

KGA (UK) Ltd

Chartered Building Services Consulting Engineers



Sustainability Statement and Energy Audit

Project

Dogs Trust, Huyton

6008-KGA-00-XX-RP-M-0001

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1. SUMMARY

1.1 ENERGY AND CARBON TARGETS

Multiple layers of energy and carbon requirements apply to the development at a national, regional and local level, each of which requires different targets to be met. The development will be designed to target the most onerous requirements applicable for this proposal.

On that basis, the implications of the relevant targets for the proposed development can be summarised as follows:

- All development must meet the prevailing Building Regulations requirements. The development will be brought forward under Part L 2021 and this has been used as the basis of this energy statement.

1.2 ENERGY STRATEGY

This energy statement has been structured in line with the energy hierarchy: Be Lean, Be Clean, Be Green.

The proposals for the scheme have been developed in accordance with the desire to achieve an energy efficient and sustainable development. The development will be designed to achieve optimum energy performance and will incorporate the following design features:

- Significantly exceed the minimum fabric requirements of Part L2A (2021) of the Building Regulations.
- All buildings will include 100% low energy lighting and lighting control.
- All buildings will be provided with mechanical ventilation with heat recovery (MVHR) systems for ventilation within Offices and training areas.
- Cellular and management offices to be heated and cooled via a high efficiency split AC units
- Majority of the site to be heated via underfloor heating served by an air source heat pump with DHW priority
- It is not possible to serve the development from a district heating network.
- Renewable and zero carbon technology such as photoelectric solar panel are required to achieve compliance.

1.3 RESULTS

Accredited IES VE software was used to determine the regulated carbon emissions. The results were then used to assess the total baseline carbon emissions, the carbon emissions after the application of energy efficiency measures and the carbon emissions after the application of improvement in fabric, energy efficient building services and low and zero carbon technologies. The results are shown in Table 1-1 below and exceed the -5% target reduction.

Table 1-1 Carbon Emissions Reduction Over Part L 2013

2. PROJECT BACKGROUND

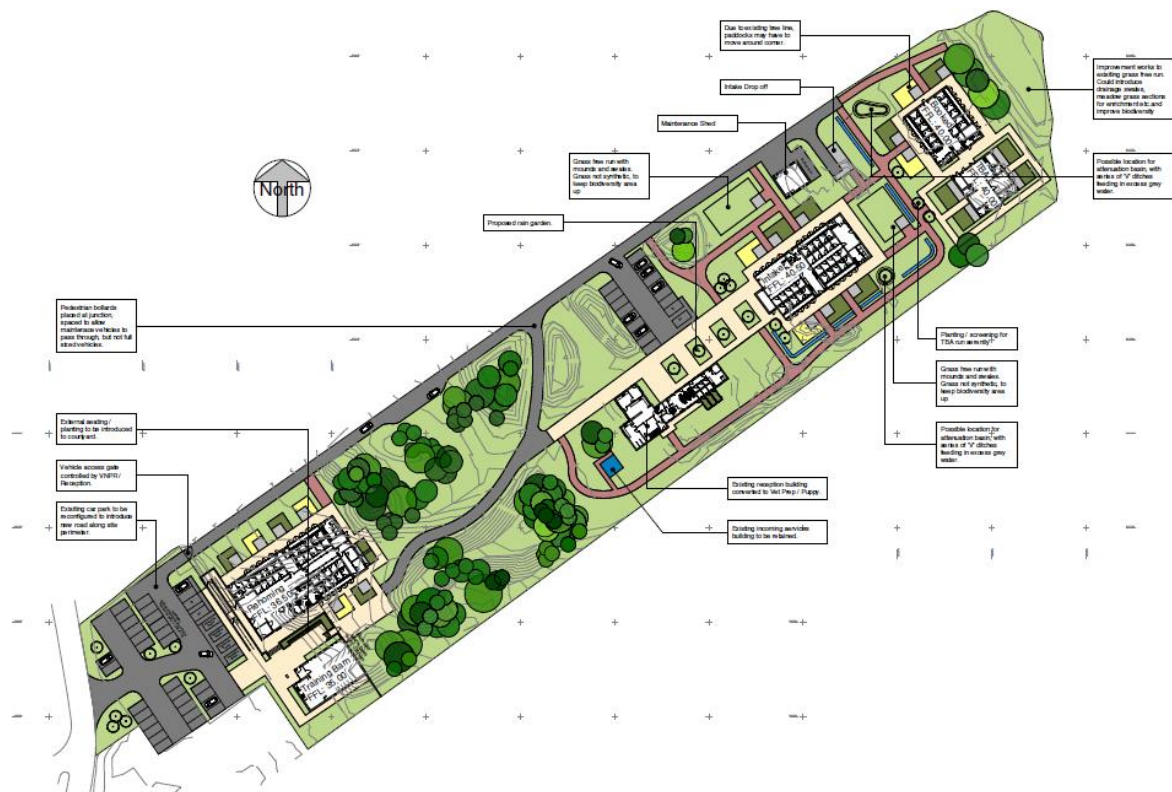
2.1 DEVELOPMENT DESCRIPTION

Dogs Trust Huyton, as defined by the Black line boundary on the site location plan submitted with this application (Figure 1-1) comprises an undeveloped open grassed area. Vegetation aligns the North, South, East and Western site boundaries of the site. Beyond the North site boundary is a railway with Huyton and Prescot Golf Course beyond. The M57 motorway runs to the East Boundary of the site.

The site is accessed via a road leading from Whiston Lane.

The Dogs Trust Huyton site, the subject of this application, provides an opportunity to construct multiple sustainable commercial units. The design strategy is to be lean be, be green and be clean.

Figure 2-1 Site Location Map for the Proposed Development (site boundary within red line)



3. POLICY CONTEXT

Local planning authorities should expect new development to:

- Comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
- Take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

Knowsley Council's approach to sustainable development is underpinned by core policies from the adopted Local Plan. The Core Strategy (2016) provides overarching strategy and policies and the long term vision for Council.

3.1 LOCAL PLAN

Key policies underpinning the Local Plan approach to sustainable development include:

- Policy CS22 – Sustainable and Low Carbon Development

The Local Plan sets out policy in the Knowsley Plan and identifies a number of objectives to reduce emissions and encourage sustainable construction. For this scheme we have adopted the following energy hierarchy

1. **Be lean:** use less energy
2. **Be clean:** supply energy efficiently
3. **Be green:** use renewable energy

The policy requires commercial developments meet the carbon emissions reduction over Part L (2021) of the Building Regulations.

The Policy includes planning policies both for reducing energy consumption within buildings and the use of renewable energy. These policies cover the role of the energy strategy and the requirements of planning applications.

3.2 SUSTAINABLE DEVELOPMENT

Sustainable Construction Principles

- 1) New development will be required to meet high standards of sustainable design and construction and minimise carbon emissions. This should be achieved by:
 - a. Designing new buildings for flexible uses throughout their lifetime;
 - b. Avoiding the creation of adverse local climate conditions by using natural systems to avoid internal overheating and excessive heat generation;
 - c. Ensuring developments are comfortable and safe for users;
 - d. Making the most effective and sustainable use of water, aggregates and other resources;
 - e. Limiting energy use by incorporating high standards of insulation, heat retention, natural ventilation and passive solar techniques;
 - f. Landscaping (including measures such as green walls or roofs) to create shelter and reduce any heat island effect;

- g. Using sustainable materials from local suppliers where possible;
- h. Supplying energy efficiently and incorporating decentralised energy systems, using renewable and low carbon energy where feasible;
- i. Managing flood risk, including through the use of Sustainable Drainage Systems (SuDS) and flood resilient design for infrastructure and property; and
- j. Promoting sustainable waste practices in new and existing developments.

Low Carbon Development, Community Energy Fund and Allowable Solutions

- 2) Government targets for carbon reduction in new development are expected to be implemented through updates to the Building Regulations. Where it is not technically feasible or economically viable to meet the requirements on site, contributions to the Council's Community Energy Fund may be accepted as one of a range of options under the Government's proposed 'Allowable Solutions' mechanism. The Fund will be used to support carbon reduction initiatives in Knowsley and potentially the wider Liverpool City Region.

Sustainable Construction Targets

- 3) Local targets for sustainability in relation to specific development areas or sites may be outlined in the Local Plan: Site Allocations and Development Policies. Priority Zones and Decentralised Energy Networks

Priority Zones and Decentralised Energy Networks

- 4) Knowsley Industrial Park and Knowsley Business Park are identified as a 'Priority Zone'. Within this area the Council and its partners will facilitate renewable and low carbon infrastructure by (subject to feasibility) requiring new development to:
 - a. Make provision for connection to an existing or planned decentralised energy network; and
 - b. Be designed to enable future connectivity in terms of proposed site layout, infrastructure and heating provision, including consideration of connections at a later date or phase.
- 5) Subject to opportunity and need, additional 'Priority Zones' may be identified in the Local Plan: Site Allocations and Development Policies

4. BASELINE CARBON EMISSIONS

The first stage of the energy assessment is to establish the baseline site energy demand and CO₂ emissions based on accredited Part L software for the commercial development.

IES VE software was used to establish the baseline regulated carbon emissions.

The baseline limiting building fabric performance values are summarised in table 4-1

Table 4-1 Fabric performance notional and backstop values

ELEMENT	LIMITING FABRIC PERFORMANCE
External Wall U-value (W/m ² K)	0.26
Party wall U-value (W/m ² K)	0.26
Ground floor U-value (W/m ² K)	0.18
Roof U-value (W/m ² K)	0.16 (pitched)
Curtain Wall / Glazing U-value (W/m ² K)	1.6U / G0.4 / LT 0.71
Roof Light / Glazing G-value	2.2U / G0.55 / LT 0.6
Air permeability (m ³ /hr.m ² @ 50 Pa)	8.0

5. BE LEAN: REDUCE ENERGY DEMAND

The first step to achieving Building Regulations compliance and the targets outlined previously is to reduce energy demand. The measures associated with reducing demand can be termed as 'Energy Efficiency Measures'.

The Proposed Development will incorporate a number of relevant energy conservation measures the benefits of which are discussed below. In summary the following measures will be included:

- Improved air tightness;
- High performance building fabric;
- High performance glazing;
- 100% low energy lighting and controls;
- Mechanical ventilation with heat recovery.

5.1 BUILDING FABRIC

At this stage we have based the thermal enhancements to match the notional building set out in the building regulations.

At this stage it is anticipated that an overall U-value for the curtain walling system of around 1.4W/m²K or better will be achieved. For the purposes of this assessment this value has been used, though solutions will be sought to reduce the U-value further where possible in order to realise further carbon reductions.

Glazing to the units will be specified to achieve a g-value of around 0.4. This is considered to provide an appropriate year-round balance between maximising daylighting and beneficial wintertime solar gain, and minimising summertime solar gains to reduce the overheating risk and need for comfort

cooling. However there are in some instances where the solar gain levels have exceeded criterion 3 and therefore solar shading or enhancement to the glazing would be required to achieve compliance.

The current proposals for the building fabric performance for the Proposed Development are summarised in Table 5-1.

Table 5-1 Fabric performance targets

ELEMENT	NOTIONAL FABRIC PERFORMANCE
External Wall U-value (W/m ² K)	0.18
Party wall U-value (W/m ² K)	0.18
Ground floor U-value (W/m ² K)	0.15
Roof U-value (W/m ² K)	0.15
Curtain Wall / Glazing U-value (W/m ² K)	1.4U / G0.4 / LT 0.7
Roof Lights / Glazing G-value	2.1U / G0.55 / LT 0.7
Air permeability (m ³ /hr.m ² @ 50 Pa)	4.0

5.2 BUILDING SERVICES

A high performance MEP building services is proposed for the scheme. Table 5-2 lists the general specification for the heating system, lighting and ventilation strategy for the proposed commercial units.

Table 5-2 General heating, cooling, ventilation and lighting specification for dwellings

ELEMENT	GENERAL SPECIFICATION
Ventilation	Mechanical ventilation with heat recovery (MVHR) units to achieve a specific fan power of 1.4W/l/s with a heat recovery efficiency of 75% or more with demand control Mechanical ventilation zonal extract units to achieve a specific fan power of 0.4W/l/s with demand control.
Internal lighting	100% low energy, daylight control. Lighting efficiency to be 115lm/w minimum
Primary heat source	Heating and cooling provided by High Efficiency heat pump with heating SCOP of 3.57 to serve underfloor heating and DHW cylinders. Offices with AC to have SCOP3.5 and cooling SEER of 5.0. Dog runs to be treated as unheated.
Heating controls	Central Time Control Optimum Start /Stop Local time control Local Temperature control Weather Compensation Control Variable Speed differential sensor across pump.
Heat emitters	Underfloor Heating and Air conditioning cassettes (office only)
Overheating control / cooling	Natural ventilation (General) and Split comfort cooling/heating (management office). Full overheating assessment to be undertaken in accordance with TM54

6.0 BE CLEAN: SUPPLY ENERGY EFFICIENTLY

After consumption has been reduced through the application of energy efficiency measures, the

next step is to consider low carbon technologies in order to provide further reduction in carbon dioxide emissions.

The following low carbon technologies have been investigated for the proposed development.

- District heating network;
- Combined Heat and Power (CHP);
- Ground Source Heat Pump;
- Air Source Heat Pump.

6.1 DISTRICT HEATING NETWORK

There are no existing district heating networks in the vicinity of the development.

Therefore, connection for District Heating has not been considered viable for this scheme.

6.2 COMBINED HEAT AND POWER (CHP)

On the basis that the development cannot be supplied directly from a district heating network, the use of CHP led LTHW heating system has been considered. CHP systems are generators which produce on site generated electricity and use the waste heat within the development. To operate at maximum efficiency CHP systems require a constant steady state and heat load within the development.

Primarily domestic hot water consumption is likely to make up a significant proportion of the total heat demand, which provides an ideal year-round baseline heat load for the use of CHP.

The selection of the CHP should be carefully considered as a CHP which is too small will be limited in onsite electrical generation and an oversized CHP will have reduced running hours typically during the summer time periods, due to reduced heating loads.

Advantages of CHP include;

- Waste heat can be utilized for the space heating;
- Can also provide domestic hot water;
- Reasonable payback.
- Continuous year round heating load to serve swimming pool.

Disadvantages of CHP include:

- High maintenance costs;
- Acoustic assessment and treatment required to control noise breakout;
- Large internal space require to house CHP and buffer vessel;
- High initial capital cost;
- Frequent maintenance required.

- **Due to the incorporation of renewable technology into the electric grid the emission factors of a CHP boiler may have a negative impact on the reduction of carbon emissions.**

The reduction in carbon emission from grid displaced electricity result in CHP having a negative impact with regards to reducing carbon emissions.

Due to improvements and reduction in carbon emissions from grid displaced electricity the use of a CHP has not been considered for future assessment.

6.3 GROUND SOURCE HEAT PUMP (GSHP)

Ground Source Heat Pump (GSHP) technology is widely used in the UK. Diverse applications include space heating, water heating and heat recovery in residential sectors.

The technology makes use of the energy stored in the Earth coming mainly from solar radiation and the transfer of heat from ground water. Essentially, heat pumps take up heat at a certain temperature and release it at a higher temperature. This is achieved by means of ground collectors (coils), in which a heat exchange fluid circulates and transfers heat via a heat exchanger to the heat pump. The cycle is driven by the temperature difference between the ground and the circulating fluid. The advantage of the using the ground as heat source rather than air, is the relatively constant temperatures of the ground throughout the year allowing the refrigerant fluid to operate optimally.

Ground source heat pumps can be categorised as having closed or open loops, and those closed can be installed in three ways: horizontally, vertically, or in a underground aquifer. The type chosen depends on the building load, available land areas and the soil and rock type at the installation site. These factors will help determine the most economical choice for installation of the ground loop.

Open loop systems are often referred to as groundwater heat pump. Ground water is pumped in the secondary loop through the heat exchanger in the heat pump and released at a lower temperature back into the ground. It may be suitable where there is a source of relatively clean water, and all local codes and regulations regarding groundwater discharge are met.

For closed loop systems, water or antifreeze solution is circulated through plastic pipes buried beneath the earth's surface. A system that would supply the full space and water heating demand of a typical house would need 200m of ground coils, and for commercial buildings this can reach thousands of metres. Different space configurations of piping are possible depending on the available land, soil conditions, and excavation costs.

- Horizontal collectors require relatively large area of land free from hard rock. They are most appropriate for small installations, and particularly for new build. The pipes are buried in trenches 1- 2m deep. Spatial optimisation is possible by laying pipes in group configurations. However, minimum distances should be maintained in order to allow for good thermal exchange.
- Vertical collectors are used where land is limited and are suitable for most soil and rock types. Vertical borehole heat exchangers could also be of various configurations (single, double, U-shaped, etc.) with typical diameters of 0.1-0.2m and between 15m and 180m deep. Minimum spacing between adjacent boreholes of 5-15m should be maintained to prevent thermal interference. Vertical boreholes are used in open loop systems to access the local water table. It should be noted that an open loop system must comply with Environmental Agency (EA) protocol.
- Parallel and series connections can be used where more than one horizontal loop or borehole are in place

Almost all heat pumps in operation are based on the vapour compression cycle, which combines efficiency, safety, and reasonable cost. A detailed ground survey, considering ground conditions and potentially other features such as sewers, tunnels and archaeology will be needed. Ground conditions will also affect ease of construction and performance of the system.

Advantages of GSHP include:

- Low maintenance requirement
- Can be easily incorporated into the building providing space is available for external heat pumps;
- Can also provide domestic hot water;
- More suitable for heating systems with lower operating water temperatures i.e. underfloor heating systems;
- Consistent annual efficiency over ASHP

Disadvantages of GSHP include:

- Electricity required to run heat pump;
- Space for internal condenser required and large external area;
- High initial capital cost;
- More suitable for heating systems with relatively low operating temperatures i.e. underfloor heating systems;
- May result in high electrical use if not designed/specified correctly on in non-favourable external environmental conditions.

Ground source heat pumps are comparable with conventional LTHW heating system and are best suited for low temperature heating systems which utilise underfloor heating.

We would propose that a new heating system is installed with a 45/35°C flow and return serving underfloor heating manifolds. Any reduction in heating flow temperature will result in increased SCOP of the heating plant.

A significant upgrade in electrical infrastructure would also need to be considered.

6.4 AIR SOURCE HEAT PUMP (ASHP)

Air Source Heat Pumps (ASHP) absorb heat from the outside air. This heat can then be used to heat radiators, underfloor heating systems, or Air Handling Units.

An air source heat pump extracts heat from the outside air in the same way that a fridge extracts heat from its inside. It can get heat from the air even when the temperature is as low as -15° C. Heat pumps have some impact on the environment as they need electricity to run, but the heat they extract from the ground, air, or water is constantly being renewed naturally.

Unlike gas and oil boilers, heat pumps deliver heat at lower temperatures over much longer periods. During the winter, they may need to be on constantly to heat a property efficiently.

Air source heat pumps can also provide cooling via a reversible type heat pump to provide space heating and cooling using external air properties to generate heat and/or cooling via piped systems.

Advantages of ASHP include:

- Low maintenance requirement;

- Can be easily incorporated into the building providing space is available for external heat pumps;
- Air Primary heat source/heat dump;
- Can also provide domestic hot water;
- Easier to install than Ground Source;
- More suitable for heating systems with lower operating water temperatures i.e. underfloor heating systems;
- Initial installation costs are considerably lower than GSHP.

Disadvantages of ASHP include:

- Electricity required to run heat pump;
- Space for external condenser required. External heat pumps and space required will be considerably larger for commercial buildings;
- Efficiencies may be lower than ground source during winter conditions;
- More suitable for heating systems with relatively low operating temperatures i.e. underfloor heating systems;
- May result in high electrical use if not designed/specified correctly on in non-favourable external environmental conditions;

For ASHP technology to be viable as a LZC technology, consideration needs to be given to the operation of the site along with the type of heating system and/or cooling system proposed. A small area is required to house the external heat pumps for a scheme of this size; this may also create external noise issue. An acoustic noise assessment should be undertaken to manage the noise generation of the unit.

We would propose that a new heating system is installed with a 45/35°C flow and return serving underfloor heating manifolds. Any reduction in heating flow temperature will result in increased SCOP of the heating plant.

A significant upgrade in electrical infrastructure would also need to be considered.

7. BE GREEN: RENEWABLE ENERGY TECHNOLOGIES

Renewable Energy Technologies are those listed below which can provide a source of energy onsite that is not primarily based on the consumption of fossil fuels or grid electricity and/or utilises a heat source that is renewable such as ground source and solar thermal systems.

- Wind Power
- Biomass Heating
- Solar Thermal Hot Water Heating
- Photovoltaic Panels

In accordance with the requirements of the Local Plan, we have evaluated a number of renewable energy technologies and outlined how they may be applied to the development.

7.1 WIND POWER

Harnessing the kinetic energy of wind can provide a renewable source of on-site electricity generation. Wind turbines need to be positioned where a frequent and steady source of wind is available that is not too turbulent or uneven in direction. Typically wind turbines are positioned on the roof of buildings that are significantly higher than their surroundings and or located in open areas where there is minimum disruption to prevailing winds.

The development is located within an urban environment with numerous adjacent buildings of similar height providing turbulent wind conditions unsuitable for wind power generation.

In addition, wind turbines are not considered to be appropriate in townscape and architectural terms to provide wind turbines on top of the building. On that basis they are not proposed for the Dogs Trust site development.

7.2 BIOMASS HEATING

Biomass heating has embodied environmental impacts from transport and fuel combustion which makes it less desirable in Air Quality Management Areas (AQMA's). A review of the potential impact on air quality from increased wood fuelled biomass use in London has been carried out by AEA Energy & Environment, and was published in December 2007. Whilst the development is not within a London Borough the assessment indicates that potentially increasing the contribution from small-scale wood fuelled biomass combustion may lead to a substantial increase in nitrogen dioxide and particulate matter concentrations.

However there are several technologies such as ceramic filters, electrostatic precipitators or bag filters which can all be used to significantly reduce the emissions to air and have successfully been used on biomass systems located within AQMA's. Solid biomass relies on a reliable fuel supply which must be delivered and stored on site. Sites using biomass solutions therefore require good access routes both of which are viable on this site. Biomass boilers also have weekly maintenance requirements and relatively high fuel costs compared to gas.

However, as the building is to be heated via heat pump LTHW heating production would be limited. Therefore the use of Biomass would not be viable throughout the year and has not been considered for this scheme.

7.3 SOLAR THERMAL

Solar thermal (ST) generation involves capturing solar radiant heat to preheat or heat domestic hot water. Correctly located and orientated, solar thermal systems can meet a proportion of a building's domestic hot water dependent on the expected demand profile and available space for locating ST collectors.

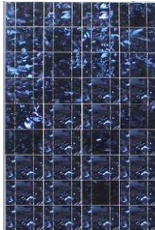
A solar thermal hot water system would offset some proportion of the baseline hot water load throughout the summer months if provided. The limited roof space and visual aesthetics do not make solar thermal a viable option. Ground mounted solar collectors could be incorporated however would need to be in close proximity to the building and would need to be pumped. A ground mounted solar thermal array would also require a drain back module should there be no hot water demand during the summer months. Evacuate tube solar thermal panels are very efficient however the glass tubes are fragile, and it is recommended that the panels are roof mounted where possible. When considering the above, the use of solar thermal has therefore not been considered for this scheme.

7.4 PHOTOVOLTAIC PANELS

The feasibility of providing photovoltaic (PV) panels has been assessed for this scheme. Solar PV panels located on the top roof areas can be used to provide electricity generation which can contribute to the Local Authority Targets.

Photovoltaic (PV) modules convert sunlight into DC electricity and can be integrated into buildings. PV is distinct from other renewable energy technologies since it has no moving parts to be maintained and is silent. PV systems can be incorporated into buildings in various ways; on sloped roofs and flat roofs, on facades, atria and as shading devices.

Table 7.1 Three most common types of photovoltaic cell

Property	Monocrystalline Silicon	Polycrystalline Silicon	Thin Film Amorphous Silicon
			
Cell efficiency at standard test conditions	15-22%	14-15%	8-12%
Module efficiency	13-21%	12-14%	5-7%
Advantages/Disadvantages	Most efficient but highest cost	Less expensive than monocrystalline but slightly less efficient	Considerably cheaper but approximately half the efficiency of a typical monocrystalline panel

Since PV's generate DC output, an inverter and other equipment is needed to deliver the power to a building or the grid in an acceptable AC form. The cost of the inverter and these 'balance of system' (BOS) components can approach 50% of the total cost of a PV system.

There are several issues which will need to be considered further if one or more photovoltaic arrays are to be included. Consideration must be given to any over-shading provided by surrounding buildings as well as orientation and elevation of the panels.

A particular advantage of solar PV, over other types of LZC technology, is that the running costs are very low (requires no fossil fuel for operation) and since there are no moving parts, very little maintenance is required.

The suitability of this technology for the site is dependent on space availability for panel mounting. For all proposed new building southern facing pitched roofs would be preferred.

A PV system would offset some proportion of the baseline load if provided. The available roof space and the high electrical load and percentage of electrical load attributed to lighting throughout the day.

7.5 SUITABILITY APPRAISAL

All renewable energy technologies which may be considered feasible for the scheme have been assessed and summarised in table 7-1.

Table 7-2 Renewable technology suitability appraisal

TECHNOLOGY	APPRAISAL
Wind	Not suitable at this site
Biomass	Limited all round heating
Solar Thermal	Limited to HWS demand and summertime operation
Photovoltaic Panels	Suitable

7.6 CARBON EMISSIONS REDUCTION

All renewable energy technologies which may be considered feasible for the scheme have been assessed, the outcomes of which are summarised above. From that exercise, it was concluded that Solar PV panels were the most suitable for this scheme and would work effectively alongside the proposed HVAC services.

Table 7-3 Be Green: Unit 1&2 Carbon Emissions

	Notional Part L2 2021 (TER) (kgCO2/m2)	Building Part L2 2021 (TER) (kgCO2/m2)	TPER kWh/m2	BPER kWh/m2	PV Area Required
Intake	3.8	3.2	40.2	32.9	35m ² @ 21% efficiency 130° Azimuth (clockwise from north) 30° Inclination (° from horizontal)
Rehoming	4.0	3.5	41.6	36.7	30m ² @ 21% efficiency

					135° Azimuth (clockwise from north) 30° Inclination (° from horizontal)
Booked	3.9	3.1	41.1	32.3	10m3 @ 21% efficiency 235° Azimuth (clockwise from north) 30° Inclination (° from horizontal)
Training Barn	5.2	4.9	54.6	50.1	15m3 @ 21% efficiency 120° Azimuth (clockwise from north) 30° Inclination (° from horizontal)
TBA	5.8	4.6	60.6	48.1	8m3 @ 21% efficiency 235° Azimuth (clockwise from north) 30° Inclination (° from horizontal)

8. CONCLUSION

In accordance with the policy to reduce CO2 emissions and meet Part L2 2021, all 5 new build units comply utilising a combination of "Be Lean", "Be Clean" and "Be Green" measures.

APPENDIX A

BRUKL DOCUMENTS

Project name

Rehoming

As designed

Date: Tue Apr 18 16:39:40 2023

Administrative information

Building Details

Address: Dogs Trust, Huyton, XXX XXX

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.19

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.19

BRUKL compliance module version: v6.1.e.0

Foundation area [m²]: 303.51The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	4.04
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	3.62
Target primary energy rate (TPER), kWh _{PE} /m ² annum	42.4
Building primary energy rate (BPER), kWh _{PE} /m ² annum	37.63
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.18	__000005:Surf[6]
Floors	0.18	0.15	0.15	__000005:Surf[10]
Pitched roofs	0.16	0.15	0.15	__000005:Surf[2]
Flat roofs	0.18	0.15	0.15	SP000000:Surf[1]
Windows** and roof windows	1.6	1.43	1.43	__000005:Surf[3]
Rooflights***	2.2	2.2	2.2	__000005:Surf[0]
Personnel doors^	1.6	1.6	1.6	__00002B:Surf[1]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	4

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- ASHP (UFH) + NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.57	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- ASHP (UFH) + MVHR(75)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.57	-	0.2	-	0.75
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- ASHP (UFH) + MV(E)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.57	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

4- Split Server

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- ASHP DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	3.57	0.009
Standard value	2*	N/A
* Standard shown is for all types except absorption and gas engine heat pumps.		

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
40 - Asst. Man. Office	-	-	-	1.4	-	-	-	-	-	-	N/A
42 - Dis. WC	-	-	0.4	-	-	-	-	-	-	-	N/A
43 - Food Prep	-	-	0.4	-	-	-	-	-	-	-	N/A
49 - Man. Office	-	-	-	1.4	-	-	-	-	-	-	N/A
51 - Office With Kitchenette	-	-	-	1.4	-	-	-	-	-	-	N/A
53 - Reception	-	-	-	1.4	-	-	-	-	-	-	N/A
54 - Sluice	-	-	0.4	-	-	-	-	-	-	-	N/A
59 - WC	-	-	0.4	-	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
01 - Entrance		115	-	-
02 - Entrance Lobby		115	-	-
03 - Corridor		115	-	-
04 - Corridor		115	-	-
05 - Corridor		115	-	-
06 - Corridor		115	-	-
07 - Corridor		115	-	-
08 - Corridor		115	-	-
09 - Corridor		115	-	-
10 - K1		115	-	-
11 - K2		115	-	-
12 - K3		115	-	-
13 - K4		115	-	-
14 - K5		115	-	-
15 - K6		115	-	-
16 - K7		115	-	-
17 - K8		115	-	-
18 - K9		115	-	-
19 - K10		115	-	-
20 - K11		115	-	-
21 - K12		115	-	-
22 - K13		115	-	-
23 - K14		115	-	-
24 - K15		115	-	-
25 - S1		115	-	-
26 - S2		115	-	-
27 - S3		115	-	-
28 - S4		115	-	-
29 - S5		115	-	-
30 - S6		115	-	-
31 - S7		115	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
32 - S8		115	-	-
33 - S9		115	-	-
34 - S10		115	-	-
35 - S11		115	-	-
36 - S12		115	-	-
37 - S13		115	-	-
38 - S14		115	-	-
39 - S15		115	-	-
40 - Asst. Man. Office		115	-	-
41 - Cleaners		115	-	-
42 - Dis. WC		115	-	-
43 - Food Prep		115	-	-
44 - IT		115	-	-
45 - Kennel Run		115	-	-
46 - Kennel Run		115	-	-
47 - Kennel Run		115	-	-
48 - Laundry		115	-	-
49 - Man. Office		115	-	-
50 - Meet & Greet		115	-	-
51 - Office With Kitchenette		115	-	-
52 - Plant Room		115	-	-
53 - Reception		115	15	9
54 - Sluice		115	-	-
55 - Sponser K1 - Run		115	-	-
56 - Sponser K1 - Sleep		115	-	-
57 - Sponser K2 - Run		115	-	-
58 - Sponsor K2 - Sleep		115	-	-
59 - WC		115	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
10 - K1	N/A	N/A
11 - K2	N/A	N/A
12 - K3	N/A	N/A
13 - K4	N/A	N/A
14 - K5	N/A	N/A
15 - K6	N/A	N/A
16 - K7	N/A	N/A
17 - K8	N/A	N/A
18 - K9	N/A	N/A
19 - K10	N/A	N/A
20 - K11	N/A	N/A
21 - K12	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
22 - K13	N/A	N/A
23 - K14	N/A	N/A
24 - K15	N/A	N/A
25 - S1	N/A	N/A
26 - S2	N/A	N/A
27 - S3	N/A	N/A
28 - S4	N/A	N/A
29 - S5	N/A	N/A
30 - S6	N/A	N/A
31 - S7	N/A	N/A
32 - S8	N/A	N/A
33 - S9	N/A	N/A
34 - S10	N/A	N/A
35 - S11	N/A	N/A
36 - S12	N/A	N/A
37 - S13	N/A	N/A
38 - S14	N/A	N/A
39 - S15	N/A	N/A
40 - Asst. Man. Office	N/A	N/A
44 - IT	N/A	N/A
48 - Laundry	N/A	N/A
49 - Man. Office	N/A	N/A
50 - Meet & Greet	YES (+217.7%)	NO
51 - Office With Kitchenette	N/A	N/A
53 - Reception	N/A	N/A
56 - Sponser K1 - Sleep	N/A	N/A
58 - Sponsor K2 - Sleep	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	554.6	554.6
External area [m ²]	1614.7	1614.7
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	4	5
Average conductance [W/K]	439.77	490.76
Average U-value [W/m ² K]	0.27	0.3
Alpha value* [%]	25	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

Retail/Financial and Professional Services
 Restaurants and Cafes/Drinking Establishments/Takeaways
 Offices and Workshop Businesses
 General Industrial and Special Industrial Groups

100 Storage or Distribution

Hotels
 Residential Institutions: Hospitals and Care Homes
 Residential Institutions: Residential Schools
 Residential Institutions: Universities and Colleges
 Secure Residential Institutions
 Residential Spaces
 Non-residential Institutions: Community/Day Centre
 Non-residential Institutions: Libraries, Museums, and Galleries
 Non-residential Institutions: Education
 Non-residential Institutions: Primary Health Care Building
 Non-residential Institutions: Crown and County Courts
 General Assembly and Leisure, Night Clubs, and Theatres
 Others: Passenger Terminals
 Others: Emergency Services
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	10.55	13.27
Cooling	0	0
Auxiliary	2.9	1.93
Lighting	16.61	12.25
Hot water	3.38	0.72
Equipment*	31.33	31.33
TOTAL **	33.44	28.16

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	9.23	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>9.23</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	120.98	132.7
Primary energy [kWh _{PE} /m ²]	37.63	42.4
Total emissions [kg/m ²]	3.62	4.04

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	246.2	0	21.5	0	2.2	3.19	0	3.57	0	
Notional	270.6	0	27	0	1.2	2.78	0	----	----	
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	179.2	0	15.6	0	12.2	3.19	0	3.57	0	
Notional	204.8	0	20.5	0	15.8	2.78	0	----	----	
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	169.6	0	14.8	0	8.2	3.19	0	3.57	0	
Notional	178.7	0	17.9	0	4.9	2.78	0	----	----	
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	0	0	0	0	0	3.26	3.55	3.5	5	
Notional	0	0	0	0	0	2.78	4.63	----	----	
[ST] No Heating or Cooling										
Actual	0	0	0	0	0	0	0	0	0	
Notional	0	0	0	0	0	0	0	----	----	

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Project name

Booked**As designed**

Date: Tue Apr 18 15:23:21 2023

Administrative information

Building Details

Address: Dogs Trust, Huyton, xxx xxx

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.19

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.19

BRUKL compliance module version: v6.1.e.0

Foundation area [m²]: 119.23The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	3.92
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	3.09
Target primary energy rate (TPER), kWh _{PE} /m ² annum	41.12
Building primary energy rate (BPER), kWh _{PE} /m ² annum	32.31
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.18	LN000014:Surf[4]
Floors	0.18	0.15	0.15	LN000014:Surf[2]
Pitched roofs	0.16	0.15	0.15	LN000014:Surf[0]
Flat roofs	0.18	-	-	No flat roofs in building
Windows** and roof windows	1.6	1.52	1.52	LN000005:Surf[4]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.6	1.6	LN000014:Surf[3]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	4

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- ASHP (UFH) + NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.57	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- ASHP (UFH) + MV(E)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.57	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- DHW ASHP

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	3.57	0.009
Standard value	2*	N/A
* Standard shown is for all types except absorption and gas engine heat pumps.		

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I			
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard	
02 - Food Prep	-	-	0.4	-	-	-	-	-	-	-	N/A	
03 - Laundry	-	-	0.4	-	-	-	-	-	-	-	N/A	
31 - Sluice	-	-	0.4	-	-	-	-	-	-	-	N/A	
33 - WC	-	-	0.4	-	-	-	-	-	-	-	N/A	

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
01 - Corridor		115	-	-
02 - Food Prep		115	-	-
03 - Laundry		115	-	-
04 - Plant		115	-	-
05 - Run		115	-	-
06 - Run		115	-	-
07 - Run 1		115	-	-
08 - Run 2		115	-	-
09 - Run 3		115	-	-
10 - Run 4		115	-	-
11 - Run 5		115	-	-
12 - Run 6		115	-	-
13 - Run 7		115	-	-
14 - Run 8		115	-	-
15 - Run 9		115	-	-
16 - Run 10		115	-	-
17 - Run 11		115	-	-
18 - Run 12		115	-	-
19 - Sleep 1		121	-	-
20 - Sleep 2		121	-	-
21 - Sleep 3		121	-	-
22 - Sleep 4		121	-	-
23 - Sleep 5		121	-	-
24 - Sleep 6		121	-	-
25 - Sleep 7		121	-	-
26 - Sleep 8		121	-	-
27 - Sleep 9		121	-	-
28 - Sleep 10		121	-	-
29 - Sleep 11		121	-	-
30 - Sleep 12		121	-	-
31 - Sluice		115	-	-
32 - Store		115	-	-
33 - WC		115	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
07 - Run 1	N/A	N/A
08 - Run 2	N/A	N/A
09 - Run 3	N/A	N/A
10 - Run 4	N/A	N/A
11 - Run 5	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
12 - Run 6	N/A	N/A
13 - Run 7	N/A	N/A
14 - Run 8	N/A	N/A
15 - Run 9	N/A	N/A
16 - Run 10	N/A	N/A
17 - Run 11	N/A	N/A
18 - Run 12	N/A	N/A
19 - Sleep 1	N/A	N/A
20 - Sleep 2	N/A	N/A
21 - Sleep 3	N/A	N/A
22 - Sleep 4	N/A	N/A
23 - Sleep 5	N/A	N/A
24 - Sleep 6	N/A	N/A
25 - Sleep 7	N/A	N/A
26 - Sleep 8	N/A	N/A
27 - Sleep 9	N/A	N/A
28 - Sleep 10	N/A	N/A
29 - Sleep 11	N/A	N/A
30 - Sleep 12	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	213.7	213.7
External area [m ²]	686.7	686.7
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	4	5
Average conductance [W/K]	203.75	234.65
Average U-value [W/m ² K]	0.3	0.34
Alpha value* [%]	25	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

Retail/Financial and Professional Services
 Restaurants and Cafes/Drinking Establishments/Takeaways
 Offices and Workshop Businesses
 General Industrial and Special Industrial Groups

100 Storage or Distribution

Hotels
 Residential Institutions: Hospitals and Care Homes
 Residential Institutions: Residential Schools
 Residential Institutions: Universities and Colleges
 Secure Residential Institutions
 Residential Spaces
 Non-residential Institutions: Community/Day Centre
 Non-residential Institutions: Libraries, Museums, and Galleries
 Non-residential Institutions: Education
 Non-residential Institutions: Primary Health Care Building
 Non-residential Institutions: Crown and County Courts
 General Assembly and Leisure, Night Clubs, and Theatres
 Others: Passenger Terminals
 Others: Emergency Services
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	6	11.44
Cooling	0	0
Auxiliary	3.72	2.6
Lighting	16.63	12.33
Hot water	2.34	0.92
Equipment*	68.22	68.22
TOTAL**	28.69	27.29

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	7.82	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>7.82</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	68.82	114.47
Primary energy [kWh _{PE} /m ²]	32.31	41.12
Total emissions [kg/m ²]	3.09	3.92

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	146.9	0	12.8	0	3.9	3.19	0	3.57	0	
Notional	271.7	0	27.2	0	2.2	2.78	0	----	----	
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	82.6	0	7.2	0	6.8	3.19	0	3.57	0	
Notional	89.7	0	9	0	8.9	2.78	0	----	----	
[ST] No Heating or Cooling										
Actual	0	0	0	0	0	0	0	0	0	
Notional	0	0	0	0	0	0	0	----	----	

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Project name

Intake

As designed

Date: Wed Apr 26 15:08:51 2023

Administrative information

Building Details

Address: Dogs Trust, Huyton, XXX XXX

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.19

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.19

BRUKL compliance module version: v6.1.e.0

Foundation area [m²]: 224.07The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	3.82
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	3.17
Target primary energy rate (TPER), kWh _{PE} /m ² annum	40.24
Building primary energy rate (BPER), kWh _{PE} /m ² annum	32.92
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.18	01000001:Surf[1]
Floors	0.18	0.15	0.15	01000001:Surf[6]
Pitched roofs	0.16	0.15	0.15	01000001:Surf[0]
Flat roofs	0.18	-	-	No flat roofs in building
Windows** and roof windows	1.6	1.43	1.43	03000000:Surf[2]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.6	1.6	01000001:Surf[4]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building
U _{a-Limit} = Limiting area-weighted average U-values [W/(m ² K)] U _{a-Calc} = Calculated area-weighted average U-values [W/(m ² K)] U _{i-Calc} = Calculated maximum individual element U-values [W/(m ² K)] * Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. ** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position. ^ For fire doors, limiting U-value is 1.8 W/m ² K NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	4

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- ASHP (UFH) + NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.57	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- ASHP (UFH) + MV(E)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.57	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- ASHP (UFH) + HRU(75)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.57	-	0.2	-	0.75
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- ASHP DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	3.57	0.009
Standard value	2*	N/A
* Standard shown is for all types except absorption and gas engine heat pumps.		

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
49 - WC	-	-	0.4	-	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
53 - Training	-	-	-	1.4	-	-	-	-	-	-	N/A
54 - Sluice	-	-	0.4	-	-	-	-	-	-	-	N/A
55 - Food Prep	-	-	0.4	-	-	-	-	-	-	-	N/A
56 - Laundry	-	-	0.4	-	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
01 - Plant		115	-	-
02 - Circulation		115	-	-
03 - Circulation		115	-	-
04 - Circulation		115	-	-
05 - Sleep 1		115	-	-
06 - Sleep 2		115	-	-
07 - Sleep 3		115	-	-
08 - Sleep 4		115	-	-
09 - Sleep 5		115	-	-
10 - Sleep 6		115	-	-
11 - Sleep 7		115	-	-
12 - Sleep 8		115	-	-
13 - Sleep 9		115	-	-
14 - Sleep 10		115	-	-
15 - Sleep 11		115	-	-
16 - Sleep 12		115	-	-
17 - Sleep 13		115	-	-
18 - Sleep 14		115	-	-
19 - Sleep 15		115	-	-
20 - Sleep 16		115	-	-
21 - Sleep 17		115	-	-
22 - Sleep 18		115	-	-
23 - Sleep 19		115	-	-
24 - Sleep 20		115	-	-
25 - Run 1		115	-	-
26 - Run 2		115	-	-
27 - Run 3		115	-	-
28 - Run 4		115	-	-
29 - Run 5		115	-	-
30 - Run 6		115	-	-
31 - Run 7		115	-	-
32 - Run 8		115	-	-
33 - Run 9		115	-	-
34 - Run 10		115	-	-
35 - Run 11		115	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
36 - Run 12		115	-	-
37 - Run 13		115	-	-
38 - Run 14		115	-	-
39 - Run 15		115	-	-
40 - Run 16		115	-	-
41 - Run 17		115	-	-
42 - Run 18		115	-	-
43 - Run 19		115	-	-
44 - Run 20		115	-	-
45 - Run		143	-	-
46 - Run		143	-	-
47 - Run		143	-	-
48 - Run		143	-	-
49 - WC		115	-	-
50 - M&E Cupboard		115	-	-
51 - Store		115	-	-
52 - Store		115	-	-
53 - Training		115	-	-
54 - Sluice		115	-	-
55 - Food Prep		115	-	-
56 - Laundry		115	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
05 - Sleep 1	N/A	N/A
06 - Sleep 2	N/A	N/A
07 - Sleep 3	N/A	N/A
08 - Sleep 4	N/A	N/A
09 - Sleep 5	N/A	N/A
10 - Sleep 6	N/A	N/A
11 - Sleep 7	N/A	N/A
12 - Sleep 8	N/A	N/A
13 - Sleep 9	N/A	N/A
14 - Sleep 10	N/A	N/A
15 - Sleep 11	N/A	N/A
16 - Sleep 12	N/A	N/A
17 - Sleep 13	N/A	N/A
18 - Sleep 14	N/A	N/A
19 - Sleep 15	N/A	N/A
20 - Sleep 16	N/A	N/A
21 - Sleep 17	N/A	N/A
22 - Sleep 18	N/A	N/A
23 - Sleep 19	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
24 - Sleep 20	N/A	N/A
25 - Run 1	N/A	N/A
26 - Run 2	N/A	N/A
27 - Run 3	N/A	N/A
28 - Run 4	N/A	N/A
29 - Run 5	N/A	N/A
30 - Run 6	N/A	N/A
31 - Run 7	N/A	N/A
32 - Run 8	NO (-100%)	NO
33 - Run 9	N/A	N/A
34 - Run 10	N/A	N/A
35 - Run 11	N/A	N/A
36 - Run 12	N/A	N/A
37 - Run 13	N/A	N/A
38 - Run 14	N/A	N/A
39 - Run 15	N/A	N/A
40 - Run 16	N/A	N/A
41 - Run 17	N/A	N/A
42 - Run 18	N/A	N/A
43 - Run 19	N/A	N/A
44 - Run 20	N/A	N/A
53 - Training	NO (-73.8%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	391.3	391.3
External area [m ²]	1165	1165
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	4	5
Average conductance [W/K]	317.8	348.3
Average U-value [W/m ² K]	0.27	0.3
Alpha value* [%]	25	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

Retail/Financial and Professional Services
 Restaurants and Cafes/Drinking Establishments/Takeaways
 Offices and Workshop Businesses
 General Industrial and Special Industrial Groups

100 Storage or Distribution

Hotels
 Residential Institutions: Hospitals and Care Homes
 Residential Institutions: Residential Schools
 Residential Institutions: Universities and Colleges
 Secure Residential Institutions
 Residential Spaces
 Non-residential Institutions: Community/Day Centre
 Non-residential Institutions: Libraries, Museums, and Galleries
 Non-residential Institutions: Education
 Non-residential Institutions: Primary Health Care Building
 Non-residential Institutions: Crown and County Courts
 General Assembly and Leisure, Night Clubs, and Theatres
 Others: Passenger Terminals
 Others: Emergency Services
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	5.23	9.85
Cooling	0	0
Auxiliary	8.37	2.73
Lighting	19.92	13.13
Hot water	2.73	1.06
Equipment*	59.78	59.78
TOTAL **	36.24	26.77

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	15.1	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>15.1</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	59.93	98.56
Primary energy [kWh _{PE} /m ²]	32.92	40.24
Total emissions [kg/m ²]	3.17	3.82

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	110.5	0	9.6	0	3.7	3.19	0	3.57	0
	Notional	219.1	0	21.9	0	2.1	2.78	0	----	----
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	55.5	0	4.8	0	7.8	3.19	0	3.57	0
	Notional	61.9	0	6.2	0	10.1	2.78	0	----	----
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	179.6	0	15.7	0	8	3.19	0	3.57	0
	Notional	201.9	0	20.2	0	4.8	2.78	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Project name

TBA

As designed

Date: Wed Apr 19 14:27:58 2023

Administrative information

Building Details

Address: Dogs Trust, Huyton, XXX XXX

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.19

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.19

BRUKL compliance module version: v6.1.e.0

Foundation area [m²]: 115.89The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	5.76
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	4.59
Target primary energy rate (TPER), kWh _{PE} /m ² annum	60.62
Building primary energy rate (BPER), kWh _{PE} /m ² annum	48.07
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.18	__00000B:Surf[4]
Floors	0.18	0.15	0.15	__00000B:Surf[1]
Pitched roofs	0.16	0.15	0.15	__00000B:Surf[0]
Flat roofs	0.18	-	-	No flat roofs in building
Windows** and roof windows	1.6	1.41	1.41	__00000B:Surf[2]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.6	1.6	__00000B:Surf[3]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	4

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- ASHP (UFH) + HRU(75)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.57	-	0.2	-	0.75
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- ASHP (UFH) + NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.57	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- ASHP DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	3.57	0.009
Standard value	2*	N/A
* Standard shown is for all types except absorption and gas engine heat pumps.		

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I			
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
01 - Bath & Groom	-	-	-	1.4	-	-	-	-	-	-	-	N/A
04 - Office / Food Prep	-	-	-	1.4	-	-	-	-	-	-	-	N/A
14 - Training Room 01	-	-	-	1.4	-	-	-	-	-	-	-	N/A
15 - Training Room 02	-	-	-	1.4	-	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire		Display light source	
Zone name		Efficacy [lm/W]		Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95		80	0.3
01 - Bath & Groom		115		-	-
02 - Circulation		115		-	-
03 - Kennel		115		-	-
04 - Office / Food Prep		115		-	-
05 - Plant		115		-	-
06 - TBA 1		115		-	-
07 - TBA 2		115		-	-
08 - TBA 3		115		-	-
09 - TBA 4		115		-	-
10 - TBA Run 1		115		-	-
11 - TBA Run 2		115		-	-
12 - TBA Run 3		115		-	-
13 - TBA Run 4		115		-	-
14 - Training Room 01		115		-	-
15 - Training Room 02		115		-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01 - Bath & Groom	NO (-74.6%)	NO
03 - Kennel	N/A	N/A
06 - TBA 1	N/A	N/A
07 - TBA 2	N/A	N/A
08 - TBA 3	N/A	N/A
09 - TBA 4	N/A	N/A
14 - Training Room 01	N/A	N/A
15 - Training Room 02	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	144.1	144.1
External area [m ²]	494.7	494.7
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	4	5
Average conductance [W/K]	124.46	159.85
Average U-value [W/m ² K]	0.25	0.32
Alpha value* [%]	25	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

Retail/Financial and Professional Services
 Restaurants and Cafes/Drinking Establishments/Takeaways
 Offices and Workshop Businesses
 General Industrial and Special Industrial Groups

100 Storage or Distribution

Hotels
 Residential Institutions: Hospitals and Care Homes
 Residential Institutions: Residential Schools
 Residential Institutions: Universities and Colleges
 Secure Residential Institutions
 Residential Spaces
 Non-residential Institutions: Community/Day Centre
 Non-residential Institutions: Libraries, Museums, and Galleries
 Non-residential Institutions: Education
 Non-residential Institutions: Primary Health Care Building
 Non-residential Institutions: Crown and County Courts
 General Assembly and Leisure, Night Clubs, and Theatres
 Others: Passenger Terminals
 Others: Emergency Services
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	11.93	20.83
Cooling	0	0
Auxiliary	6.6	3
Lighting	18.02	15.3
Hot water	3.78	1.19
Equipment*	62.24	62.24
TOTAL **	40.33	40.31

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	9.28	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>9.28</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	136.83	208.36
Primary energy [kWh _{PE} /m ²]	48.07	60.62
Total emissions [kg/m ²]	4.59	5.76

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	135.4	0	11.8	0	3.7	3.19	0	3.57	0	
Notional	247	0	24.7	0	2.1	2.78	0	----	----	
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	189.6	0	16.5	0	8	3.19	0	3.57	0	
Notional	265.7	0	26.6	0	4.6	2.78	0	----	----	
[ST] No Heating or Cooling										
Actual	0	0	0	0	0	0	0	0	0	
Notional	0	0	0	0	0	0	0	----	----	

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Project name

Training Barn

As designed

Date: Wed Apr 19 14:53:12 2023

Administrative information

Building Details

Address: Dogs Trust, Huyton, XXX XXX

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.19

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.19

BRUKL compliance module version: v6.1.e.0

Foundation area [m²]: 181.51The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	5.21
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	4.86
Target primary energy rate (TPER), kWh _{PE} /m ² annum	54.56
Building primary energy rate (BPER), kWh _{PE} /m ² annum	50.13
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.18	__000000:Surf[4]
Floors	0.18	0.15	0.15	__000000:Surf[5]
Pitched roofs	0.16	0.15	0.15	__000000:Surf[0]
Flat roofs	0.18	-	-	No flat roofs in building
Windows** and roof windows	1.6	1.41	1.41	__000000:Surf[1]
Rooflights***	2.2	2.2	2.2	__000001:Surf[0]
Personnel doors^	1.6	-	-	No personnel doors in building
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building
U _{a-Limit} = Limiting area-weighted average U-values [W/(m ² K)] U _{a-Calc} = Calculated area-weighted average U-values [W/(m ² K)] U _{i-Calc} = Calculated maximum individual element U-values [W/(m ² K)] * Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. ** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position. ^ For fire doors, limiting U-value is 1.8 W/m ² K NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	4

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- ASHP (UFH) + NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.57	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- ASHP (UFH) + MV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.57	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- ASHP (UFH) + HRU(75)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.57	-	0.2	-	0.75
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- ASHP DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	3.57	0.009
Standard value	2*	N/A
* Standard shown is for all types except absorption and gas engine heat pumps.		

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
03 - Kitchen	-	-	0.4	-	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
04 - Cleaners	-	-	0.4	-	-	-	-	-	-	-	N/A
06 - Acc WC	-	-	0.4	-	-	-	-	-	-	-	N/A
07 - Training Room	-	-	-	1.4	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value		95	80	0.3
01 - Circulation		115	-	-
02 - Lobby		115	-	-
03 - Kitchen		115	-	-
04 - Cleaners		115	-	-
05 - Store		115	-	-
06 - Acc WC		115	-	-
07 - Training Room		115	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
07 - Training Room	YES (+6%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	181.5	181.5
External area [m ²]	697	697
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	4	5
Average conductance [W/K]	188.5	200.64
Average U-value [W/m ² K]	0.27	0.29
Alpha value* [%]	25	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

Retail/Financial and Professional Services
 Restaurants and Cafes/Drinking Establishments/Takeaways
 Offices and Workshop Businesses
 General Industrial and Special Industrial Groups

100 Storage or Distribution

Hotels
 Residential Institutions: Hospitals and Care Homes
 Residential Institutions: Residential Schools
 Residential Institutions: Universities and Colleges
 Secure Residential Institutions
 Residential Spaces
 Non-residential Institutions: Community/Day Centre
 Non-residential Institutions: Libraries, Museums, and Galleries
 Non-residential Institutions: Education
 Non-residential Institutions: Primary Health Care Building
 Non-residential Institutions: Crown and County Courts
 General Assembly and Leisure, Night Clubs, and Theatres
 Others: Passenger Terminals
 Others: Emergency Services
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	16.54	20.26
Cooling	0	0
Auxiliary	9.56	5.77
Lighting	15.62	8.89
Hot water	4	1.28
Equipment*	43.9	43.9
TOTAL **	45.72	36.2

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	13.6	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>13.6</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	189.68	202.69
Primary energy [kWh _{PE} /m ²]	50.13	54.56
Total emissions [kg/m ²]	4.86	5.21

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	301.7	0	26.3	0	2.2	3.19	0	3.57	0	
Notional	302	0	30.2	0	1.2	2.78	0	----	----	
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	176.8	0	15.4	0	17.2	3.19	0	3.57	0	
Notional	217.3	0	21.7	0	22.9	2.78	0	----	----	
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	167.6	0	14.6	0	8	3.19	0	3.57	0	
Notional	180.2	0	18	0	4.8	2.78	0	----	----	

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type