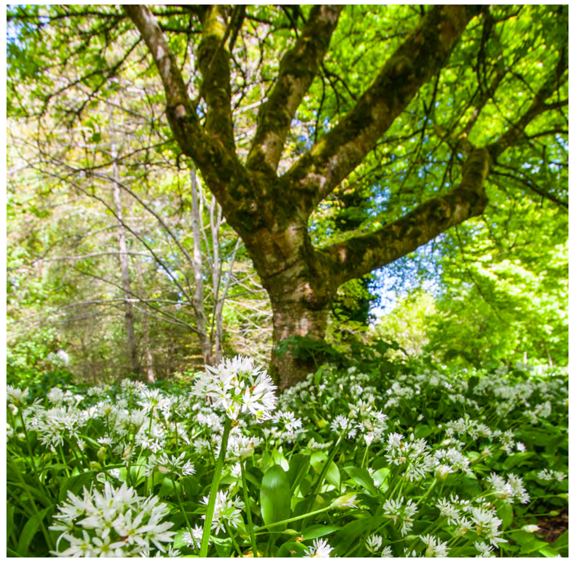
LACKENROE **SHD**

APPENDIX 12

Air Quality & Climate



VOLUME III | Appendices

LACKENROE **SHD**

APPENDIX 12-1

Ambient Air Quality Standards

VOLUME III | Appendices

APPENDIX 12.1 Ambient Air Quality Standards

National standards for ambient air pollutants in Ireland have generally ensued from Council Directives enacted in the EU (& previously the EC & EEC) (see Table 12-1). The initial interest in ambient air pollution legislation in the EU dates from the early 1980s and was in response to the most serious pollutant problems at that time which was the issue of acid rain. As a result of this sulphur dioxide, and later nitrogen dioxide, were both the focus of EU legislation. Linked to the acid rain problem was urban smog associated with fuel burning for space heating purposes. Also apparent at this time were the problems caused by leaded petrol and EU legislation was introduced to deal with this problem in the early 1980s.

In recent years the EU has focused on defining a basis strategy across the EU in relation to ambient air quality. In 1996, a Framework Directive, Council Directive 96/62/EC, on ambient air quality assessment and management was enacted. The aims of the Directive are fourfold. Firstly, the Directive's aim is to establish objectives for ambient air quality designed to avoid harmful effects to health. Secondly, the Directive aims to assess ambient air quality on the basis of common methods and criteria throughout the EU. Additionally, it is aimed to make information on air quality available to the public via alert thresholds and fourthly, it aims to maintain air quality where it is good and improve it in other cases.

As part of these measures to improve air quality, the European Commission has adopted proposals for daughter legislation under Directive 96/62/EC. The first of these directives to be enacted, Council Directive 1999/30/EC, has been passed into Irish Law as S.I. No 271 of 2002 (Air Quality Standards Regulations 2002), and has set limit values which came into operation on 17th June 2002. Council Directive 1999/30/EC, as relating to limit values for sulphur dioxide, nitrogen dioxide, lead and particulate matter, is detailed in Table 13.1. The Air Quality Standards Regulations 2002 detail margins of tolerance, which are trigger levels for certain types of action in the period leading to the attainment date. The margin of tolerance varies from 60% for lead, to 30% for 24-hour limit value for PM_{10}, 40% for the hourly and annual limit value for NO_2 and 26% for hourly SO_2 limit values. The margin of tolerance commenced from June 2002, and started to reduce from 1 January 2003 and every 12 months thereafter by equal annual percentages to reach 0% by the attainment date. A second daughter directive, EU Council Directive 2000/69/EC, has published limit values for both carbon monoxide and benzene in ambient air. This has also been passed into Irish Law under the Air Quality Standards Regulations 2002.

The most recent EU Council Directive on ambient air quality was published on the 11/06/08 which has been transposed into Irish Law as S.I. 180 of 2011. Council Directive 2008/50/EC combines the previous Air Quality Framework Directive and its subsequent daughter directives. Provisions were also made for the inclusion of new ambient limit values relating to $PM_{2.5}$. The margins of tolerance specific to each pollutant were also slightly adjusted from previous directives. In regards to existing ambient air quality standards, it is not proposed to modify the standards but to strengthen existing provisions to ensure that non-compliances are removed. In addition, new ambient standards for $PM_{2.5}$ are included in Directive 2008/50/EC. The approach for $PM_{2.5}$ was to establish a target value of 25 μg/m^3, as an annual average (to be attained everywhere by 2010) and a limit value of 25 μg/m^3, as an annual average (to be attained everywhere by 2015), coupled with a target to reduce human exposure generally to $PM_{2.5}$ between 2010 and 2020. This exposure reduction target will range from 0% (for $PM_{2.5}$ concentrations of less than 8.5 μg/m^3 to 20% of the average exposure indicator (AEI) for concentrations of between 18 - 22 μg/m^3). Where the AEI is currently greater than 22 μg/m^3 all appropriate measures should be employed to reduce this level to 18 μg/m^3 by 2020. The AEI is based on measurements taken in urban background locations averaged over a three year period from 2008 - 2010 and again from 2018-2020. Additionally, an exposure concentration obligation of 20 μg/m^3 was set to be complied with by 2015 again based on the AEI.

Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions. The Alert Threshold is defined in Council Directive 96/62/EC as "a level beyond which there is a risk to human health from brief exposure and at which immediate steps shall be taken as laid down in Directive 96/62/EC". These steps include undertaking to ensure that the necessary steps are taken to inform the public (e.g. by means of radio, television and the press).

The Margin of Tolerance is defined in Council Directive 96/62/EC as a concentration which is higher than the limit value when legislation comes into force. It decreases to meet the limit value by the attainment date. The Upper Assessment Threshold is defined in Council Directive 96/62/EC as a concentration above which high quality measurement is mandatory. Data from measurement may be supplemented by information from other sources, including air quality modelling.

An annual average limit for both NO_X (NO and NO_2) is applicable for the protection of vegetation in highly rural areas away from major sources of NO_X such as large conurbations, factories and high road vehicle activity such as a dual carriageway or motorway. Annex VI of EU Directive 1999/30/EC identifies that monitoring to demonstrate compliance with the NO_X limit for the protection of vegetation should be carried out distances greater than:

- 5 km from the nearest motorway or dual carriageway
- 5 km from the nearest major industrial installation
- 20 km from a major urban conurbation

As a guideline, a monitoring station should be indicative of approximately 1000 km^2 of surrounding area.

Under the terms of EU Framework Directive on Ambient Air Quality (96/62/EC), geographical areas within member states have been classified in terms of zones. The zones have been defined in order to meet the criteria for air quality monitoring, assessment and management as described in the Framework Directive and Daughter Directives. Zone A is defined as Dublin and its environs, Zone B is defined as Cork City, Zone C is defined as 23 urban areas with a population greater than 15,000 and Zone D is defined as the remainder of the country. The Zones were defined based on among other things, population and existing ambient air quality.

EU Council Directive 96/62/EC on ambient air quality and assessment has been adopted into Irish Legislation (S.I. No. 33 of 1999). The act has designated the Environmental Protection Agency (EPA) as the competent authority responsible for the implementation of the Directive and for assessing ambient air quality in the State. Other commonly referenced ambient air quality standards include the World Health Organisation. The WHO guidelines differ from air quality standards in that they are primarily set to protect public health from the effects of air pollution. Air quality standards, however, are air quality guidelines recommended by governments, for which additional factors, such as socio-economic factors, may be considered.

LACKENROE **SHD**

APPENDIX 12-2

Transport Infrastructure Ireland Significance Criteria

VOLUME III | Appendices

APPENDIX 12.2 Transport Infrastructure Ireland Significance Criteria

Magnitude of Change	Annual Mean NO_2 / PM_{10}	No. days with PM_{10} concentration > 50 µg/m^3	Annual Mean $PM_{2.5}$
Large	Increase / decrease ≥4 µg/m^3	Increase / decrease >4 days	Increase / decrease ≥2.5 µg/m^3
Medium	Increase / decrease 2 - <4 µg/m^3	Increase / decrease 3 or 4 days	Increase / decrease 1.25 - <2.5 µg/m^3
Small	Increase / decrease 0.4 - <2 µg/m^3	Increase / decrease 1 or 2 days	Increase / decrease 0.25 - <1.25 µg/m^3
Imperceptible	Increase / decrease <0.4 µg/m^3	Increase / decrease <1 day	Increase / decrease <0.25 µg/m^3

Table A12.2.1 Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Absolute Concentration in Relation to Objective/Limit Value	Change in Concentration Note 1		
	Small	**Medium**	**Large**
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m^3 of NO_2 or PM_{10}) (≥25 µg/m^3 of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m^3 of NO_2 or PM_{10}) (22.5 - <25 µg/m^3 of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (30 - <36 µg/m^3 of NO_2 or PM_{10}) (18.75 - <22.5 µg/m^3 of $PM_{2.5}$)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<30 µg/m^3 of NO_2 or PM_{10}) (<18.75 µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m^3 of NO_2 or PM_{10}) (≥25 µg/m^3 of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m^3 of NO_2 or PM_{10}) (22.5 - <25 µg/m^3 of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (30 - <36 µg/m^3 of NO_2 or PM_{10}) (18.75 - <22.5 µg/m^3 of $PM_{2.5}$)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<30 µg/m^3 of NO_2 or PM_{10}) (<18.75 µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight Beneficial

Note 1 Well Below Standard = <75% of limit value.

Table A12.2.2 Air Quality Impact Significance Criteria For Annual Mean Nitrogen Dioxide and PM_{10} and $PM_{2.5}$ Concentrations at a Receptor

LACKENROE **SHD**

APPENDIX 12-3

Dust Management Plan

VOLUME III | Appendices

APPENDIX 12.3 Dust Management Plan

The objective of dust control at the site is to ensure that no significant nuisance occurs at nearby sensitive receptors. In order to develop a workable and transparent dust control strategy, the following management plan has been formulated by drawing on best practice guidance from Ireland, the UK (IAQM (2014), The Scottish Office (1996), UK Office of Deputy Prime Minister (2002) and BRE (2003)) and the USA (USEPA (1997)).

Site Management
The aim is to ensure good site management by avoiding dust becoming airborne at source. This will be done through good design and effective control strategies.
At the construction planning stage, the siting of activities and storage piles will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance (see Figure 13.1 for the windrose for Casement Aerodrome). As the prevailing wind is predominantly westerly to south-westerly, locating construction compounds and storage piles downwind (to the east) of sensitive receptors will minimise the potential for dust nuisance to occur at sensitive receptors.

Good site management will include the ability to respond to adverse weather conditions by either restricting operations on-site or quickly implementing effective control measures before the potential for nuisance occurs. When rainfall is greater than 0.2mm/day, dust generation is generally suppressed (UK Office of Deputy Prime Minister (2002), BRE (2003)). The potential for significant dust generation is also reliant on threshold wind speeds of greater than 10 m/s (19.4 knots) (at 7m above ground) to release loose material from storage piles and other exposed materials (USEPA, 1986). Particular care should be taken during periods of high winds (gales) as these are periods where the potential for significant dust emissions are highest. The prevailing meteorological conditions in the vicinity of the site are favourable in general for the suppression of dust for a significant period of the year. Nevertheless, there will be infrequent periods were care will be needed to ensure that dust nuisance does not occur. The following measures shall be taken in order to avoid dust nuisance occurring under unfavourable meteorological conditions:

- The Principal Contractor or equivalent must monitor the contractors' performance to ensure that the proposed mitigation measures are implemented and that dust impacts and nuisance are minimised;
- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions;
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details;
- It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses;
- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out;
- It is the responsibility of the contractor at all times to demonstrate full compliance with the dust control conditions herein;
- At all times, the procedures put in place will be strictly monitored and assessed.

The dust minimisation measures shall be reviewed at regular intervals during the works to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed and satisfactory procedures implemented to rectify the problem. Specific dust control measures to be employed are described below.

Site Roads / Haulage Routes

Movement of construction trucks along site roads (particularly unpaved roads) can be a significant source of fugitive dust if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25 to 80% (UK Office of Deputy Prime Minister, 2002).

- A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles using unpaved site roads;
- Access gates to the site shall be located at least 10m from sensitive receptors where possible;
- Bowsers or suitable watering equipment will be available during periods of dry weather throughout the construction period. Research has found that watering can reduce dust emissions by 50% (USEPA, 1997). Watering shall be conducted during sustained dry periods to ensure that unpaved areas are kept moist. The required application frequency will vary according to soil type, weather conditions and vehicular use;
- Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only.

Land Clearing / Earth Moving

Land clearing / earth-moving works during periods of high winds and dry weather conditions can be a significant source of dust.

- During dry and windy periods, and when there is a likelihood of dust nuisance, watering shall be conducted to ensure moisture content of materials being moved is high enough to increase the stability of the soil and thus suppress dust;
- During periods of very high winds (gales), activities likely to generate significant dust emissions should be postponed until the gale has subsided.

Storage Piles

The location and moisture content of storage piles are important factors which determine their potential for dust emissions.

- Overburden material will be protected from exposure to wind by storing the material in sheltered regions of the site. Where possible storage piles should be located downwind of sensitive receptors;
- Regular watering will take place to ensure the moisture content is high enough to increase the stability of the soil and thus suppress dust. The regular watering of stockpiles has been found to have an 80% control efficiency (UK Office of Deputy Prime Minister, 2002);
- Where feasible, hoarding will be erected around site boundaries to reduce visual impact. This will also have an added benefit of preventing larger particles from impacting on nearby sensitive receptors.

Site Traffic on Public Roads

Spillage and blow-off of debris, aggregates and fine material onto public roads should be reduced to a minimum by employing the following measures:

- Vehicles delivering or collecting material with potential for dust emissions shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust;
- At the main site traffic exits, a wheel wash facility shall be installed if feasible. All trucks leaving the site must pass through the wheel wash. In addition, public roads outside the site shall be regularly inspected for cleanliness, as a minimum on a daily basis, and cleaned as necessary.

Summary of Dust Mitigation Measures

The pro-active control of fugitive dust will ensure that the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released, will contribute towards the satisfactory performance of the contractor. The key features with respect to control of dust will be:

- The specification of a site policy on dust and the identification of the site management responsibilities for dust issues;
- The development of a documented system for managing site practices with regard to dust control;
- The development of a means by which the performance of the dust minimisation plan can be regularly monitored and assessed; and
- The specification of effective measures to deal with any complaints received.

LACKENROE **SHD**

APPENDIX 12-4

Energy Statement - AECOM

VOLUME III | Appendices

AECOM

Development at Glouthaune

Energy Statement

Bluescape Ltd

01 November 2021

Delivering a better world

Quality information

Prepared by	Checked by	Verified by	Approved by
Sinead Muldoon Senior Mechanical Engineer	Eoin Doohan Associate Director	Keith Fitzpatrick Associate Director	Raymond Reilly Regional Director

Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	01.11.2021	For Information	RR	Raymond Reilly	Regional Director

Distribution List

# Hard Copies	PDF Required	Association / Company Name
	1	Bluescape Ltd

Prepared for:

Bluescape Ltd

Prepared by:

Sinead Muldoon
Senior Mechanical Engineer
T: +353-87-115-3585
E: sinead.muldoon@aecom.com

AECOM Ireland Limited
4th Floor
Adelphi Plaza
Georges Street Upper
Dun Laoghaire
Co. Dublin A96 T927
Ireland

T: +353 1 238 3100
aecom.com

Table of Contents

1. Introduction

The purpose of this document is to outline the proposed energy conservation approach / strategy for the proposed residential development at Glounthaune, Co. Cork. The goal of the energy strategy will be to provide high efficiency, low energy, sustainable building services systems to minimise the carbon footprint of this development. The development will follow the objectives and requirements of the 'Cork County Development Plan 2014' and the 'Cobh Municipal District Local Area Plan 2017'.

Reducing carbon dioxide emissions into the atmosphere to reduce impact on climate change is one of the major objectives of sustainable development. This document will outline the energy efficiency measures, on site generation and embedded renewable energy strategies that could be adopted to substantially reduce the energy demands and carbon emissions, arising from fossil fuel use, from the proposed development at Glounthaune, Co. Cork.

2. Design Basis

Part L of the Building Regulations & Nearly Zero Energy Buildings (NZEB)

The EU Energy Performance of Buildings Directive (EPBD), transposed into Irish Law from 2006 onwards, contains a range of provisions to improve the energy performance of new and existing buildings. It is the main European legislative instrument to improve energy performance of buildings within the EU. In 2010 the EPBD was recast to include the requirement that member states should ensure that all new buildings are 'Nearly Zero- Energy Buildings' by the 31st December 2020.

'Nearly Zero-Energy Buildings', or NZEB, means a building that has a very high energy performance, as determined in accordance with Annex I of the EPBD. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on site or nearby. The actual energy performance to meet NZEB standards are set by the member states using cost optimal analyses and guidelines set by the EU Commission.

A revised Part L of the Building Regulations (to incorporate S.I. No. 292/2019 – European Union (Energy Performance of Buildings) for Dwellings was issued and transposed into Irish law in 2019. Some of the improvements over previous Part L Regulations include:

For dwellings a reduction in the Energy Performance Coefficient (EPC) from 0.4 to 0.3 (an improvement in performance of 25%)

For dwellings amendments to the renewable energy provisions

Increased thermal performance of the building fabric (lower U values and air permeability)

Changes in the Dwelling Energy Assessment Procedure (DEAP) including more emphasis on hot water efficiency

More emphasis on energy efficient lighting design

Increased requirements for renovation projects

Amendments to the renewable energy provision calculations

Improved Mechanical & Electrical Services and Lighting specifications.

The regulations represent a marked improvement in building standards with respect to energy efficiency. The revised Part L Regulations will heavily influence the design of the proposed residential development at Glounthaune

and will form the main design basis for the project. Where economically and practically feasible the design will aim to exceed the requirements of the revised Part L.

Cork County Development Plan

The 'Cork County Development Plan 2014' sets out the council's objective to promote energy efficient development in new buildings. In line with objective ED 5-1 'Building Energy Efficiency and Conservation' the Glounthaune development shall be designed to minimise energy consumption and maximise energy efficiency. Local renewable energy sources will be provided in line with Part L of the Building Regulations.

Cobh Municipal District Local Area Plan

In accordance with section 3.4.103 of the 'Cobh Municipal District Local Area Plan 2017' the development will 'encourage energy-efficient housing layouts'. Water conservation measures, including flow restrictors and rainwater harvesting, will also be considered to align with the local area plan.

Other Standards

Other design standards which will be used in the design include:

- CIBSE guides, technical notes and other documentation
- ASHRAE guides
- Relevant Irish Building Regulations

Relevant Irish, British and European standards.

3. Approach

Introduction

Building energy efficiency and sustainability involves all designers and stakeholders from the start of the design process. The most successful sustainable sites are those which keep energy efficiency and sustainability at the core of the project from design through to construction.

The 4 main principles to achieve energy efficient buildings are:

Reduce: Reduce energy consumption by passive and active means, for example improving building fabric and utilising low energy equipment.

Reuse: Reuse energy where possible by recovering waste energy where possible.

Renewables: Utilise renewable technologies to offset energy from fossil fuel technologies.

Rethink: Constantly rethink and refine the energy strategy and approach.

The potential strategies outlined in this report are based around these principles.

Passive Energy Reduction

New Build Elements and Extensions

The first step to implementing a low energy design on the residential development at Glounthaune will be to reduce the energy required to heat the development using passive means. The main passive energy reduction measure on new build elements will be the specification of a high-performance building fabric including high specification u-values for building elements such as walls, glazing, roof and floors. Infiltration losses account for a significant proportion of the total heat loss of buildings and the air tightness details of the development will be carefully developed to minimise infiltration losses. Thermal bridges also contribute a significant proportion of building heat loss and thermal bridges at junctions will be carefully detailed to reduce these losses.

Careful design of glazing (particularly on south facing facades) has the potential to reduce the heating consumption of the development by maximising solar heat gain. The glazing specification shall maximise solar gain while minimising heat loss. While maximising solar gain can reduce heating consumption it can cause overheating issues. In recognition of this overheating assessments will be carried out during the design and mitigation measures (for example blinds) will be provided where required to prevent overheating.

Heating & Renewable Strategies

The heating and renewable energy strategy will have the most significant impact on the energy conservation approach for the residential development at Glounthaune. In this section some of the heating and renewable solutions that will be considered for the residential development at Glounthaune are described. All of these systems will be examined in detailed during the design stage to examine plant space requirements, fuel sources, cost benefit analyses and life cycle analyses.

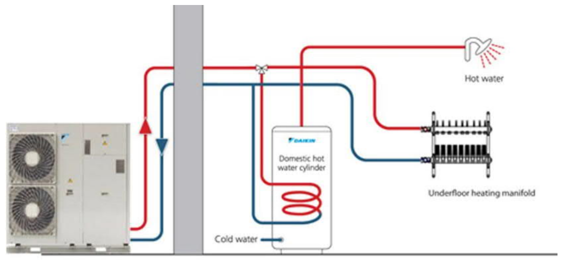
Heat Pumps

A number of different heat pump technologies are available. All of the heat pump technologies will deliver all or a proportion of the renewable energy of the development as required under Part L of the Building Regulations.

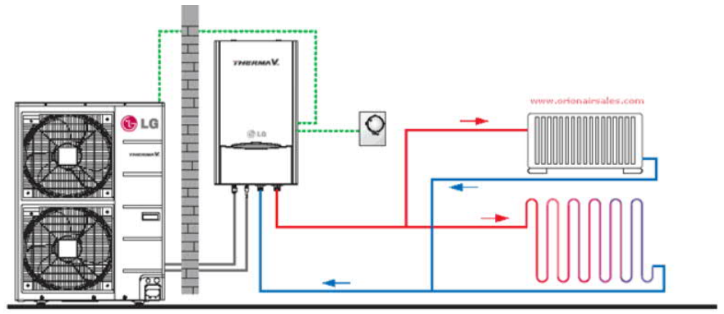
Air to water heat pumps take heat from the outside air and transfer it to a water-based system via a refrigerant cycle. This hot water is used for space heating, typically with underfloor heating or perimeter radiators. The hot water is also used to generate domestic hot water. Air to water heat pumps offer significantly higher efficiencies than conventional fossil fuel type boilers.

There are three main types of air to water heat pumps:

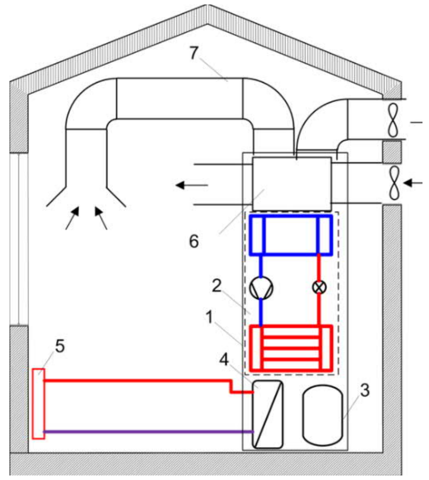
- A Mono-Bloc heat pump (MBHP) will provide the dwellings with heating and hot water. Hot water is provided indirectly via a hot water storage cylinder. No refrigerant pipework enters the dwellings if a Mono-Bloc heat pump is installed. An external heat pump unit is required.



- A Split-Bloc heat pump (SBHP) will provide the dwellings with heating and hot water. Hot water is provided indirectly via an integrated hot water storage cylinder. There is an indoor unit and an outdoor unit when a Split-Bloc heat pump is installed with connecting refrigerant pipework entering the dwellings. The integrated hot water cylinder offers energy efficiency benefits over the Monobloc heat pump.

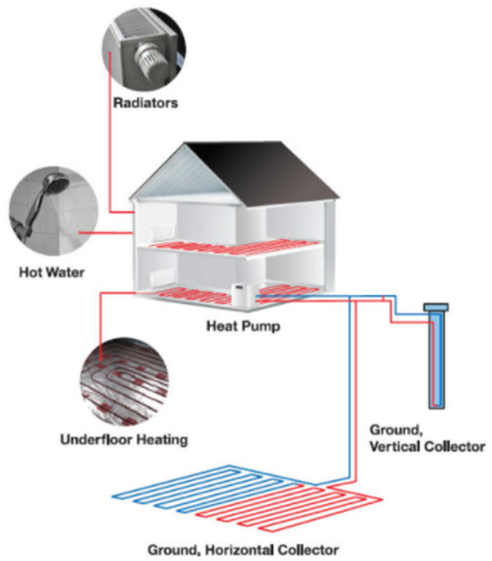


- An Exhaust Air Heat Pump (EAHP) unit works by passing the warm extract air from the 'Wet Rooms' across the heat exchanger of the heat pump to generate hot water. The EAHP is typically a self-contained unit within the dwellings. No external equipment is required.



An Air to Air Heat Pump (AAHP) will provide the dwellings with heating using a ducted system. Hot water is provided indirectly via an integrated hot water storage cylinder. There are indoor units and outdoor units when an Air to Air heat pump is installed with connecting refrigerant pipework entering the dwellings. The integrated hot water cylinder offers energy efficiency benefits over the Monobloc heat pump. Please note this system requires a high performing fabric due to limited heating capacity

Ground Source Heat Pumps work on the same principle as air source heat pumps with the exception that heat is absorbed from the ground rather than the air. This heat is absorbed using open or closed piped loops / boreholes in the ground.



Other Renewable Systems

Solar thermal systems utilise solar energy to generate domestic hot water using either 'Evacuated Tube' or 'Flat plate collectors'. These collectors can be fixed on the roof tiles or integrated into the roof. Solar thermal could be used in conjunction with electric heating or be supplementary to heat pump systems.

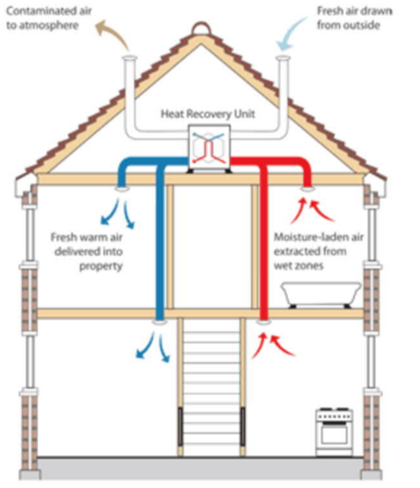
Photovoltaic (PV) systems use solar energy to generate electricity for use in the development or for export to the grid. PV panels can be fixed on the roof tiles or integrated into the roof. PV systems could be used in conjunction with electric heating or be supplementary to heat pump systems.

All the options above will be able to provide heating and/or hot water to the dwellings whilst having relatively low maintenance requirements. They will also significantly contribute towards meeting Part L Requirements.

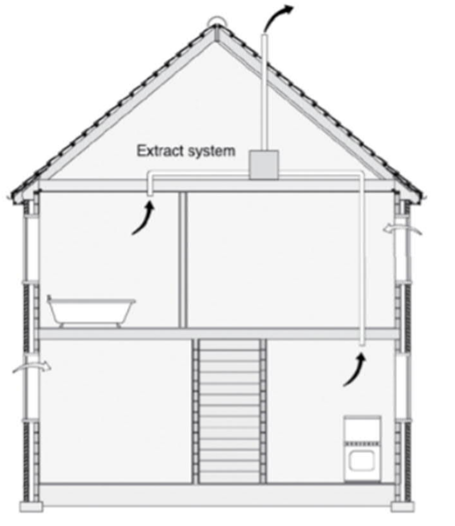
Ventilation Strategies

In parallel with TGD Part L, TGD Part F (Ventilation) was also updated in 2019. While not strictly prohibiting natural ventilation systems the document places more emphasis on mechanical ventilation systems. Mechanical ventilation systems deliver significantly greater indoor air qualities, particularly in air tight buildings. Therefore mechanical ventilation systems will be considered for each dwelling in the next stage of the design. Systems that will be considered include (in order of efficiency, most to least):

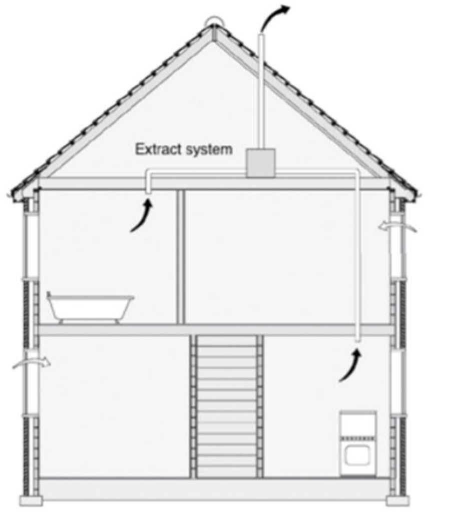
- Mechanical Ventilation with Heat Recovery which recovers waste heat from the exhaust air to heat the incoming fresh air. This system extracts air from wet rooms such as bathrooms and toilets and provides fresh air to other parts of the dwelling.



- Demand Control Ventilation which continuously extracts air from wet rooms with inlet air being controlled via humidity sensitive wall inlets



- Continuous Mechanical Extract which continuously extracts air from wet rooms with inlet air via passive vents.



-

The heating strategy will also influence the ventilation strategy as the ventilation systems may be integral to the heating systems (for example with exhaust air heat pumps).

Domestic Water Usage

One of the notable characteristics of modern high efficient residential developments is that domestic hot water use now accounts for a much larger proportion of total heating consumption as fabric heating requirements reduce. Therefore, there is significant energy saving potential by implementing strategies to reduce domestic hot water usage. The design for the residential development at Glounthaune will seek to reduce hot water consumption insofar as possible. Some of the measures that will be considered included minimising domestic hot water storage losses, the use of low use water fittings and the reduction of circulation losses.

To reduce overall water use rainwater harvesting will be considered to provide water for toilet flushing and other suitable uses (e.g. irrigation if applicable). This will be examined further at the next stage of design.

Lighting

Lighting also accounts for a significant proportion of energy consumption in buildings. The strategies that will be employed in the design of the residential development at Glounthaune to reduce the energy consumption from lighting will be:

- Careful lighting design in dwellings to provide adequate lux levels while eliminating over provision / over design of lighting
- Selection and specification of low energy use light fittings through including LED's where practical
- Careful specification of lighting controls which may include occupancy sensing, daylight sense and smart lighting control systems.

Electric Vehicle Charging

The development will facilitate the provision of charging infrastructure for electric vehicles in line with the requirements of the updated Part L of the Building Regulations which is expected to be issued later this year, should it apply to this development. The exact number of EV chargers will be determined at the next phase of the design.