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Lisdaran - LRD, Co. Cavan

ENERGY EFFICIENCY AND CLIMATE CHANGE ADAPTATION DESIGN STATEMENT

(Residential development)

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1. Introduction

A.M. Rogers + Associates have been appointed by **Lisdaran Developments Limited** to prepare this Energy Efficiency and Climate Change Adaptation Design Statement as part of the documentation for a proposed residential development on lands at **Lisdaran, Cavan Town, Co. Cavan.**

Large-scale Residential development consists of the provision of a total of **109no**. residential units along with provision of a crèche. Particulars of the development comprise as follows:

- Site excavation works to facilitate the proposed development to include excavation and general site preparation works.
- The provision of a total of 65 no. residential dwellings which will consist of 23 no. 2 bed units, 26 no. 3 bed units and 16 no. 4 bed units.
- The provision of a total of 44 no. apartments units consisting of 8no.1 bed units, 18no. 2bed units and 18no. 3 bed units.
- Provision of a two storey creche with associated parking, bicycle and bin storage.
- Provision of associated car parking at surface level via a combination of in-curtilage parking for dwellings and via on-street parking for the creche and duplex apartment units.
- Provision of electric vehicle charge points with associated site infrastructure ducting to provide charge points for residents throughout the site.
- Provision of associated bicycle storage facilities at surface level throughout the site and bin storage facilities.
- Provision of internal access roads and footpaths and associated works to include for regrading of site levels as required.
- Provision of residential communal open space and public open space areas to include formal play areas along with all hard and soft landscape works with public lighting, planting and boundary treatments to include boundary walls, railings & fencing.
- Internal site works and attenuation systems which will include for provision of a hydrocarbon and silt interceptor prior to discharge.
- All ancillary site development/construction works to facilitate foul, water and service networks for connection to the existing foul via a rising main and provision of a foul pumping station, water connections and ESB network connections.

The detailed breakdown of the proposed residential scheme is as follows:

Typology	1 Bed	2 Bed	3 Bed	4 Bed	Total
Houses	-	23	26	16	65
Apartments	8	18	18	-	44
Total	**8**	**41**	**44**	**12**	**109**

Table 1 | *Schedule of Accommodation*

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

The dwellings will be required to minimize overall energy use and to incorporate an adequate proportion of renewable energy in accordance with Building Regulations Part L 2022, Conservation of Energy & Fuel (hereinafter referred to as "*Part L 2022 Dwellings*").

2. Building Regulations Part L 2022 Dwellings

Compliance with Building Regulations *Part L 2022 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 2022 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 reasonably practicable.*

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 2022 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 minimize 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.

	U-Values
Pitched roof	0.16 W/m^{2}K
Flat roof	0.20 W/m^{2}K
Walls	0.18 W/m^{2}K
Floor	0.18 W/m^{2}K
Windows	1.4 W/m^{2}K

Table 2 | Typical compliant U- Values

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 2022 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.

2.6 Requirements for Common Areas

Section 0.1.2.3 requires that:

Where a new dwelling forms part of a larger building, the guidance in this document applies to the individual dwelling, and the relevant guidance in Technical Guidance Document L - Conservation of Fuel and Energy – Buildings other than dwellings applies to the non-dwelling parts of the building

2.7 L2A & S.I No 393 of 2021 Regulation 5 Part (f) – Electric Vehicle Charging

The regulation requires that:

(a) A multi-unit building containing one, or more than one, dwelling that is new shall have installed ducting infrastructure (consisting of conduits for electrical cables) for each car parking space, to enable the subsequent installation of recharging points for electric vehicles where the parking space is:

(i) located inside the building concerned, or

(ii) is within the curtilage of the building concerned.

(c) A new building that is a dwelling, other than where the dwelling forms part of a multi-unit building, where a parking space is located within the curtilage of the dwelling, shall have installed appropriate electric vehicle recharging infrastructure to enable the subsequent installation of recharging points for electric vehicles.

This requires that ducting provision for the future installation of car charging point be made in all carparks with more than 10 parking spaces associated with multi-unit residential buildings. It also requires that individual / own-door dwellings which have on curtilage parking are provided with ducting infrastructure to allow the future installation of e-car charging.

3. Building Energy Rating (BER)

As of 1st July 2009, all newly constructed domestic buildings and existing buildings offered for sale or rent must have a Building Energy Rating (BER) certificate. For this project, the development is targeting an A3 BER, indicating a high level of energy efficiency, in line with Part L 2022 standards for Nearly Zero Energy Buildings (NZEB).

The BER assesses a building's overall energy performance by measuring its primary energy consumption and associated carbon emissions over one year. The rating is classified on a scale from A1 to G, with A1 being the most energy-efficient. For this project, the goal is to minimize both energy consumption and carbon emissions, contributing to the national targets for climate change and sustainability.

The following factors significantly influence the primary energy consumption of the building:

- Building type (e.g., dwelling, office, retail)
- Building orientation (which impacts passive solar gains and heat loss)
- Thermal envelope (including the insulation levels of walls, roofs, floors, windows, and doors)
- Air permeability (the amount of air leakage into or out of the building envelope)
- Heating systems (type, efficiency, and fuel source)
- Cooling systems (where relevant, system type and efficiency)
- Ventilation (natural or mechanical systems such as Mechanical Ventilation with Heat Recovery (MVHR))
- Fan and pump efficiency (for all mechanical systems)
- Domestic hot water generation (system type and efficiency)
- Lighting systems (efficiency of artificial lighting)

Compliance with Part L 2022

The proposed development is designed to comply with the updated **Part L 2022** standards for **dwellings**, which emphasize the need for energy-efficient designs and nearly zero energy usage in new homes. **Part L 2022** mandates that all new dwellings must achieve a **Building Energy Rating (BER) of A3** or better, and comply with stricter requirements for **thermal insulation, airtightness, and renewable energy integration**.

4. Building Fabric

Before considering efficient building services or renewable energy systems, the form and fabric of a building must be assessed and optimized 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.

4.1 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 2022 (Dwellings) Compliant Values
Floor	0.18 W/m^{2}K	0.18W/m^{2}K
Roof (Flat)	0.20 W/m^{2}K	0.20 W/m^{2}K
Roof (Pitched)	0.16 W/m^{2}K	0.16 W/m^{2}K
Walls	0.21 W/m^{2}K	0.18 W/m^{2}K
Windows/Glazed doors	1.6 W/m^{2}K	1.4W/m^{2}K

Table 3 | U-Values proposed

4.2 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 is a max of 5 **m^3/m^2/hr** @ 50 pa 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 pressurization method' and CIBSE TM23: 2000 'Testing buildings for air leakage"

4.3 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/m^2K. The Thermal Bridging Factor is used in the overall dwelling Part L calculation, this value can be entered in three different ways:

$0.15W/m^2K$	Used where the ACDs are not adhered to
$0.08W/m^2K$	Used where the ACDs are fully adhered to
$< 0.08\ W/m^2K$	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.

5. 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 2022 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 below set out the options for the dwellings proposed for the site. 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.

5.1 Option 1 - 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.

5.2 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 increased 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.

6. Climate Change Adaptation

6.1 On-site Construction

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

- Excavation activities have potential to expose the soils and geological environment to pollution. The contractor shall agree the methodology of excavating cut material with the Local Authority where necessary and ensure that soils are protected against risk of pollution during the construction period.
- Measures shall be implemented during the construction phase to mitigate risks to the water and hydrogeological environment.
- Measures shall be implemented during the construction phase in order to mitigate risks to plant and animal life.
- Appropriate material ordering to minimise waste
- Measures shall be implemented during the construction phase in order to reduce the amount of waste produced, manage the wastes generated responsibly and handle waste in such a manner as to minimise the effect on the environment.
- 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.

6.2 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 for fit out at a future date.

6.3 Transport

The traffic and transport proposals for the scheme are comprehensively addressed in the traffic and transport assessment submitted with this proposed development package, 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 current National Transport Authority (NTA) Development Plan.
- A key part of this development has been to link into the existing sustainable mode of transport that has been provided in the adjacent developments through cycling and walking along safe routes to the amenities in the surrounding areas.
- The town centre is well-served by bus routes, providing convenient and accessible public transport options that help reduce reliance on private vehicles for all types of journeys.

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.

6.4 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.

6.5 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.

6.6 Sustainable Urban Drainage.

The Surface Water drainage proposals for the scheme are comprehensively addressed in the Engineering Assessment Report submitted with the proposed development package, the measures below are provided as a summary of the recommendations contained within the assessment.
The proposed new development will increase the impermeable area and run-off volume when compared with the existing green-field site. The new drainage system has the following features.

- Discharged flows are reduced to equivalent green-field run-off rates in accordance with the GDSDS.
- Attenuation storage is provided; in accordance with the GDSDS. Flows are generally restricted to greenfield run-off rates therefore this will mimic the undeveloped scenario which should mitigate flood risk to the receiving watercourses.

The SUDS proposals for the development include:

Four attenuation tanks will be on the site.

- **Attenuation Tank No:1** will be in the southern part of the site, while **Attenuation Tank No: 5 and Attenuation Tank No :3** will be positioned in the central region on the site and the last one **Attenuation Tank No:4** is located at the northern end of the site.
- **Attenuation Tank No:1** has capacity of 583.4 m^3 and **Attenuation Tank No:5** has a capacity of 47.4m^3. Meanwhile **Attenuation Tank No:3** can hold 143.7m^3 and last one **Attenuation Tank No:4** has a capacity of 265.3m^3

Before being discharged or stored in either attenuation tank, surface water runoff will pass through a petrol interceptor to remove pollutants. This ensures that only treated water is managed within the system, contributing to effective and sustainable stormwater management on-site.

- Permeable paving in all private driveways.
- Rain Gardens
- Suds tree pits
- Filter drains

7. 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.

7.1 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 2022 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 centralized mechanical ventilation systems to ensure adequate ventilation rates are achieved in the dwelling which maximizing the benefits of the airtight construction

7.2 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 finalized.

8. Existing & Proposed Utilities

8.1 Natural Gas

The proposed development will not connect to the existing gas network, as it will exclusively utilize **heat pumps** for space heating and hot water. This approach aligns with the project's commitment to energy efficiency and compliance with **Nearly Zero Energy Building (NZEB)** standards.

8.2 ESB Networks

For ESB Networks connections, a dedicated ESB substation (23.3 m²) is proposed to provide power supply to the new dwellings on the site. The substation's exact location will be discussed and agreed with ESB during the design process. Although a formal application for the connection cannot be made at this stage, it will be submitted as soon as the development works are scheduled to commence and the addresses for the units are confirmed.

8.3 Eir

There is existing Eir Networks infrastructure in the vicinity of the site. A formal application cannot be made at this stage but will be made as soon as the development works are scheduled to commence. The Eir infrastructure will allow for broadband and telephone services to the site.

8.4 Virgin Media

There is existing VM Networks infrastructure in the vicinity of the site. A formal application cannot be made at this stage but will be made as soon as development works are scheduled to commence. The VM infrastructure will allow for broadband and telephone services to the site.

REPORT END

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00	Plan	D. Hari	R. Frasca	A. Rogers	03-07-2025


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