Princedom Street, Manchester

Energy + Environmental Standards Statement

12192A-AEW-XX-XX-RP-T4-0001-P01-EESS

05/07/2023

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Executive summary

The proposed development of 22 affordable homes has been designed in accordance with Passivhaus principles. The development shall seek certification from the Passive House Institute with the aspiration to achieve the Classic level of performance. If any units fail to achieve the Classic level of Passivhaus certification, then they are expected to meet the Passive House Institute (PHI) Low Energy Building performance standard. As such, as range of performance for the site is demonstrated between the PHI Low Energy and Passivhaus Classic standards.

Following the Passivhaus standard has put a significant emphasis on a fabric first approach and resources are focused on reducing energy demand, the first and most important step of the energy hierarchy. Applying Passivhaus principles is expected to reduce the site emissions by between 49 and 65% through energy efficiency alone.

The development is designed benefit from low carbon heat, in the form of air source heat pumps, and is designed to be solar PV ready, such that this technology could be easily retrofitted for a future upgrade from Passivhaus to the emerging UK Net Zero Carbon Building Standards.

Use of low carbon heat from an air source heat pump for hot water demands will further reduce emissions to a cumulative total reduction of between 53 and 69% against a 2010 baseline.

The proposed improvements in energy efficiency through following Passivhaus principles are expected to result in improvements of 27 to 52% against a Part L 2021 Building Regulations compliant development using heat pumps.

In terms of construction materials, an off-site manufacturer timber panelised system is proposed. This construction method utilises lower embodied carbon building materials and modern methods of construction to reduce wastage and construction impacts on site.

Thermal comfort calculations have been performed in accordance with CIBSE TM59 to ensure that the proposed development is resilient from overheating expected in a changing climate. Measures to manage overheating risks include fixed shading and natural ventilation.

Adapatation measures for a changing climate include permeable paving and attenuation sustainable urban drainage systems (SUDs) to reduce surface water run off.

The baseline biodiversity units and proposed have been calculated in a separate report and for a 10% uplift a small off-site contribution would be required.

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Introduction

This document has been prepared by Aew Architects to present how the proposed development at Princedom Street responds to Manchester City Council current and emerging planning policy to reduce the energy and environmental impact of development.

The proposed development consists of 22 affordable dwellings arranged in two storey townhouses, as shown in figure 1.

This document shall review what the relevant existing and emerging planning policies are. The development site shall be appraised for the opportunities and constraints with which it may respond to these policies.

The statement shall then present how the development proposes to achieve the highest standards of energy efficiency and reduced environmental impacts.

Figure 1: Proposed Site Plan. Extract from 12192-AEW-XX-XX-DR-A-0502-S2-P04-Proposed - Site Layout - Presentation

Planning Policy context

Manchester Core Strategy policy EN4 requires development to follow the energy hierarchy to reduce fuel poverty and decouple growth in the economy from increasing CO2 emissions and fuel costs.

Policy EN4 encourages opportunities for low and zero carbon energy generating technologies and lower embodied carbon building materials.

Policy EN6 sets targets for a 15% reduction in carbon emissions against Part L 2010 through applying the energy hierarchy. Where the CO2 emissions reductions required under any future version of Part L Building Regulations (2021) are in excess of the % minimum requirement then building regulations standards take precedent.

Appendix A of the Core Strategy details the requirements for energy statement calculations (the calculations in Appendix A of this document reflect this format).

The emerging Places for Everyone development Plan Document is expected to require new development to meet net zero carbon targets by 2028 ahead of the Greater Manchester ambition to be a carbon neutral city-region by 2038.

The Guide to Development in Manchester Supplementary Planning Document and Planning Guidance (SPD) sets out the content requirements expected from an Environmental Standards Statement, however, this document does refer to a number of Unitary Development Plan policies that have been replaced by the Core Strategy.

Analysis of site

The development site has previously been for terraced housing; however, the site has been cleared in 2003. The site has remained cleared and as such the site is currently described as amenity grassland as shown in figure 2.

The site is bordered on all sides by existing residential development.

Further details of the existing site can be found within the Design and Access Statement and Preliminary Ecological Appraisal reports.

Figure 2: Existing site extract from 12192-AEW-XX-XX-PP-A-006-S2-P01-Design and Access Statement

Energy Efficiency

The proposed development has been designed in accordance with Passivhaus principles. The development shall seek certification from the Passive House Institute with the aspiration to achieve the Classic level of performance. If any units fail to achieve the Classic level of Passivhaus certification, then they are expected to meet the Passive House Institute (PHI) Low Energy Building performance standard. As such as range of performance for the site is demonstrated between PHI Low Energy and Passivhaus Classic standards.

Following the Passivhaus standard has put a significant emphasis on a fabric first approach and resources are focused on reducing energy demand, the first and most important step of the energy hierarchy. Applying Passivhaus principles is expected to reduce the site emissions by between 49 and 65% through energy efficiency alone when compared with 2010 baseline standards.

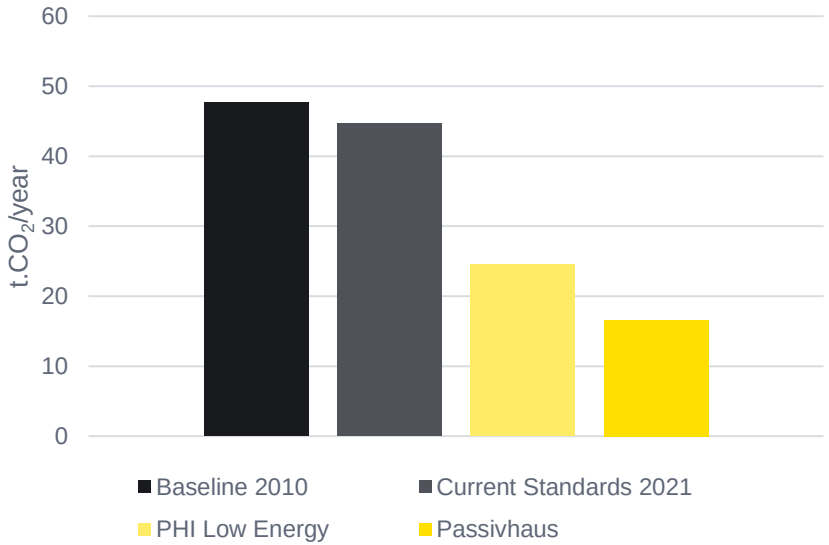

Figure 3: Energy efficiency scenarios for site CO_2 (See Appendix A for assumptions)

The proposed energy efficiency measures include significantly enhanced building fabric thermal performance as detailed in Table 1. U-values and air tightness improve on minimum standards in order to reduce space heating demands.

A very low air tightness is a key requirement of Passivhaus, the Passivhaus requirement of an air tightness below 0.6 ac/hr is over 90% better than the standards required by current Part L building regulations.

An extremely low air tightness is completed by a mechanical ventilation with heat recovery system, this system shall be used to reclaim heat from exhaust air to pre-heat fresh incoming air.

Construction details shall also be designed for continuity of insulation to avoid any significant thermal bridging.

All lighting shall be low energy LEDs to reduce electricity demands.

Taps and showers shall be low flow rates to reduce domestic hot water demands.

New construction U-values (W/m^2K)		
	Notional Part L 2021	Proposed Specification
External wall	0.18	0.14
Roof	0.18	0.11
Floor	0.13	0.09
Windows	1.20	0.80

Table 1: Proposed new build U values against notionally compliant Part L 2021 values.

Renewable Energy

All potential renewable energy technologies have been considered for their application to this development. Full details of this assessment are included within appendix A.

The proposals shall utilise a heat pump for domestic hot water generation, one of the advantages of this system is that the condenser is located internally as part of an integrated domestic hot water cylinder. There are therefore no visual or external noise implications, and the condensers aren't located where they may be vulnerable to damage.

Figure 4 demonstrates the proposed performance utilising low carbon heat for domestic hot water and with a PHI Low Energy or full Passivhaus standard energy performance. This is compared with the 2010 baseline without renewables and a 2021 Part L compliant standard with a heat pump for space heating and hot water.

It can be seen that the proposals will result for a total carbon reduction against the baseline of between 53% and 69%.

The proposals are expected to reduce carbon emissions from between 27% and 52% compared to a Part L 2021 notional heat pump specification.

The development is designed with flexibility in mind such that solar PV and batteries could be easily retrofitted in the future to maximise on site renewable energy generation to uplift the performance to net zero carbon in operation.

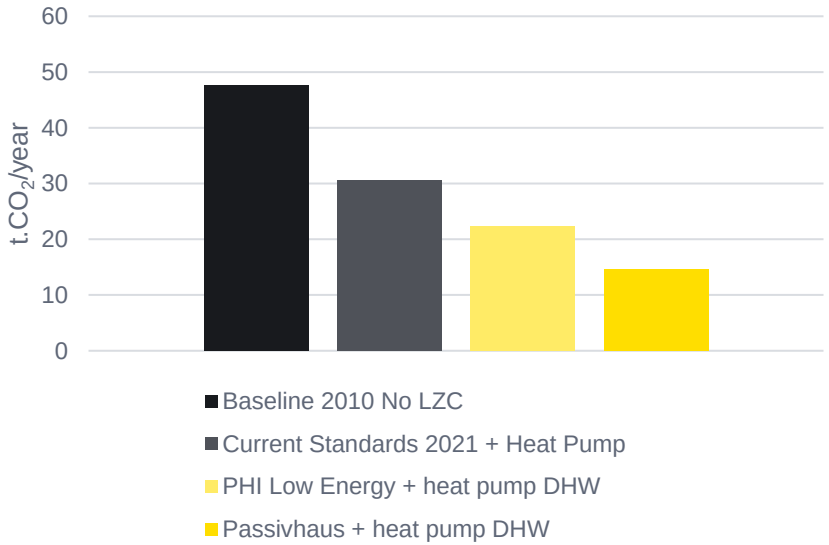

Figure 4: Energy efficiency and low carbon heat scenarios site CO_2 (See Appendix A for assumptions)

Environmental Design

As thermal performance increases and more intense periods of high temperatures occur due to a changing climate then the consideration of potential overheating risks in building design becomes more significant.

CIBSE TM59 thermal comfort calculations have been carried out as part of the concept design development to ensure that the proposals have optimised glazed areas, shading and natural ventilation to reduce overheating risks through passive means.

Acoustics and air quality risks have been considered to inform the ventilation strategy.

The landscape design utilises deciduous trees which shall provide solar shading when in leaf during summer months but allow beneficial solar gains during winter when out of leaf.

In terms of construction materials, an off-site manufacturer timber panelised system is proposed. This construction method utilises lower embodied carbon building materials and modern methods of construction to reduce wastage and construction impacts on site.

Figure 5: Proposed elevations extract from 12192-AEW-XX-XX-PP-A-007_Design and Access Statement

Water Management and Weather Resilience

The site is in a low flood risk area and the drainage strategy has been designed to sustainably manage the more intensive weather events expected in a changing climate.

The proposed sustainable urban drainage strategy (SUDs) utilises permeable paving attenuation tanks to attenuate the level of rainfall expected during a 1 in 100 year event including a +45% allowance for more intensive events expected due to climate change.

Waste Management

The proposed development is provided with bin stores sized in accordance with the Local Authority requirements.

Sufficient space for recycling storage shall be provided within both the external bin store and within bins provided within the kitchens.

Construction Management

The construction site shall be managed responsibly in order to limit any environmental impacts on the local area.

Site waste shall be sorted and processed off-site to maximise re-use and recycling and limit any waste sent to landfill.

Biodiversity + Waterways

A preliminary ecology appraisal has been carried out and found no habitats of significant ecological value. Full details of the existing site are within the preliminary ecological appraisal and Arboricultural Assessments.

A number of ecological enhancements are proposed, these include planting that priorities native species within new hedgerow and tree planting.

A separate biodiversity net gain assessment and report undertaken by Kingdom Ecology has calculated that the baseline biodiversity units has been calculated at 1.06 Habitat Units and 0.00 Hedgerow Units. After completion this will be 0.80 habitat units and 0.18 Hedgerow Units, and could be reduced further with bat and bird boxes.

Appendix A: Calculations of Energy Performance

Set out baseline information

- The proposed development is 100% residential. Consisting of 22 number 3 bed townhouses.
- Total floor area 2,200m^2.
- It is anticipated that the development will be constructed in a single phase.
- The servicing strategy shall be based on individual space heating and domestic hot water system being provided to each dwelling.

Calculate total energy demand of the completed development

- Energy demands have been calculated using designPH and PHPP software.
- The baseline scenario is based on a Part L 2010 specification.
- Current Part L 2021 specification results are shown for information.
- Due to recent changes in Part L carbon emissions factors (SAP10.2) the baseline and energy efficiency scenarios are based on 100% efficient electric and hot water generation. In SAP10.2 gas has a higher carbon emissions factor than electricity so having a gas-fired baseline would exaggerate emissions reductions.

Baseline (2010) kWh/m^2	**End Townhouse**	**Mid Townhouse**	**Site Total**
Space Heat	82	71	
DHW	15	15	
Lighting	1	1	
Auxiliary	0	0	
Total	196	174	
TFA m^2	87	88	
Number	8	14	
Total kWh	136,313	214,185	**350,498**

Calculate the equivalent annual carbon emissions from the completed development

- Carbon emissions equivalent are calculated using the current SAP10.2 carbon emission factors.

Site baseline energy (2010) kWh	**SAP 10.2 kg.CO_2/kWh**	**Site baseline kg.CO_2**	**Site baseline (2010) t.CO_2**
350,498	0.136	47,668	**48**

Apply appropriate carbon emissions reduction target

- Carbon emissions equivalent are calculated using the current SAP10.2 carbon emission factors.
- EN6 Target area 3 requires a 15% reduction over Part L 2010 for micro generation areas.
- Where the CO_2 emissions reduction required under any future revision to Part L of the building regulations becomes greater than the '% Minimum requirement', the reduction required under building regulations would apply.
- Current 2021 Part L regulations require a reduction in CO2 in excess of the EN6 target against a 2010 baseline. Therefore, the methodology above for calculating a baseline using the 2021 notional building performance (assuming direct electric to focus on energy efficiency only) shall also be calculated to show the context of proposed energy efficiency improvements against current regulations.

Baseline (2021) kWh/m²	**End Townhouse**	**Mid Townhouse**	**Site Total**
Space Heat	75	66	
DHW	15	15	
Lighting	1	1	
Auxiliary	0	0	
Total	196	174	
TFA m²	87	88	
Number	8	14	
Total kWh	126,569	201,865	**328,434**

Site baseline energy (2021) kWh	SAP 10.2 kg.CO_2/kWh	Site baseline kg.CO_2	Site baseline (2021) t.CO_2
328,434	0.136	44,667	**45**

Apply the energy hierarchy

- Two energy efficiency improvement scenarios are shown, one compliant with the PHI Low Energy Standard, and one fully meeting Passivhaus.
- Direct electric heating is still assumed to isolate improvements just through energy efficiency.

PHI Low Energy kWh/m²	**End Townhouse**	**Mid Townhouse**	**Site Total**
Space Heat	30	30	
DHW	15	15	
Lighting	1	1	
Auxiliary	2	2	
Total	93	93	
TFA m²	87	88	
Number	8	14	
Total kWh	64.973	115,009	**179,982**

PHI Low Energy kWh	SAP 10.2 kg.CO_2/kWh	Site baseline kg.CO_2	PHI Low Energy t.CO_2
179,982	0.136	24,478	**24**

Passivhaus kWh/m²	**End Townhouse**	**Mid Townhouse**	**Site Total**
Space Heat	15	15	
DHW	15	15	
Lighting	1	1	
Auxiliary	2	2	
Total	63	63	
TFA m²	87	88	
Number	8	14	
Total kWh	44,093	78,049	**122,142**

Passivhaus kWh	SAP 10.2 kg.CO_2/kWh	Site baseline kg.CO_2	Passivhaus t.CO_2
122,142	0.136	16,611	**17**

Consider all appropriate low carbon, renewable and/or decentralised energy technologies

- Low carbon heating is to be prioritized over renewable energy generation.
- Solar PV and solar thermal are both suitable for inclusion but would be competing for roof space.
- Solar PV and solar thermal could be easily retrofitted to further reduce carbon emissions.
- Solar PV, and potentially also battery storage, could be applied to uplift performance to satisfy forthcoming UK Net Zero Carbon Building Standards.

Renewable energy feasibility matrix		
	Feasibility consideration	Suitable for inclusion
Solar photovoltaics	South facing roof, no significant overshading + sufficient power demands.	Yes
Solar photovoltaics + battery storage	Battery storage can benefit residential uses where PV generation will peak when residents may be at work.	Yes
Wind turbine	Not a suitable technology for a built-up area.	No
Micro hydro	No potential water resource on site.	No
Solar water heating	South facing roof, no significant overshading and sufficient demands.	Yes
Solar air heating	No unshaded south facing walls without openings.	No
Combined Heat + Power	Gas-fired CHP no longer offers carbon savings compared to a decarbonised electricity grid. Not sufficient year-round heat demand.	No
Biofuels	Negative impacts on air quality.	No
Air Source Heat Pump	Sufficient location for condenser unit + sufficient heat demands.	Yes
Ground Source Heat Pump	Constrained site for ground loop so boreholes likely. Significant cost uplift over air source and passivhaus principles result in low space heating demands.	No
Water Source Heat Pump	No potential water resource on site.	No
Geothermal	Not sufficient demands to justify exploratory drilling.	No

Assessment of least cost technology option

- An air source heat pump with an assumed coefficient of performance of 3 is applied.
- In terms of a 2021 Part L compliant specification a heat pump is likely to be required for space heating and domestic hot water demands.
- Within a PHI Low Energy and Passivhaus Standard it is assumed that space heating demands are so low that direct electric space heating may be used alongside a heat pump for domestic hot water to provide low carbon heat.

Part L 2021 Heat Pump kWh/m²	End Townhouse	Mid Townhouse	Site Total
Space Heat	25	22	
DHW	5	5	
Lighting	1	1	
Auxiliary	0	0	
Total	124	114	
TFA m²	87	88	
Number	8	14	
Total kWh	86,296	137,969	**224,265**

Site energy Part L 2021 Heat Pump kWh	SAP 10.2 kg.CO_2/kWh	Site baseline kg.CO_2	Site Part L 2021 Heat Pump t.CO_2
224,265	0.136	30,500	**31**

PHI Low Energy HP DHW kWh/m²	End Townhouse	Mid Townhouse	Site Total
Space Heat	30	30	
DHW	5	5	
Lighting	1	1	
Auxiliary	2	2	
Total	85	85	
TFA m²	87	88	
Number	8	14	
Total kWh	59,500	105,321	**164,821**

PHI Low Energy HP DHW kWh	SAP 10.2 kg.CO_2/kWh	Site baseline kg.CO_2	PHI Low Energy Inc. Heat Pump t.CO_2
164,821	0.136	22,416	**22**

Passivhaus HP DHW kWh/m²	End Townhouse	Mid Townhouse	Site Total
Space Heat	15	15	
DHW	5	5	
Lighting	1	1	
Auxiliary	2	2	
Total	55	55	
TFA m²	87	88	
Number	8	14	
Total kWh	38,620	68,361	**106,981**

Passivhaus HP DHW kWh	SAP 10.2 kg.CO_2/kWh	Site baseline kg.CO_2	Passivhaus Inc. Heat Pump t.CO_2
106,981	0.136	14,549	**15**

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