricity were used.

The most important consideration when designing CHP plant is to carefully assess both the heat load and the electrical load. A CHP installation will typically operate at approximately 80% combined efficiency. Approximately 60% of the useful output will be thermal energy with the remaining 40% being available as electric energy.

E.g. a CHP plant which consumes 100kWhrs of gas will produce approximately 80kWhrs of useful output. 50 kWhrs of this output will be available as thermal energy while the electric energy output will be 30kWhrs.

Given the proportion of thermal energy and electricity produced it is essential that the CHP plant is selected to meet the heat load of the building and not necessarily to meet base electrical loads.

CHP technology will not be included in this development. There is a concern regarding the Heat Losses associated with a large distribution network of LPHW Heating Pipework circulating constantly.

Heat Pump Technology

The general principal of heat pump technology is the use of electrical energy to drive a refrigerant cycle capable of extracting heat energy from one medium at one temperature and delivering this heat energy to a second medium at the desired temperature. The basic thermodynamic cycle involved is reversible which allows the heat pump to be used for heating or cooling.

The efficiency of any heat pump system is measured by its coefficient of performance (CoP). This is a comparison between the electrical energy required to run the heat pump and the useful heat output of the heat pump, e.g. a heat pump requiring 1kW of electrical power in order to deliver 3kW of heat energy has a CoP of 3.0.

This operating principle can be applied to different situations, making use of the most readily available heat source on any given site. The most common types are:

- Ground Source
- Water Source
- Air Source

Water source heat pumps generally offer the highest CoP however they can be expensive to install and maintain and must have a source of water from a well, lake or river.

An initial technical and financial analysis of this technology has shown that they will not be suitable for use within the building. There are also concerns regarding the potential practical difficulties and programming implications of incorporating vertical boreholes on such a tight site.

On a financial level, the significant increase in capital costs associated with ground source heat pumps and the associated boreholes is not considered to be justified by the potential savings that would be achieved.

A form of Air source heat pump technology is a viable solution for this project, namely Exhaust Air Heat Pumps. Locations for individual Exhaust Air Heat Pumps have been identified.

Heat Pump technology will be included in the development.

Bio-Mass Boilers

The use of biofuel in the form of wood chip or wood pellet can provide a realistic alternative to conventional fuels such as oil or gas. In terms of heat output, biomass boilers operate in exactly the same manner as conventional oil or gas fired boilers. There are, however, important differences to be considered.

The major drawback of a biomass heating system is the inconvenience associated with supply and storage of fuel, the increased maintenance of the boiler plant when compared to gas or oil-fired systems and the increased capital costs.
The advantage of the system, however, is the practically zero net carbon emissions associated with the combustion of wood products and the marginal cost savings which can be achieved.

When natural gas is available as a potential fuel source it is always very difficult to make a sound financial argument for the inclusion of biomass heating systems. The unit cost of wood pellet or indeed wood chip (although slightly cheaper than pellet) is generally only marginally less than the unit of cost of natural gas (less than 10%).

This marginal saving is typically offset by the increase in maintenance costs and is never sufficient to offset the increase in capital costs associated with this installation of the biomass systems.
Biomass technology will not be included in the development.

Solar Water Heating

Solar thermal collection uses of the sun's energy and transfers the heat generated to the building's domestic hot water supply. Two distinct types of collection panel are available. The evacuated tube array and the flat panel collector. The evacuated tube array is the more effective of the two as it is capable of generating approximately twice as much hot water from the same surface area of flat panel.

Solar thermal collection can deliver up to 50% of the total annual hot water load of a Building.

Further to a review the optimum solution was deemed to be Heat Pumps + PV.
Therefore, Solar thermal technology will not be included in the development.

Photovoltaic (PV) Panels

PV Panels are capable of generating direct current electricity from the sun's energy, which can then be converted to alternating current and used within the building. They are generally a "maintenance free" technology as there are no moving parts. They also typically have a 20-year manufacturer's guarantee on electrical output and can be expected to operate effectively of 30 years or more. A PV solar array will be included in the project.

Wind Turbines

Due to the urban nature of the site wind energy has not been considered.

7 WATER CONSERVATION PLAN

Water consumption and the conservation of water has become increasingly important in recent times. There are a number of potential advantages from the conservation of water both environmentally and financially. The reductions in usage of water result in reductions in energy, wastewater and in turn associated costs.

The water supply for the site will be taken from the Local Authority mains network.

There are a number of features which will be included in the design of the water services installation which will reduce the consumption of potable water.

Low Water Use Sanitary Ware

The sanitary ware selected within the buildings can have a significant effect on the water consumption. Low use appliances such as aerated taps, dual flush WC's and low water use showers will be installed throughout the development

The following is a table detailing maximum water consumption for various appliances:

Appliance	**Minimum Standard**
Dual Flush Cistern	6/4 Litres or better
Showers	<9 litres/min
Taps	Aerating Taps (approx 0.5l/use)

Water Storage 24 Hours

Dwelling house or Apt. (up to 3 Bed without power shower)	227 litres
Dwelling house or Apt. (4 Bedrooms or single power shower)	340 litres
Dwelling house or Apt. (having 2 full bathrooms)	682 litres
Additional water storage per shower en-suite in the above	90 litres

8 BUILDING LIFE CYCLE

The new Apartment Guidelines are as outlined in the Introduction in this Document.

Under Section 6.0 Operation and Management of Apartment Developments states the following:

"*Certainty regarding the long-term management and maintenance structures that are put in place for an apartment scheme is a critical aspect of this form of residential development. It is essential that robust legal and financial arrangements are provided to ensure that an apartment development is properly managed, with effective and appropriately resourced maintenance and operational regimes.*

In this regard, consideration of the long-term running costs and the eventual manner of compliance of the proposal with the Multi-Unit Developments Act, 2011 are matters which should be considered as part of any assessment of a proposed apartment development.

Accordingly, planning applications for apartment development shall include a building lifecycle report which in turn includes an assessment of long-term running and maintenance costs as they would apply on a per residential unit basis at the time of application, as well as demonstrating what measures have been specifically considered by the proposer to effectively manage and reduce costs for the benefit of residents".

Design Measures to ensure Low Maintenance and Low Running Costs
The following measures will be incorporated into the Design to achieve Low Maintenance and Running Costs.

These measures will include but not limited to;

- Efficient Heating System using LPHW Panel Radiators
- Efficient Hot Water Generation also using Air Heat Pump Technology
- Low Air Infiltration reducing heat losses
- User friendly Heating and Hot Water Controls to enhance occupant comfort and reduce over heating
- Heat recovery ventilation system in house units
- LED Low Energy Lighting throughout

Estimated Annual Heating, Hot Water and Lighting Running Costs.
All of the dwellings have been scheduled together with their calculated energy consumption and energy consumption costings.

It is intended this information will be used to feed into an overall building Life Cycle Report which will also have input from the Client, Property Managers and Consultants.