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# Woodbrook Phase 1

## Energy Statement Report

Aeval

October 2019

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This document has 25 pages including the cover.

## Document history

| Revision | Purpose description | Origin-ated | Checked | Reviewed | Author-ised | Date |
|---|---|---|---|---|---|---|
| Rev 0 | Planning (For Information) | NS | MT | NS | KB | 06.08.19 |
| Rev 1 | Planning Submission | NS | MT | NS | KB | 29.10.19 |
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## Client signoff

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|---|---|
| Client | Aeval |
| Project | Woodbrook Phase 1- Woodbrook Phase 1 |
| Job number | 5154251 |
| Client signature / date | |

# Contents

# Introduction

This document has been prepared and checked in accordance with Atkins BS OHSAS 18001:2007, EN ISO 9001:2015 and EN ISO 14001:2015.

This document has been prepared by Atkins, with all practical experience, caution and persistent work within the terms of the Contract with the Client, take into account of the resources devoted to us by agreement with the Client.

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# Executive Summary

This report demonstrates how Developer and design team will improve energy performance will be achieved, and over and above that required by the building regulations and energy efficiency through climate sensitive design that takes account of orientation and typography, and retention of existing site features wherever possible.

Developer and design team will show consideration of fabric performance, renewable technologies and efficient and clean building services.

This is proposed report has been prepared as a compliance requirement for planning applications made in accordance with Dun Laoghaire Rathdown County Council guidelines.

The Residential units and other commercial buildings will achieve the nearly zero or very low amount of energy required to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby and in compliance with PART L / or NZEB.

The energy performance of each house will comply with the requirements of the building regulations, achieving a BER of A3 or better. Detail of the energy performance is included in this report.

This report includes the following elements: -

1. Water Conservation Report
2. Energy Efficiency / Sustainability
3. Part L / Nearly Zero Energy Building (NZEB)
4. Building Life Cycle.
5. Key Energy Reduction and Sustainability Energy
6. Performance Details for the Mechanical and Electrical Services (As described in Appendix A).

# 1. Water Conservation Plan

## 1.1. Water Consumption

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 to be considered which will be included in the design of the water services installation. This approach will reduce the consumption of site development potable water.

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 for phase 1.

The following table itemising maximum water consumption for several appliances:

| Application | Standard (Minimum) |
|---|---|
| Dual Flush Cistern | 6/4 Litres or better |
| Mixer Showers | <9 Litres / min |
| Basin Taps | Aerating Taps (approx. 0.5l/use) |

## 1.2. Water Storage Provision

The table below indicates 24 hours typical storage requirements related to commonly used fitting: -

| Apartment | Storage Capacity |
|---|---|
| 1 Bed | 227 Litres |
| 2 Bed, (1bath+ 1WC) | 227 Litres |
| 3 Bed (2 bath) | 682 Litres |

# 2. Energy Efficiency / Sustainability

## 2.1. 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.

## 2.2. 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 relevant current/ near future building regulations (Part L 2018 / public consultation).

Target U-Values are acknowledged in below table.

| Element | Building Regulation (w/m² °k) | Fosters Avenue (w/m² °k) | Statement |
|---|---|---|---|
| Walls | 0.18 | 0.18 | Compliant |
| Floors | 0.18 | 0.15 | Compliant |
| Windows | 1.4 | 1.4 | Compliant |
| Roofs | 0.2 | 0.2 | Compliant |

## 2.3. 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% 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 3m3/m2/hr has been identified.

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

- BS EN 13829:2001 – Title, Thermal Performance of the Buildings; Determination of Air Permeability of Buildings, Fan Pressurisation Method (i.e. Intended for the measurement of the air permeability of buildings or parts of buildings in the field. Specifies the use of mechanical pressurisation or depressurisation of a building or part of a building. Also describes the measurement of the resulting air flow rates over a range of indoor-outdoor static pressure differences. Intended for the measurement of the air leakage of building envelopes of single-zone buildings).

- CIBSE TM23: 2000 ‘Testing Buildings for Air Leakage”

## 2.4. 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.

## 2.5. Combined Heat & Power, if Appropriate

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.

## 2.6. 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 the 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 the heat pumps and the associated boreholes is not considered to be justified by the potential savings that would be achieved.

Air source heat pump technology is a viable solution for this project. Locations for external condensers / central air to water heat pump have been located.

Heat Pump technology will be included in the development.

## 2.7. Bio-Mass Boilers

The use of bio-fuel 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.

## 2.8. 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.

## 2.9. Solar PV

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.

## 2.10. Wind Turbines

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

## 2.11. Conclusion

From the outset of the design process an integrated approach has been adopted which involved all members of the design team with focus and a holistic approach to sustainable design with a goal to provide a building that is designed in an environmentally sensitive manner while meeting the required comfort conditions of the project. It is the intention of the team that this approach will be continued through the detailed design process to ensure the targets identified are achieved.

The proposed solution will incorporate heat pumps and photovoltaic panels.

BER Target NZEB Compliance Apartments rated at A2 / or A3.

# 3. Part L / Nearly Zero Energy Building (NZEB)

## 3.1. Overview

This section sets out to review the method of compliance with building regulations to the residences 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.

*Note:*
*There are a large number of variables to be taken into account, so any changes will need to be re-calculated to ensure that compliance is still achievable.*

At this early stage of the project, a number of assumptions have been made regarding fabric performance.

Four types of apartment have been examining in this report: -

- A typical mid storey 2 bed apartment
- A typical mid storey 1 bed apartment
- A typical top storey 2 bed apartment
- A typical top storey 1 bed apartment

The dwelling has been analysed for compliance with the 2018 TGD for Part L (NZEB).

This document has only been released for public consultation, and the contents may well change when the submissions have been considered.

Unforeseen requirements may necessitate alterations to the design when the full 2018 TGD is released.

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 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, 20% of the building energy must be provided via renewable technologies. This is measured in the form of a renewable energy ratio (RER).

The design will be achieved with the proposed NZEB specification using a combination of different system design solutions. The average uplift in cost across all dwelling types to be modelled would be 1.9%. The range of uplift approximate to 0.7% to 4.2% over current construction costs depending on the dwelling archetype and design specification applied.

The overheating analysis risk will be based on the CIBSE TM 59 overheating assessment methodology and criteria. It will be suggested that the mitigation package can be fairly limited, given that there were only marginal exceedances in selected rooms. The adopted mitigation strategy assumes occupant-controlled via curtain/ blinds on the east, west and/or south façade. When this strategy is adopted all dwellings is excepted to pass the CIBSE TM 59 overheating risk assessment criteria.

An analysis of the feasibility of photovoltaics and heat pumps will be carried on multi-storey apartment blocks. Also, Heat pumps have been found to be a viable solution to meet the renewables contribution on all multi storey apartment blocks.

Solar PV (Photovoltaics) are a viable option for apartment blocks up to 12-storeys in height.

## 3.5. Maximum Elemental U-Values

Technical Guidance Document Part L 2018 (public consultation) sets out maximum U-Values which may not be exceeded for each construction type: -

| Fabric Elements | Area Weighted / Average Element U-Value (Um) | Average Element U-Value Individual Element or Section Element |
|---|---|---|
| Roof<br><br>Pitched Roof<br>- Insulation at Ceiling<br>- Insulation on Slope<br><br>Flat Roof | <br><br>0.16<br><br>0.16<br><br>0.20 | 0.3 |
| Walls | 0.18 | 0.6 |
| Ground Floor | 0.18 | 0.6 |
| Other Exposed Floors | 0.18 | 0.6 |
| External Doors, Windows and Rooflights | 0.14 | 3.0 |

## 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 2018 (public consultation) were used for the purposes of this analysis.

All 3 options were based on the same fabric design, so ensure a like-for- like comparison. The fabric input data and all three options are laid out in this section.

### 3.6.1. Fabric performance

U- Value thermal properties:

- External Wall 0.18 W/m2k
- Roof 0.20 W/m2k
- Ground 0.15 W/m2k
- Windows 1.40 W/m2k (Double glazing)
- Thermal Bridging 0.08 W/m2.K

Air tightness test according to CIBSE TM 23 best practice standards to achieve 3 m3/m2/hr at 50Pa or 0.15 air changes per hour. The thermal mass of each apartment varies between low-medium. Three Heating System Types will be analysed and checked for NZEB Compliance.

## 3.7. Initial Specification to Achieve 70% Improvement on Part L

Based on the A fabric and services specification was agreed with Department of Housing, Planning and Local Government (DHPLG) and Sustainable Energy Authority Ireland (SEAI) to ensure that it was technically feasible and it was a reasonable approach to achieve this level of improvement. AECOM then varied the amount of photovoltaics to achieve the 70% improvement.

Table 2 shows the current specification to meet Part L (taken from Appendix E of TGD L 2011) and the new specification to achieve the 70% improvement. In particular, the new specification includes triple glazing, no secondary space heating system, and approximately 10% more PV installed in order to achieve the MPEPC of 0.30. The improvement in performance is shown in Table 3.

The following options are the systems to be analysed.

## 3.8. Option 1 – Gas Fired Boilers & Solar PV

### 3.8.1. Ventilation:

- Demand controlled ventilation system – whole house extract
- Performance based on Aereco DCV system
- SFP of 0.29

### 3.8.2. Domestic hot water:

- Provided by the same gas-fired boiler as the space heating
- Stored in a 180 litre hot water cylinder
- Performance based on the Kingspan Albion Ultrasteel
- Daily heat loss of 1.32 kWh
- Boiler with insulated primary pipework and with cylinder thermostat

### 3.8.3. Lighting Fixtures:

- 100% low-energy fittings (i.e. LEDs)

### 3.8.4. Space heating:

- Central heating system with radiators
- Supplied by a gas-fired boiler
- Efficiency of 91.2%

### 3.8.5. Renewables:

PV panels are proposed to provide the renewable contribution as indicated on the following table:

| Apartment Type | No. of PV Panels | Area of PV Panels (m2) |
|---|---|---|
| 2 bed mid-floor | 7 | 12 |
| 1 bed mid-floor | 5 | 8 |
| 2 bed top-floor | 10 | 16 |
| 1 bed top-floor | 6 | 10 |

- This is based on 320W panels at an angle of 15˚ (South Facing)
- Total area given does not include spacing between panels to avoid self-shading

## 3.9. Option 2 – NIBE Exhaust Air Heat Pumps

### 3.9.1. Ventilation:

- Whole-house extract by the NIBE system
- Exhaust air fed through the heat pump unit to extract heat
- SFP of 0.70

Note: NIBE - Heating & Energy
Types:

- Ground Source / Geothermal Heat Pumps,
- Exhaust Air Heat Pumps,
- Air to Water Heat Pumps.

### 3.9.2. Domestic hot water:

- Provided by the same heat pump boiler as the space heating
- Stored in a 180 litre hot water cylinder
- Performance based on the NIBE F730
- Daily heat loss of 2.02 kWh
- Boiler and thermal store within a single casing
- Hot water efficiency of 194%

### 3.9.3. Lighting Fixture:

- 100% low-energy fittings (i.e. LEDs)

### 3.9.4. Space heating:

- Central heating system with underfloor heating
- Supplied by exhaust air heat pump
- Performance based on NIBE F730
- Efficiency in the range of 360% (varies based on heat loss)

### 3.9.5. Renewables:

PV panels are proposed to provide the renewable contribution as indicated on the following table:

| Apartment Type | No. of PV Panels | Area of PV Panels (m2) |
|---|---|---|
| 2 bed mid-floor | 4 | 7 |
| 1 bed mid-floor | 3 | 5 |
| 2 bed top-floor | 5 | 8 |
| 1 bed top-floor | 4 | 7 |

- This is based on 320W panels at an angle of 15˚ (South Facing)
- Total area given does not include spacing between panels to avoid self-shading

## 3.10. Option 3 – Centralised Air-Source Heat Pumps & Micro-Heat Pumps

### 3.10.1. Ventilation:

- Demand controlled ventilation system – whole house extract
- Performance based on Aereco DCV system
- SFP of 0.29

### 3.10.2. Domestic hot water:

- Provided by the same heat pump boiler as the space heating
- No storage within the apartment, based on community heating
- Hot water efficiency of 338%

### 3.10.3. Lighting:

- 100% low-energy fittings (i.e. LEDs)

### 3.10.4. Space heating:

- Group heating system with underfloor heating
- Centralised heat pump system produces hot water for a low-temperature distribution system
- Centralised heat pump efficiency of 338%
- Micro- heat pump (such as Zeroth) in each apartment increases the temperature of the water from low-temperature to that required to serve underfloor heating and hot water

There is currently no approved methodology for simulating this using the DEAP software. There is an agreement with the BRE in the UK, that the efficiency of the internal unit be discounted from the calculations. Zeroth are currently negotiating with SEAI on this matter, and in the meantime, we have followed the BRE's SAP methodology to analyse this system.

### 3.10.5. Renewables:

PV panels are proposed to provide the renewable contribution as indicated on the following table:

| Apartment Type | No. of PV Panels | Area of PV Panels (m2) |
|---|---|---|
| 2 bed mid-floor | 2 | 3.2 |
| 1 bed mid-floor | 1 | 1.6 |
| 2 bed top-floor | 3 | 4.8 |
| 1 bed top-floor | 1 | 1.6 |

- This is based on 320W panels at an angle of 15˚ (South Facing)
- Total area given does not include spacing between panels to avoid self-shading

## 3.11. Conclusion

Based on analysis of the useable roof space of the building, options 1 and 2 are not feasible methods of providing Space Heating and Hot Water Generation as the required number of PV panels under both options exceeds the area of useable roof space. Therefore, with the current building elements & parameters the only viable option to proceed with is option 3.

# 4. Building Life Cycle

The new Apartment Guidelines are as outlined and in conjunction of the Building Lifecycle Report. 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".

## 4.1. 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 Exhaust Air Heat Pump Technology
- Efficient Hot Water Generation also using Exhaust 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
- LED Low Energy Lighting throughout

## 4.2. Estimated Annual Heating, Hot Water and Lighting Running Costs.

All of the apartment units 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.

# 5. Key Energy Reduction and Sustainable Design

BER minimum of A-3.

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

Reduction in $CO_2$ Emissions compared to a Building Regulation Compliant Residential Building to Part L 2018 (public consultation)

| Element Criteria | Building Regulation (w/m² °k) | Fosters Avenue (w/m² °k) | Statement |
|---|---|---|---|
| Walls | 0.18 | 0.18 | Compliant |
| Floors | 0.18 | 0.15 | Compliant |
| Windows | 1.4 | 1.4 | Compliant |
| Roofs | 0.2 | 0.2 | Compliant |

Air Tightness Test to achieve 3m³/m²/hrs a 60% improvement on the Building Regulations advised upper limit figure.

Use of LED Lights. LED lights in the residences and in the Landlords areas.

# Appendices

# Appendix A. MEP Building Services Performance

## A.1. Mechanical System Design

| Item No. | Service System / Mechanical |
|---|---|
| **A 1.1** | **Proposed 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.<br><br>*Indoor Climate:*<br>Operative temperature: Winter mode: min. 21°C<br>*Outdoor Design Conditions – Dublin:*<br><br>Winter: Temperature -5˚C 100% RH<br>Summer: Temperature 26˚C (dry bulb)<br>Humidity: 19.5˚C wb (wet bulb)<br>*Air Quality:*<br>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. |
| **A 1.2** | **Heating Design Criteria** |
| | Air to Water central heat pump serving a low temperature water loop with individual water to water heat pumps located within each apartment, delivering a very high efficiency heating system.<br>Wall mounted panel radiators will provide the required heat output in each room in the apartments.<br>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. |
| **A 1.3** | **Water Design Criteria** |
| | 24 hour centralised water storage shall be provided based on Building Regulations and Irish Water Requirements. Potable water shall be provided to each kitchen in each apartment.<br>W.C. cisterns shall have a maximum flushing capacity of 6 litres. |
| **A 1.4** | **Sprinkler Design Criteria** |
| | First aid firefighting will be provided in accordance with building regulation requirements. |
| **A 1.5** | **Sanitary Design Criteria** |
| | The soils and waste installation shall be in lead free µPVC. |

## A.2. Electrical System Design

| Item No. | Service System / Electrical |
|---|---|
| **A 2.1** | **Proposed 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.<br>▪ The general services provision shall be in accordance with DCC social and affordable housing guide, requirements, where required. |
| **A 2.2** | **Site Utilities Infrastructure Design Criteria** |
| | ▪ Overall Site Works Infrastructure i.e. ESB, TV / Eircom.<br>▪ A dedicated ESB sub-station will be sited in the development to serve the entire site. The supply to the apartments will be at LV. Switchgear shall be located in areas protected from influence of sea salt corrosions, flooding or water ingress.<br>▪ Overall public and common areas such as power and control for the gates and site small power requirement. |
| **A 2.3** | **LV Switchgear, Main and Sub distribution Design Criteria** |
| | ▪ ESB metering for each dwelling will be provided.<br>▪ All main distribution boards will be Form 4b with Local Board Form 3b.<br>▪ A separate ESB metered landlord distribution board will be provided for each block.<br>▪ Power Factor Correction equipment will be provided by the Landlord to ensure a minimum corrected value of 0.95 exists on all phases. |
| **A 2.4** | **Standby Power Supply Design Criteria** |
| | ▪ Standby generator will be provided by the Landlord to support all firefighting and life safety systems in the building, if and where required. |
| **A 2.5** | **Lightning Protection / Voltage Equalising Equipment Design Criteria** |
| | ▪ The building will be equipped with lightning arresters in the form of roof leads, down-leads, ring leads and foundation earth points.<br>▪ 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.<br>▪ 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. |
| **A 2.6** | **Cable Containment Distribution (Duct Systems) Design Criteria** |
| | The duct system in common areas will include for four separate cable runways.<br>▪ One for LV power, control and supervisory equipment<br>▪ One for the data network<br>▪ One for ELV functions<br>▪ One for Fire Alarm<br>▪ |
| **A 2.7** | **General and Emergency Lighting & Controls Design Criteria** |
| | ▪ External lighting will be provided in car park and access areas in compliance with design standards.<br>▪ 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.<br>▪ 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. |
| **A 2.8** | **Fire Alarm Design Criteria** |
| | ▪ The fire alarm system will comply with IS3218. The system will be designed for L3 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. |
| **A 2.9** | **Security Design Criteria** |
| | ▪ 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. |
| **A 2.10** | **Satellite Design Criteria** |
| | ▪ Where appropriate, space for 1no. / 1200mm (nominal diameter) satellite dish will be allowed, location on the roof. The dish needs to be able to see an arc of the sky from southeast to southwest, above an angle of 20 degrees elevation. |

## A.3. Lifts System Design

| Item No. | Lifts |
|---|---|
| **A 3.1** | **Passenger Lifts** |
| | The passenger lifts will provide a level of service which meets or exceeds the following: -<br><br>▪ Internal lift car dimensions – as per lift traffic analysis (i.e. 8 to 10 persons capacity approximate).<br>▪ Lift door clear height 2100mm<br>▪ All lifts serve all floors including basement levels quality internal car finish, and as appropriate<br>▪ Customer display in car<br>▪ All lifts to comply with EN 81. |
| **A 3.2** | **Firefighting Lifts** |
| | ▪ To be provided in accordance with BS 9999:2008, if and where required |

## A.4. Health & Safety / Acts & Regulations System Design

| Item No. | Lifts |
|---|---|
| **A 4.1** | **Statutory Design Criteria** |
| | ▪ The M&E Installation(s) will comply with all Acts, relevant Statutory Instruments and Regulations as indicated in this document and General Construction Works Regulations". |
| **A 4.2** | **Technical Design Criteria** |
| | ▪ The M&E design will be fully compliant with the current Irish Building Regulations – Technical Guidance Documents.<br>▪ The services will be certified to in full accordance with the particular technical requirements as set out in the service providers' construction guidelines. |
| **A 4.3** | **Utility Design Criteria** |
| | ▪ All utility installations will be robust and conform to Irish and European Standards and Codes of Practice. |
| **A 4.4** | **CE Marking Design Criteria** |
| | ▪ The MEP equipment, systems supplied and installed will conform to the appropriate EU Directives and shall carry the applicable CE Marking. |
| **A 4.5** | **Directives Design Criteria** |
| | ▪ Suppliers of M&E and electronic equipment shall comply with the Waste Management (Waste Electrical and Electronic Equipment) Regulations 2005 and the Waste Management (Restriction of Certain Hazardous Substances in Electrical and Electronic Equipment) Regulations 2005, and The Low Voltage directive (LVD) 2014/35/EU.<br>▪ In the absence of a specific recommendation or requirements not covered by the ETCI National Rules, then the IEE Regulations 17th Edition (Revised) will be followed.<br>▪ All systems shall be commissioned in accordance with CIBSE and BSRIA codes. |
| **A 4.6** | **Testing & Commissioning** |
| | ▪ 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. |
| **A 4.7** | **Health & Safety** |
| | ▪ All works carried out shall be in full accordance with the Safety, Health & Welfare at Work Act 2005 and SI 291 - Safety, Health and Welfare at Work (Construction) Regulations 2013. |

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