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Energy Efficiency and Climate Change Adaptation Design Statemen

Proposed Phase 3 of Aderrig Development at Adamstown SDZ, Co. Dublin

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Comments

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Disclaimer

Content

1. Introduction

Waterman Moylan Engineering Consultants have been appointed by Quintain Developments Ireland Ltd. to prepare this Energy Statement as part of the planning documentation for a proposed residential development on lands at the Aderrig site, located within the Adamstown Strategic Development Zone (ASDZ), Co. Dublin.

The proposed development is labelled as Phase 3 of Aderrig and consists of 207 no. residential units distributed as per the schedule of accommodation shown in Table 1 below.

Unit Type	2-Bedroom	3-Bedroom	4-Bedroom	Total
Houses	-	59	16	**75**
Duplexes	64	68	-	**132**
Total	**64**	**127**	**16**	**207**

Table 1 | *Proposed Schedule of Accommodation.*

This report identifies the energy standards with which the proposed development will have to comply and also sets out the overall strategy that will be adopted to achieve these energy efficiency targets.

The dwellings will be required to minimise overall energy use and to incorporate an adequate proportion of renewable energy in accordance with Building Regulations Part L 2021, Conservation of Energy & Fuel (hereinafter referred to as "*Part L 2021 Dwellings*").

2. Building Regulations Part L 2021 Dwellings

Compliance with Building Regulations *Part L 2021 Dwellings* is broken down into six distinct categories, known as Regulation 8; parts (a) to (f).

A summary of each of these parts as listed in Technical Guidance Document L 2011 is provided below together with a description of what is required to demonstrate compliance and suggested routes to meeting the required standards.

2.1 Regulation 8 Part (a)

The regulation requires that:

> *Providing that the energy performance of the building is such as to limit the calculated primary energy consumption and related carbon dioxide (CO2) to that of a nearly zero energy building within the meaning of the Directive insofar as is reasonable*

Part (a) is the overarching compliance target which stipulates the required overall reduction in energy consumption and carbon emissions for new dwellings.

This requires that the energy consumption and carbon emissions of every dwelling is assessed using the DEAP software and that reductions of 70% in energy consumption and 65% in carbon emissions are achieved. The baseline against which this reduction is to be measured is considered to be a dwelling which is constructed to perfectly comply with the 2005 version of Building Regulations Part L.

The ratio of the energy consumed by the proposed dwelling to a similar dwelling constructed to 2005 energy efficiency standards is referred to as the "Energy Performance Co-efficient"

2.2 Regulation 8 Part (b)

The regulation requires that:

> *Providing that, the nearly zero or very low amount of energy required is covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby;*

This requires that all new dwellings are provided with a renewable energy source. The regulations state that 20% of the total energy consumed within the dwelling must be provided from renewable thermal sources (solar thermal, biomass, heat pumps) or renewable electrical sources (Photovoltaic, Micro-wind).

In practical terms, for a multiple unit development, this requirement is usually met by incorporating PV panels at roof level, incorporating air source heat pump technology or by adding an element of biomass or micro-Combined Heat & Power (CHP) to a district heating scheme.

Where CHP is included, the renewable energy is considered to be the waste heat which is generated as a by-product of the electricity produced. Specific calculation methods are set out within TGD *Part L 2021 Dwellings* which detail how compliance should be demonstrated.

2.3 Regulation 8 Part (c)

The regulation requires that:

> *Limiting heat loss and, where appropriate, availing of heat gain through the fabric of the building;*

This requires that the fabric of the building is designed to minimise heat loss from the building and that the air permeability of the structure limits the unwanted passage of air into the building.

Typical compliant U-Values are as follows.

Pitched roof	0.16 W/m^2K
Flat roof	0.20 W/m^2K
Walls	0.18 W/m^2K
Floor	0.18 W/m^2K
Windows	1.4 W/m^2K

The u-values of individual elements can be relaxed if required provided that compensatory measures are taken on other elements and that the overall area weighted u-value for the entire dwelling is the same as it would have been if all individual elements had complied.

The thermal bridging details of junctions in the envelope of the building (floor-wall; wall-window; wall-roof, etc) must also be designed and constructed in accordance with the guidance set out in Limiting Thermal Bridging and Air Infiltration – Acceptable Construction Details

Every dwelling must also be subjected to an air pressure test to determine the air tightness. All dwellings must achieve and air tightness of less than $5m^3/m^2/hour$ when tested at 50 Pascals. In multiple dwelling developments with repeating apartment types, testing can be conducted on a representative sample of units in accordance with Table 1.5.4.3 of TGD *Part L 2021 Dwellings*.

2.4 Regulation 8 Parts (d & e)

The regulation requires that:

> *Providing and commissioning energy efficient space and water heating systems with efficient heat sources and effective controls;*
>
> *Providing that all oil and gas fired boilers shall meet a minimum seasonal efficiency of 90%;*

These require that gas or oil-fired boilers are at least 90% efficient and that heating controls allow independent time control of the heating (2 zones for dwellings larger than $100m^2$) and hot water. Heating in each zone should also be controlled by room thermostats (in the case of heating) and cylinder stats (in the case of hot water).

2.5 Regulation 8 Parts (f)

The regulation requires that:

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

This requires that information is provided to the dwelling owner which relates to the effective and efficient operation of the systems installed in that dwelling. Instructions on how to control the heating & hot water systems based on time and temperature requirements.

3. Building Fabric

Before considering efficient building services or renewable energy systems, the form and fabric of a building must be assessed and optimised so as to reduce the energy demand for heating, lighting and ventilation. Target performance levels have been identified by the design team and are presented below.

3.1 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 exceed the requirements of the building regulations. Target U-Values are identified below.

U-Values	**Range of Target Values Proposed**	**Part L 2021 (Dwellings) Compliant Values**	**Part L 2021 (BOTDI) Compliant Values**
Floor	0.10 to 0.18 W/m²K	0.18W/m²K	0.21W/m²K
Roof (Flat)	0.12 to 0.20 W/m²K	0.20 W/m²K	0.20 W/m²K
Roof (Pitched)	0.10 to 0.16 W/m²K	0.16 W/m²K	0.16 W/m²K
Walls	0.10 to 0.18 W/m²K	0.18 W/m²K	0.21 W/m²K
Windows	0.9 to 1.4 W/m²K	1.4W/m²K	1.6W/m²K

3.2 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 **3 m3/m2/hr** has been identified for the houses on the site.

The air permeability testing will be carried out in accordance with BS EN 13829:2001 'Determination of air permeability of buildings, fan pressurisation method' and CIBSE TM23: 2000 'Testing buildings for air leakage"

3.3 Thermal Bridging

Thermal bridges occur at junctions between planar elements of the building fabric and are typically defined as areas where heat can escape the building fabric due to a lack of continuity of the insulation in the adjoin elements.

Careful design and detailing of the manner in which insulation is installed at these junctions can reduce the rate at which the heat escapes. Standard good practice details are available and are known as Acceptable Construction Details (ACDs). Adherence to these details is known to reduce the rate at which heat is lost.

The rate at which heat is lost is quantified by the Thermal Bridging Factor of the dwelling and measured in W/m2K. The Thermal Bridging Factor is used in the overall dwelling Part L calculation, this value can be entered in three different ways:

0.15W/m^{2}K	Used where the ACDs are not adhered to
0.08W/m^{2}K	Used where the ACDs are fully adhered to
< 0.08 W/m^{2}K	Used where the thermal details are thermally modelled and considered to perform better than the ACDs

It is intended that the ACDs will be adhered where suitable benchmarks exist and/or that thermal modelling will be carried out for any non-standard junction details within proposed development and that the resultant Thermal Bridging Factor will be less than 0.08W/m2K.

4. Heat Sources & Renewable Energy Options & Proposals

All new dwellings must meet overall energy performance levels (as defined by the Energy Performance Coefficient - EPC) and must have a portion of their annual energy demand provided by renewable energy sources.

The renewable energy source can be thermal energy such as solar thermal collection, biomass boilers or heat pumps or it can be electrical energy as generated by photovoltaic solar panels or wind turbines. The minimum renewable energy contributions defined in Part L 2021 Part (b) is 20% of the total energy consumption for the dwelling.

Two main fuel sources are generally available for developments of this nature, natural gas and electricity. Each present distinct options for compliance with the new standards. Solutions involving gas as the primary fuel source will typically include a solar technology such as PV panels to meet the renewable energy requirements while solutions relying on electricity will include heat pump technology.

The options presented in Sections 4.1 & 4.2 below set out the options for the houses and duplex units proposed for the site. Each is based on the building fabric performance levels identified in Table 1 in Section 3.

The final selection and combination of technologies will most likely be selected from these options based on a more in-depth technical and financial appraisal of the technologies which will be carried out during detailed design.

4.1 Option 1 - Individual Gas Fired Boilers with Solar Panels.

The use of natural gas to provide heating and hot water to dwellings and commercial buildings is very common due to its convenience and to low fuel prices. There is existing Gas Networks Ireland infrastructure in the vicinity of the proposed development and Gas Networks Ireland are aware of the proposed extent of development on the subject lands and have confirmed that there is adequate capacity in the network. High efficiency gas fired condensing boilers convert gas to heat energy with an efficiency of over 90%.

Both Solar PV and Solar Thermal Collection harvest the sun's energy to provide a renewable energy source for the dwelling. In the case of PV, the sun's energy is converted into electrical energy which offsets the use of grid electricity while in the case of solar thermal collection it is converted into thermal energy which is used to heat domestic hot water within the building.

4.2 Option 2 - Air Source Heat Pumps

Air source heat pumps (ASHPs) utilise grid supplied electricity to extract thermal energy from a heat source, in this case, the external ambient air. While the electricity consumed is obviously not renewable energy, the efficiency at which a heat pump operates allows a significant portion of the heat delivered to be considered as renewable energy. The amount of heat considered to be renewable is determined by the efficiency of the heat pump and the "primary energy conversion factor" for grid supplied electricity. Typically, approximately 40% to 50% of the heat supplied is considered to be renewable energy.

Air source heat pumps require an indoor and an outdoor component. The outdoor unit is the evaporator which extracts the thermal energy from the ambient air while the indoor unit typically includes the heating buffer tanks and the hot water cylinder for the dwelling. The outdoor unit is typically located in the back garden of a dwelling.

In recent years, the design of ASHPs has improved bringing about higher efficiencies and reduced costs. This, in turn, has led to an increase use of this technology in large scale housing developments. Certified seasonal efficiencies of some models can exceed 500% meaning that the use of this technology can easily deliver compliance with current Part L requirements.

5. Climate Change Adaptation

5.1 On-site Demolition and Construction

The construction and waste management proposals for the scheme are comprehensively addressed in the Construction & Demolition Waste Management Plan submitted with this planning application, the measures below are provided as a summary of the recommendations contained within the plan.

The demolition arising on site will consist of the following expected demolition waste: -

- MADE GROUND (sample taken on a mound of fill on the site) slightly sandy slightly gravelly CLAY with occasional subangular cobbles.
- COHESIVE DEPOSITS either slightly sandy slightly gravelly CLAY or slightly sandy gravelly SILT with occasional subangular cobbles.
- Gravel / capping material / mineral material

Only after in-situ reuse and recycling options have been fully considered will the demolition waste will be disposed of off-site by licensed waste contractors.

During the construction phase of the project, proposals for the minimisation / reuse and recycling of construction arisings will be implemented as set out in the Construction & Demolition Waste Management Plan, including:

- In the case of topsoil, careful planning and on-site storage can ensure that this resource is reused on-site as much as possible
- Earthworks for road, drainage and structure foundation forms a major part of the quantity of waste that will be generated by the construction phase of this project. To optimise the impact of the generation of surplus material due to excavation every attempt to optimise cut and fill volumes will be undertaken
- The treatment of excavated materials (cement / lime stabilisation) where necessary to allow their reuse as fill materials, further reducing the need to remove these materials to landfill, and import stone and concrete materials
- Appropriate material ordering to minimise waste
- Reuse of Concrete blocks, engineering bricks and clay bricks that are surplus can be broken up and used for hardstanding areas.
- It is envisaged that most of the recyclable waste on site will come from house construction in a form of wood and metal. Any excess wood or metal generated on site will be kept segregated and removed off site to a licenced recycling facility.

5.2 Long-term management

Encouraging the use of public transport by using the principles of environmental assessment methodologies to reduce the reliance on cars and encourage a shift to less carbon intensive modes of transport.

All in-curtilage parking spaces will be capable of being fitted with EV charging points. All off-curtilage spaces will be ducted for EV charging, with 20% fitted out from the outset.

5.3 Transport

The traffic and transport proposals for the scheme are comprehensively addressed in the Traffic & Transport Assessment submitted with this planning application, the measures below are provided as a summary of the recommendations contained within the assessment.

- Car and Bicycle parking for the proposed development have been designed in accordance with the requirements set out in the Adamstown SDZ and are in line with both Adamstown SDZ planning scheme and current South Dublin County Council Development Plan.
- The subject site is located within reasonable walking time to Adamstown train station and to bus stops along Adamstown Boulevard and Station Road to the east and southeast of the site, respectively.
- The design of the site, and it's location within the Adamstown SDZ are such that pedestrian and cycling trips are a genuine alternative to private car use.

The use of private cars for daily commuting and for recreational purposes is unavoidable however the potential long term climate impacts of private car use can be off-set by forward planning of electrical vehicle charging infrastructure. Providing ducting & ESB metering capabilities within the scheme will allow for future expansion of electric vehicle charging facilities to meet increasing demand in the short to medium term.

5.4 Environmental Assessment Methodologies

Addressing operational energy use in a manner set out in the preceding sections of this report is a vital component of any construction project however consideration must also be given to other aspects of sustainable design such as water use, material selection and minimising pollutants.

Various assessment methodologies have been developed by organisations such as the Building Research Establishment (BREEAM Methodology) and the US Green Building Council (LEED Certification) to measure the performance of various environmental and sustainable aspects of the design, construction and operation of proposed developments.

The Irish Green Building Council has also developed a similar assessment methodology in recent years which is specifically aimed at residential developments in Ireland. **The Housing Performance Index (HPI)** assessment provides a method for measuring the performance of residential developments against a range of verifiable indicators that are divided into five technical categories

- Environment,
- Economic,
- Health and Wellbeing,
- Quality Assurance
- Sustainable Location.

It allows several levels of achievement based on good, better and best practice. The award of the certificate is based on the overall attainment across all categories.

A decision will be made during detailed design as to whether formal HPI certification will be sought on the project, however, the principles set out within the HPI system will be used as guidance throughout the design process regardless of whether certification is targeted.

5.5 Embodied Carbon

Recent advances in the energy efficiency of buildings have reduced operational energy use to such an extent that the life cycle carbon emissions of a building are actually influenced more by the carbon that is embodied in the materials and processes used during the construction than it is by the carbon emitted as a result of energy used in the buildings operation. As such, the embodied carbon of a building must now be considered if a construction project is to be considered low carbon or "net-zero" carbon.

Addressing the embodied carbon requires that all the key building element categories (substructure, structure, façade, MEP services) are assessed to identify the optimal solutions in terms of embodied carbon and assess them through a multidisciplinary and holistic approach, considering implications in different areas such as efficiency, cost, programme etc.

The process of design and of material and product selection must include an analysis of the final embodied carbon and comparison with benchmarks to identify the areas that need to be optimised. This process allows the building designers and procurement managers to focus on how to eliminate the impact of the key identified hotspots, through comparative assessments and specification of products that demonstrate low embodied carbon and facilitate the production of the final embodied carbon assessment at the end of the detailed design to identify the expected impact of the Development.

5.6 Sustainable Urban Drainage.

The Surface Water drainage proposals for the scheme are comprehensively addressed in the Engineering Assessment Report submitted with this planning application, the measures below are provided as a summary of the recommendations contained within the assessment.

It is proposed to discharge the surface water from the proposed development, via a series of SuDS features and downstream defender manholes, into the existing downstream stormwater system. The methodology involved in developing a Storm Water Management Plan for the subject site is based on recommendations in the Greater Dublin Strategic Drainage Study (GDSDS) and in the SuDS Manual. It is proposed to incorporate a Storm Water Management Plan though the use of various SuDS techniques.

Based on three key elements, Water Quantity, Water Quality and Amenity, the targets of SuDS train concept will be implemented in the design. The following SuDS measures are proposed for the site:

- **Source Control**
  the provision of water butts for each residential property
- **Site Control**
  the use of bio-retention tree pits and swales to provide attenuation throughout the site
- **Regional Control**
  The use of "downstream defender" manholes prior to connection to existing downstream drainage networks to capture sediment, pollutants & hydrocarbons.

6. Proposed Solutions

The preceding sections of this report set out the regulatory requirements with which the scheme will have to comply while identifying a number of technologies and design approaches that may be utilised to achieve compliance.

The building fabric standards and the technology solutions discussed will all be assessed in greater detail during the detailed design stage of the project. A cost benefit analysis of all these available solutions will be carried out to determine the correct balance between an efficient building envelope and the most appropriate combination of technology and renewable energy systems.

The proposed approach to achieving Part L Compliance will be based on a combination of the solutions below once a detailed analysis has been completed at detailed design stage. A final decision will be made once capital costs, renewable targets and regulation compliance have all been compared to find the most appropriate solution.

6.1 Energy in Use Measures

The most likely overall solution that will be implemented will include the following measures

- Meet or exceed minimum U-Value standards
- Achieve a high level of air tightness (typically $3m^3/m^2/hr$)
- Ensure thermal bridging details are designed to meet the performance of the ACDs or an equivalent standard.
- Provide an appropriate combination of technologies to ensure energy consumption is in line with Part L 2021 requirements. This will either include air source heat pumps and/or an alternative heating system such as gas boilers with PV panels for renewable energy.
- Install centralised mechanical ventilation systems to ensure adequate ventilation rates are achieved in the dwelling which maximising the benefits of the airtight construction

6.2 Sustainability & Embodied Carbon

In addition to the measures targeted at reduction of energy in use, the design process will include the following measures:

- Use the guidance provided within the HPI Certification System to inform and steer the designs of the dwellings
- Review the embodied carbon of the materials and products proposed for the development and implement procedures that ensure that embodied carbon is considered when selections are being finalised.

UK and Ireland Office Locations